Duke Energy®

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Dianne B. Kuhnell
Senior Paralegal

VIA HAND DELIVERY

March 30, 2009

RECEIVED

MAR 30 2009

PUBLIC SERVICE COMMISSION

Mr. Jeff Derouen
Executive Director
Kentucky Public Service Commission
211 Sower Blvd
Frankfort, KY 40601

Re: Case No. 2008-00495

Dear Mr. Derouen:

Enclosed please find for filing an original and ten copies of the Responses to Initial Requests for Information from the Commission Staff to Duke Energy Kentucky and responses to Initial Requests for Information of the Attorney General in the above captioned case. We are enclosing a Petition for Confidential Treatment attached to an envelope containing the responses for which we are requesting confidential treatment.

Please date-stamp the extra two copies of each filing and the Petition and return to me in the enclosed envelope.

Sincerely,

Dianne B Kuhnell

Dianne B. Kuhnell
Senior Paralegal

<u>CERTIFICATE OF SERVICE</u>

The undersigned hereby certifies that a copy of Duke Energy Kentucky, Inc.'s Initial Requests for Information of the Attorney General served on the following by overnight mail, this 30th day of March 2009.

Rocco O. D'Ascenzo

Hon. Dennis G. Howard, II
Hon. Paul Adams
Assistant Attorneys General
1024 Capital Center Drive, Suite 200
Frankfort, Kentucky 40601

Hon. Michael L,. Kurtz
Attorney at Law
Boehm, Kurtz & Lowly
36 East Seventh Street
Suite 1510
Cincinnati, Ohio 45202
Counsel for Kroger Company

Hon. Anita Mitchell
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, Kentucky 40602

RECEIVED

MAR 30 2009

PUBLIC SERVICE COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE KENTUCKY PUBLIC SERVICE COMMISSION

Application of Duke Energy Kentucky, Inc. for Approval of Energy Efficiency Plan Including an Energy Efficiency Rider and Portfolio of Energy Efficiency Programs	))))	Case No. 2008-00495

PETITION OF DUKE ENERGY KENTUCKY, INC. FOR CONFIDENTIAL TREATMENT OF INFORMATION CONTAINED IN ITS FIRST SET OF DISCOVERY RESPONSES TO COMMISSION AND THE ATTORNEY GENERAL

Duke Energy Kentucky, Inc. ("Duke Energy Kentucky" or "Company"), pursuant to 807 KAR 5:001, Section 7, respectfully requests the Commission to classify and protect certain information in certain information provided by Duke Energy Kentucky in response to Staff data requests No. 6 (a), No. 6 (b), and Attorney General data request No. 37 in the Commission's requests for information in Appendix B, as contained in the Commission's Order dated March 16, 2009. The information Duke Energy Kentucky seeks confidential treatment ("Confidential Information") includes the Company's projected base load forecast including production and capital costs for the next several years (No. 6a), and Present Value Revenue Requirements (No. 6b). The response in No. 6 (a) contains sensitive information, the disclosure of which would provide a list of projected costs which could provide competitors with the Company's plans for future investments. The response in No. 6(b) contains Present Value Revenue Requirements (PVRR) information. The information contained in the response to the Attorney General's No. 37 pertains to projected illustrative calculations to show recovery through both save-a-watt and the existing DSM rider.

In support of this Petition, Duke Energy Kentucky states:

1. The Kentucky Open Records Act exempts from disclosure certain commercial information. KRS 61.878 (1)(c). To qualify for this exemption and, therefore, maintain the confidentiality of the information, a party must establish that disclosure of the commercial information would permit an unfair advantage to competitors of that party. Public disclosure of the information identified herein would, in fact, prompt such a result for the reasons set forth below.

2. The information contained in Attachment STAFF DR-01-006(a) and (b) regarding projected future cost projections and PVRR that Duke Energy Kentucky wishes to protect from public disclosure is identified in the filing submitted concurrently herewith. This information was developed internally by Duke Energy Kentucky personnel, is not on file with any public agency, and is not available from any commercial or other source outside Duke Energy Kentucky. The aforementioned information is distributed within Duke Energy Kentucky only to those employees who must have access for business reasons. If publicly disclosed, this information setting forth Duke Energy Kentucky's costs of operation and projected impacts give the Company's competitors, vendors and suppliers an obvious advantage in any contractual negotiations to the extent they could foresee or calculate Duke Energy Kentucky's requirements, operating margins and what Duke Energy Kentucky anticipates its business model requirements to cost. Finally, public disclosure would give Duke Energy Kentucky's contractors, vendors and competitors access to Duke Energy Kentucky's cost and operational parameters, as well as insight into its contracting practices. Competitors, suppliers, project bidders or potential equipment vendors would have ready access to DE-Kentucky's resource cost estimates and operation values given them enough information to determine a floor for any bid or proposed price. No sophisticated vendor

would consider making an offer at anything lower than DE-Kentucky's expected cost. Such access would impair Duke Energy Kentucky's ability to negotiate with prospective contractors and vendors, and could harm the Duke Energy Kentucky's competitive position in the power market, ultimately affecting the costs to serve customers.

3. The similar PVRR information contained in STAFF-DR-01-006 (b) that Duke Energy Kentucky wishes to protect from public disclosure has already been given confidential protection in this proceeding and in the Company's Integrated Resource Plan proceeding in Case No. 2008-248. Duke Energy Kentucky is merely requesting to continue this same protection here.

4. The information contained in AG-DR-01-37 includes present value calculations for avoided costs and revenues related to Rider SAW and the existing Shared Savings Model under the Company's proposed programs. The response that Duke Energy Kentucky wishes to protect from public disclosure is identified in the filing submitted concurrently herewith. This information was developed internally by Duke Energy Kentucky personnel, is not on file with any public agency, and is not available from any commercial or other source outside Duke Energy Kentucky. The aforementioned information is distributed within Duke Energy Kentucky only to those employees who must have access for business reasons. If publicly disclosed, this information setting forth Duke Energy Kentucky's costs of operation, evaluation of its Rider SAW and existing DSM Rider with projected program costs and projected impacts give the Company's competitors, vendors and suppliers an obvious advantage in any contractual negotiations to the extent they could foresee or calculate Duke Energy Kentucky's requirements, operating margins and what Duke Energy Kentucky anticipates its business model requirements to cost. Finally, public disclosure

would give Duke Energy Kentucky's contractors, vendors and competitors access to Duke Energy Kentucky's cost and operational parameters, as well as insight into its contracting practices. Competitors, suppliers, project bidders or potential equipment vendors would have ready access to DE-Kentucky's resource cost estimates and operation values given them enough information to determine a floor for any bid or proposed price. No sophisticated vendor would consider making an offer at anything lower than DE-Kentucky's expected cost. Such access would impair Duke Energy Kentucky's ability to negotiate with prospective contractors and vendors, and could harm the Duke Energy Kentucky's competitive position in the power market, ultimately affecting the costs to serve customers.

5. The information for which Duke Energy Kentucky is seeking confidential treatment is not known outside of Duke Energy Kentucky.

6. The information that Duke Energy Kentucky seeks confidential treatment herein demonstrates on its face that it merits confidential protection. If the Commission disagrees, however, it must hold an evidentiary hearing to protect the due process rights of the Company and supply the Commission with a complete record to enable it to reach a decision with regard to this matter. *Utility Regulatory Commission v. Kentucky Water Service Company. Inc.,* Ky. App., 642 S.W.2d 591, 592-94 (1982).

7. Duke Energy Kentucky does not object to limited disclosure of the confidential information described herein, pursuant to an acceptable protective agreement, to the Attorney General or other intervenors with a legitimate interest in reviewing the same for the purposes of participating in the above-styled proceeding. In fact the Attorney General has entered into such an agreement.

8. In accordance with the provisions of 807 KAR 5:001 Section 7, the Company is filing with the Commission one copy of the confidential portions of the responses to Staff's No. 6 (a), No. 6 (b) and the Attorney General's No. 37.

WHEREFORE, Duke Energy Kentucky, Inc. respectfully requests that the Commission classify and protect as confidential the specific information described herein.

Respectfully submitted,

DUKE ENERGY KENTUCKY, INC.

Amy B. Spiller (85309)
Associate General Counsel
Rocco O. D'Ascenzo (92796)
Senior Counsel
139 East Fourth Street, Room 25 AT II
Cincinnati, OH 45202
Phone: (513) 419-1810
Fax: (513) 419-1846
e-mail: amy.spiller@duke-energy.com

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of Duke Energy Kentucky, Inc.'s Petition for Confidential Treatment of Information was served on the following by overnight mail, this 30th day of March 2009.

Rocco O. D'Ascenzo

Hon. Dennis G. Howard, II
Hon. Paul Adams
Assistant Attorneys General
1024 Capital Center Drive, Suite 200
Frankfort, Kentucky 40601

Hon. Michael L,. Kurtz
Attorney at Law
Boehm, Kurtz & Lowly
36 East Seventh Street
Suite 1510
Cincinnati, Ohio 45202
Counsel for Kroger Company

Hon. Anita Mitchell
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, Kentucky 40602

VERIFICATION

State of Ohio)
) SS:
County of Hamilton)

The undersigned, David E. Freeman, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Director, Integrated Resource Planning for Duke Energy Business Services, LLC; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

David E. Freeman
David E. Freeman, Affiant

Subscribed and sworn to before me by David E. Freeman on this 23 day of March 2009.

Anita M. Schafer
NOTARY PUBLIC

My Commission Expires:

NOTARY PUBLIC STATE OF OHIO

ANITA M. SCHAFER
Notary Public, State of Ohio
My Commission Expires
November 4, 2009

243436

VERIFICATION

State of Ohio)
) SS:
County of Hamilton)

The undersigned, Richard G. Stevie, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Managing Director, Customer Market Analysis; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

Richard G. Stevie, Affiant

Subscribed and sworn to before me by Richard Stevie on this 26 day of March 2009.

NOTARY PUBLIC

My Commission Expires:

NOTARY PUBLIC STATE OF OHIO

ANITA M. SCHAFER
Notary Public, State of Ohio
My Commission Expires
November 4, 2009

243436

VERIFICATION

State of North Carolina)
) SS:
County of Mecklenburg)

The undersigned, Theodore E. Schultz, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Vice-President Marketing & Energy Efficiency; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

Theodore E Schultz

Theodore E. Schultz, Affiant

Subscribed and sworn to before me by Theodore E. Schultz on this 24th day of March 2009.

OFFICIAL SEAL
Notary Public, North Carolina
County of Cabarrus
DIANE M. WILKINSON
My Commission Expires July 12, 2009

NOTARY PUBLIC

Diane M. Wilkinson

My Commission Expires:

12 July 2009

265860

VERIFICATION

State of Indiana)
) SS:
County of Hendricks)

The undersigned, Michael Goldenberg, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Director, Products and Service; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

Michael Goldenberg

Michael Goldenberg, Affiant

Subscribed and sworn to before me by Michael Goldenberg on this 24th day of March 2009.

Paula M. Roseman

NOTARY PUBLIC Paula M. Roseman

My Commission Expires: 3/17/17
Resident: Hendricks County

266050

VERIFICATION

State of Ohio)
) SS:
County of Hamilton)

The undersigned, Paul G. Smith, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Vice President, Rates – Ohio and Kentucky; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

Paul G. Smith, Affiant

Subscribed and sworn to before me by Paul G. Smith on this 30th day of March 2009.

NOTARY PUBLIC

My Commission Expires:

NOTARY PUBLIC STATE OF OHIO

ANITA M. SCHAFER
Notary Public, State of Ohio
My Commission Expires
November 4, 2009

265927

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AG-DR-01-001

REQUEST:

Please refer to the application, page 4. Please explain the basis and reasoning behind the company's proposed plan to recover 75% of its annual avoided capacity costs and 50% of the net present value of avoided energy and capacity costs under the proposed rider. Please explain whether the company considered other methods of recovery of its costs and expenses and whether the company considered other methods of incentives to compensate the company other than the proposed rider.

RESPONSE:

The percentages were calculated to create a revenue requirement that generates an ROI of approximately 15% on program costs. The company considered this form of save-a-watt as the incentive and cost-recovery mechanism.

However, the Company has had experience with shared savings models in Ohio and Kentucky as well as a cost-only recovery model in Indiana. While Ohio and Kentucky provide recovery of lost margins, Indiana does not. Additionally, investments in energy efficiency in Indiana earn no return. These experiences have led the Company to conclude it needs a comparable earnings opportunity for energy efficiency as utilities have for generation options.

PERSON RESPONSIBLE: Paul G. Smith/Theodore E. Schultz

AG-DR-01-002

REQUEST:

Please refer to the application, page 4. Please explain the basis and reasoning behind the company's proposed earnings cap on its recovery under the proposed rider. Why were the proposed percentages chosen by the company?

RESPONSE:

Please see the direct testimony of Witness Ted Schultz at page 6 for a description of the basis of the earnings cap and calculation. The earnings cap percentages were developed in conjunction with stakeholders in both Ohio and Indiana. They were designed to provide an incentive for a utility to invest in energy efficiency resources equivalent to investing in power plants. Additionally, the ability to earn a return is tied to performance. The Company's earnings will be lower (based on the proposed cap) if the Company fails to meet its performance targets. The earnings cap percentages and relative risk were also compared to other jurisdictions. In addition, the earnings cap provides regulatory certainty concerning the level of company earnings from implementing energy efficiency programs.

PERSON RESPONSIBLE: Theodore E. Schultz

AG-DR-01-003

REQUEST:

Please refer to the application, page 5. Please explain in detail what the company means when it refers to "each year of *each vintage* of an energy conservation measure."

RESPONSE:

Conservation measures implemented today have benefits that extend for several years beyond the year in which they were first implemented. Thus, the term "vintage" refers to the year in which a measure was implemented. With respect to lost margins, the Company is seeking recovery of lost margins for a three year period. For example, for the first year of the program, which the Company considers the first vintage of measures, the Company is seeking recovery of lost margins for three years from the implementation of each measure. The second vintage, which represents the measures installed in the second year of the programs, a new three year period of lost margin recovery starts, just for the measures installed in the second vintage. The same process applies to the third and fourth vintages.

PERSON RESPONSIBLE: Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-004

REQUEST:

Please refer to the application, page 5. Please explain in detail how the company arrived at the estimate of its projected avoided costs and lost margins under the proposed rider.

RESPONSE:

The process for computing avoided costs and lost margins is discussed on pages 14 to 18 of the testimony of Dr. Richard Stevie. In addition, to clarify, the Company utilized the DSMore model to calculate the avoided energy costs for each hour for which an energy efficiency program had an impact to reduce usage. Avoided capacity cost, levelized cost of a peaking unit, was used to value the reduction of peak loads for both conservation and demand response programs. For lost margins, the Company utilized the Companies rates, net of fuel and variable operating and maintenance costs, in conjunction with the projected load reductions to compute the lost margins.

PERSON RESPONSIBLE: Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-005

REQUEST:

Please refer to the application, page 6. Please explain in detail why the company believes it is appropriate to adjust its SAW rider in year five based on projections of results and actual results rater than just its actual results.

RESPONSE:

The Company is assuming that the Rider Saw will continue beyond four years. In the fifth year, the Company will compute Rider SAW for the future based upon the projected revenue requirements for programs that will go forward plus the positive or negative balance from the true-up of the programs implemented during the first four years. So, it is a combination of the true-up for the first four years and the projected revenues for the programs that will be implemented after the fourth year.

PERSON RESPONSIBLE: Richard G. Stevie

AG-DR-01-006

REQUEST:

Please refer to the application, page 6. If the company's purpose of its rider SAW is to expand the number and scope of its energy efficiency programs in Kentucky, please explain in detail why the company has not proposed any new programs in the current application.

RESPONSE:

The programs included in the Company's application bear similar names to energy efficiency programs offered previously in Kentucky. This is to minimize customer confusion with the offerings and to ensure a consistent energy efficiency portfolio across all five states. However, the programs included in the Company's application are new programs in several ways. First, some programs, such as Smart $aver, now include additional measures not previously offered in Kentucky. In other programs, such as the K-12 Education Program, the entire program has been re-designed, to reach more customers, achieve greater efficiency impacts, and produce results at lower costs. Additionally, the Company has streamlined the vendors and back office of some programs, such as the Low Income program. The new program includes an individual vendor who will oversee the distribution of funds to crisis assistance agencies, perform the role of a general contractor, and ensure weatherization work is done consistently to high standards. Thus, the programs proposed in the new application, while bearing identical names to previous programs, are new.

PERSON RESPONSIBLE: Michael Goldenberg/Theodore E. Schultz

AG-DR-01-007

REQUEST:

Please refer to the application, page 7. Under the company's proposal it would have authority to make program changes and shift resources from one program to another without Commission approval, please explain in detail how the "flexibility" requested by the company would affect programs that may have greater intangible benefits than other programs (i.e. Energy education programs are typically not as "cost effective" as other programs, does the company intend to eliminate funding of these types of programs without Commission approval?)

RESPONSE:

The flexibility mentioned above and in the direct testimony of Theodore Schultz refers to the ability of the Company to modify certain program elements (such as incentive levels or program funding) in response to rapidly-changing market conditions. One of the primary benefits of the Company's proposal is that it focuses the Company's efforts to introduce and manage cost-effective programs that will be adopted by customers. Customer adoption can be driven by both tangible (e.g. lower bills) and intangible (e.g. "doing their part to help the environment") benefits to customers. In fact, the Company has proposed an energy education program, audits, and low income services – programs that traditionally are not necessarily cost effective. Each of these programs plays a valuable role in the portfolio to ensure maximum customer participation.

PERSON RESPONSIBLE: Theodore E. Schultz

AG-DR-01-008

REQUEST:

Please refer to the application, page 7. Is the company committing to reduce the generation at the plants that serve its Kentucky customers? If not, why not? If the company reduces the demand and capacity required by its Kentucky customers, what will it do with the electricity generated? Please explain detail.

RESPONSE:

No, not necessarily. A reduction in DE Kentucky load, or "freed-up" load, will be offered for sale into the MISO market. Incremental margins from such sales are shared with DE Kentucky's customers under the existing Rider PSM. This assumes that there is a market for the "freed-up load". For example, if the load reductions occur during off-peak periods there may not be a market for the generation.

PERSON RESPONSIBLE: Paul G. Smith

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-009

REQUEST:

Please refer to the application, page 9. Please explain in detail how the likely lower costs and operational efficiencies will be reflected under the recovery method proposed by the company. Will such efficiencies be reflected in a lower tariff or increased incentives to the company?

RESPONSE:

Under the Company's proposed recovery mechanism, if lower costs and operating efficiencies are achieved in the implementation of the energy efficiency programs, this will reduce the level of Rider SAW charged by the Company because ultimately the amount to be recovered by the Company is capped at a 15% margin on program costs. In the true-up process, lower program costs benefit customers.

PERSON RESPONSIBLE: Richard G. Stevie

AG-DR-01-010

REQUEST:

Please refer to the application, page 10. Please explain in detail what program changes the company defines as "significant".

RESPONSE:

Significant changes would include starting a new program or stopping an existing program.

PERSON RESPONSIBLE: Theodore E. Schultz

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-011

REQUEST:

Please refer to the application, page 10. Please explain whether the company believes a conflict of interest exists if it hires its own program evaluators. If it is the position of the company that such conflict does not exits, please fully explain the company's position.

RESPONSE:

The Company's approach to program evaluation is discussed in the testimony of Dr. Richard Stevie on pages 22 to 29 with accompanying Exhibits RGS-5 and RGS-6. The Company has stated that it will provide for independent review and evaluation of the proposed programs. Evaluation activities will be competitively bid, designed, managed, supervised, or conducted by independent professionals. Ultimately, the results are presented to the Commission for review. The Company does not believe a conflict exists. The proposed process is the same as the Company has employed for years in evaluating the past energy efficiency programs.

PERSON RESPONSIBLE: Richard G. Stevie

AG-DR-01-012

REQUEST:

Please refer to the application, page 10. How are such program evaluators to be chosen by the company?

RESPONSE:

Similar to the manner that measurement and verification (M&V) activities are conducted in other Duke Energy jurisdictions, Duke Energy Kentucky plans to use an independent third-party evaluation manager to prepare and issue a request for proposals (RFPs) to hire independent evaluators to conduct impact and process evaluations on the save-a-watt programs. The RFP will request bids to conduct evaluations consistent with the M&V plans submitted at the time of the program filing. Consistent with evaluation practice, evaluators will be selected based on experience, thoroughness and creativity in evaluation approach, as well as price.

PERSON RESPONSIBLE: Richard G. Stevie

AG-DR-01-013

REQUEST:

Please refer to the application, page 10. Please explain in detail what steps the company will take to ensure that a conflict does not arise in choosing its program evaluators.

RESPONSE:

See response to AG-DR-01-012.

PERSON RESPONSIBLE: Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-014

REQUEST:

Please refer to the application, page 10. Would the company agree to third party review of its proposed program evaluators? Would the company agree to third party review of the proposed program evaluators evaluation methods?

RESPONSE:

In the testimony of Dr. Richard Stevie, on pages 22 to 29 with accompanying Exhibits RGS-5 and RGS-6 and in the response to Attorney General Data Request No. 12, the Company has outlined its proposed approach to evaluation, measurement, and verification. This approach already allows for independent review of all the methods and processes that will be employed to conduct the evaluation, measurement, and verification.

PERSON RESPONSIBLE: Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-015

REQUEST:

Please refer to the application, page 12. Please explain in detail why the company believes it is appropriate to determine the level of avoided costs under the proposed tariff at the electric rates of its cogeneration/small power producers. Please explain in detail what the difference would be between avoided cost rates under the cogeneration/small power producers and its normal generation costs.

RESPONSE:

In evaluating the cost effectiveness of energy efficiency programs, one always uses the avoided costs consistent with the "peaker" methodology. The "peaker" methodology utilizes the capacity cost of a peaking unit plus marginal energy costs as the measure of avoided capacity and energy costs. This measure of avoided costs is consistent with the application of the standard cost effectiveness tests as well as consistent with the methodology in an Integrated Resource Plan. To use "normal" generation costs (which is undefined in the question but presumably average cost), one would undervalue the benefit of an energy efficiency program and not be consistent with the level of energy efficiency that would be cost effective within the Integrated Resource Plan.

PERSON RESPONSIBLE: Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-016

REQUEST:

Please refer to the application, page 12. Please explain in detail how the company proposed to treat purchased power under the proposed tariff. Is it the company's position that purchased power will be added to or subtracted from its estimated demand and capacity under the proposed tariff. Please explain the basis for the company's position on this issue.

RESPONSE:

Purchased power cost is not a component of Rider SAW.

PERSON RESPONSIBLE: Paul G. Smith

REQUEST:

Please refer to the application, page 12. Please explain in detail what percentage of recovery under the proposed tariff would be required for the company to recover all its costs under its existing programs.

RESPONSE:

Assuming the Attorney General is referring solely to the program costs, the Company would need to recover 40% of conservation avoided costs and 58% of demand response avoided costs to recover all program costs on a present value basis.

PERSON RESPONSIBLE: Theodore E. Schultz/Paul G. Smith

REQUEST:

Please refer to the application, page 15. Please explain in detail the differences between the programs proposed under the current application and those currently offered by the company.

RESPONSE:

Duke Energy Kentucky has assembled a portfolio of programs that are meant to appeal to a significant percentage of the Company's local customers. Although there are different programs that have worked in other utility jurisdictions, the Company has proposed a portfolio of programs that it feels can be successful in Kentucky. The Save-a-watt portfolio of programs has a blend of programs never before offered by Duke Energy Kentucky and existing programs that are similar to those in the current portfolio. Additionally, the existing programs will utilize new techniques for targeting, marketing and delivery that will dramatically change how these programs go to market, reach and interact with customers and work with trade allies, retailers and manufacturers. The Save-a-watt portfolio leverages tested, successful designs as the basis for the portfolio of programs while departing from conventional marketing techniques, partnerships, and data capture that differentiates the overall proposed portfolio.

As an example, the National Education Energy Education Program is replaced with Energy Efficiency Education Program for Schools, a broader based more comprehensive student-oriented program. Duke Energy Kentucky is partnering with the Scholastic company, a world-renowned educational resource for over 87 years. The program will deliver an extensive energy curriculum, teacher training, student distributed home energy audits, energy efficiency measures, school audits and community based staff. In addition, the program will deliver these services to all grades over its term.

Along with the program differences themselves, when comparing the current methods of targeting and marketing, against the new methods employed under Save-a-watt, there is a significant difference. Duke Energy Kentucky, through its collection of customer data will be able to deliver energy efficiency offers to customers based on how they use energy, the age of their home and other key attributes that impact the bill. This improved level of sophistication in targeting customers is a major advancement in program implementation that is in limited used by other utilities in general. With regards to marketing techniques, Duke Energy Ohio recent success with a compact fluorescent (CFL) light promotion is indicative of the type of pioneering marketing that will be adopted in Kentucky. The promotion was a partnership between Wal-Mart, GE and Duke Energy Ohio and resulted in CFL sales increase of over 800%, which was unprecedented. The promotion design also enabled Duke Energy Ohio to track the sales of CFL's at the customer level which was the first time this type of data collection was performed by any utility.

It is this type of innovative program design and thinking under Save-a-watt that sets the Duke Energy Kentucky programs apart from not only the current programs but from other utility programs.

PERSON RESPONSIBLE: Michael Goldenberg

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-019

REQUEST:

Please refer to the application, page 16. Please explain in detail the basis and reasoning behind the company decision not to capitalize a percentage of its avoided costs achieved by its energy efficiency programs as was suggested by the company in Case No. 2007-00477.

RESPONSE:

The Company agreed in lines 17-18, page 6, in Case No. 2007-00477 of Ted Schultz's testimony that capitalization of costs was a reasonable option. However, in lines 19-21 of that same testimony, Mr. Schultz goes on to say that using avoided costs was the most appropriate incentive, rather than capitalization of costs.

PERSON RESPONSIBLE: Theodore E. Schultz

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-020

REQUEST:

Please refer to the application, page 16. Please explain in detail why the company seeks Commission approval to reflect its treatment of the impacts to its income statement of its energy efficiency programs.

RESPONSE:

Paragraph W of the Application was intended to put the Commission on notice that the Company would be including additional information in its quarterly filings. Because the Company is not requesting to change its existing reporting obligations, Commission approval is probably not required.

PERSON RESPONSIBLE: Paul G. Smith

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-021

REQUEST:

Please refer to the application, page 17. Please explain in detail why the company proposes to include the actual program costs in a footnote to its income statement rather than in the body of its income statement. Does the company believe that the use of such data in a footnote is appropriate?

RESPONSE:

The Company intends to report its revenues, which are based on avoided costs, in the income statement. The Company proposes to footnote its actual program costs for purposes of revenue/expense matching.

PERSON RESPONSIBLE: Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-022

REQUEST:

Please refer to Attachment A of the application. Please list the members of the Kentucky residential and non-residential collaborative. Please list the title of the member and the relevant expertise of the members as it relates to energy efficiency.

RESPONSE:

Duke Energy Kentucky collaborative members include various customers and customer groups or agencies that work with Northern Kentucky residents. Collaborative membership is voluntary and requests for membership are based on representation of customer needs.

Duke Energy Kentucky Residential Collaborative

First Name	Last Name	Title	Organization	Relevant Expertise
Pam	Chapman	Institutional Market Segment Manager	Duke Energy	Employee in Energy Efficiency Strategy group.
Monica	Braunwart	Social Worker & Coordinator of Senior Plus Program	Boone County Fiscal Court	Service agency for Boone County residents.
Paul	Adams	Assistant Attorney General	Kentucky Attorney General's Office, Office of Rate Intervention	Signatory Party. The Office of Rate Intervention serves as a watchdog for consumers in various rate matters. Under Kentucky law, the office is responsible for representing the interests of Kentucky consumers before governmental rate making agencies, concentrating on utility

				cases.
Nina	Creech	VP - Operations	People Working Cooperatively	Service Agency. Helps low-income, elderly, and disabled homeowners live a higher quality of life. Assists Greater Cincinnati and Northern Kentucky residents with critical home repairs, modifications, and maintenance.
John	Davies	Acting Director of Division of Energy Efficiency and Conservation	Department for Energy Development and Independence	Leader in Kentucky's energy office. Leads Division of Energy Efficiency and Conservation.
Pat	Dressman	Director of Human Services	Campbell County Fiscal Court	Service Agency for Campbell County residents.
Beth	Hodge	Family Center Coordinator	Brighton Center	Service Agency. Strives to create opportunities for individuals and families to reach self-sufficiency through family support services, education and leadership throughout the communities of Northern Kentucky.
Carl	Melcher	Attorney	Northern Kentucky Legal Aid	Signatory Party. Offers assistance in all types of legal matters at no cost or reduced cost to those individuals who are unable to pay.
Jock	Pitts	President	People Working Cooperatively	Service Agency. Helps low-income, elderly, and disabled homeowners live a higher quality of life. Assists Greater Cincinnati and Northern Kentucky residents with critical home repairs, modifications, and maintenance.
Karen	Reagor	Coordinator of Kentucky NEED Project	Kentucky NEED Project	Energy Education Provider for Schools. Kentucky NEED takes

				a holistic approach to energy, providing core content-aligned curriculum for students, professional development for teachers and energy management programs for school operations and maintenance staff.
Joy	Rutan	Attorney	League of Women Voters	Attorney with The League of Women Voters, which encourages the informed and active participation of citizens in government, works to increase understanding of major public policy issues, and influences public policy through education and advocacy.
Florence	Tandy	Executive Director	Northern Kentucky Community Action Commission	Signatory Party and Service Agency. Helps low-income individuals and families develop the knowledge, opportunities and resources they need to achieve self reliance.

Duke Energy Kentucky Commercial & Industrial Collaborative

First Name	Last Name	Title	Company or Organization	Relevant Experience
Monica	Braunwart	Social Worker & Coordinator of Senior Plus Program	Boone County Fiscal Court	Service Agency for Residents in Boone County.
Carol	Cornell	Director, Small Business Center	Northern Kentucky University/S mall Business Development	Representative of college/university in Duke Energy Kentucky's service area and works with area small business.
John	Cain	President	Wiseway Supply	Business Member. Distributes electrical, plumbing and lighting supplies in the Greater Cincinnati area and

				serves commercial and residential contractors.
Pam	Chapman	Institutional Market Segment Manager	Duke Energy	Employee in Energy Efficiency Strategy group.
Paul	Adams	Assistant Attorney General	Kentucky Attorney General's Office, Office of Rate Intervention	Signatory Party. The Office of Rate Intervention serves as a watchdog for consumers in various rate matters. Under Kentucky law, the office is responsible for representing the interests of Kentucky consumers before governmental rate making agencies, concentrating on utility cases.
John	Davies	Acting Director of Division of Energy Efficiency and Conservation	Department for Energy Development and Independenc e	Leader in Kentucky's energy office. Leads Division of Energy Efficiency and Conservation.
Pat	Dressman	Director of Human Services	Campbell County Fiscal Court	Service Agency for Residents in Campbell County
Bob	Flick	Owner/Operator	Flick's Foods	Business Member in the food industry.
Russell	Guy	Maintenance Supervisor	Campbell County Fiscal Court	Service Agency for Residents in Campbell County.
Kris	Knochelman n	General Manager	Knockelman n Service Experts	Business Member. Sells, services and repairs HVAC systems.
Daniele	Longo	Vice President, Business Development and International Trade	Northern Kentucky Chamber of Commerce	Business Member. Strives to develop strong businesses and a vibrant economy in Northern Kentucky and its surrounding region, through business advocacy and leadership.
Ed	Monohan, Sr.	President	Monohan Development Company	Business Member. Business includes land development and office rental.
Jock	Pitts	President	People Working Cooperativel	Service Agency. Helps low-income, elderly, and disabled

			y	homeowners live a higher quality of life. Assists Greater Cincinnati and Northern Kentucky residents with critical home repairs, modifications, and maintenance.
Karen	Reagor	Coordinator of Kentucky NEED Project	Kentucky NEED Project	Energy Education Provider for Schools. Kentucky NEED takes a holistic approach to energy, providing core content-aligned curriculum for students, professional development for teachers and energy management programs for school operations and maintenance staff.
Gary	Sinclair	Maintenance Director	Kenton County Fiscal Court	Service Agency for Kenton County residents.

PERSON RESPONSIBLE: Michael Goldenberg/Pam Chapman

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-023

REQUEST:

Please refer to the testimony of David Freeman, page 8. In his testimony, Mr. Freeman indicates that the company's reserve margin is adequate until 2018 but beginning in 2019 is consistently below 15%. Please indicate the percentage of the reserve margin for each year starting from 2019 through 2028.

RESPONSE:

When the incremental capacity additions shown on Figure 1-7, page 1-35 and described on Figure 1-6, page 1-34 of Attachment DF-1 of my direct testimony are removed, the following reserve margins result, which are also shown in Attachment AG-DR-01-023.

YEAR	RES. MAR. (%)
2019	14.6
2020	13.9
2021	12.3
2022	11.3
2023	10.8
2024	9.8
2025	8.9
2026	8.0
2027	6.9
2028	6.5

PERSON RESPONSIBLE: David E. Freeman

Figure 1-7

Attachment DF-1

DUKE ENERGY KENTUCKY
SUPPLY VS. DEMAND BALANCE
(Summer Capacity and Loads)
No Incremental Capacity Additions

YEAR	INITIAL CAPACITY	SHORT TERM PURCH.	INCR. CAPACITY ADDITIONS	INCR. CAPACITY RETIRE./ DERATES	COGEN. CAPACITY	TOTAL CAPACITY	PEAK LOAD	ENERGY SECURITY ACT LIGHTING IMPACTS	INCR. CONSERV.[a]	DEMAND RESPONSE	FIRM SALES	NET LOAD	RES. MAR. (%)	CAPACITY MINUS NET LOAD	PURCHASES NEEDED TO MEET 15% RM
2008	1077	0	0	0	0	1077	871	0	0	-11	0	859	25.3	218	(89)
2009	1077	0	0	0	0	1077	880	0	-1	-13	0	866	24.3	211	(81)
2010	1077	0	0	0	0	1077	889	0	-1	-14	0	874	23.3	203	(72)
2011	1077	0	0	0	0	1077	907	0	-2	-14	0	891	20.9	186	(53)
2012	1077	0	0	-1	0	1076	918	-8	-2	-14	0	893	20.5	183	(49)
2013	1076	0	0	0	0	1076	928	-15	-3	-14	0	896	20.1	180	(46)
2014	1076	0	0	0	0	1076	938	-23	-3	-14	0	898	19.9	178	(44)
2015	1076	0	0	0	0	1076	948	-25	-3	-14	0	905	18.8	171	(35)
2016	1076	0	0	0	0	1076	958	-23	-4	-14	0	917	17.3	159	(21)
2017	1076	0	0	0	0	1076	968	-28	-4	-14	0	922	16.7	154	(16)
2018	1076	0	0	0	0	1076	978	-29	-4	-14	0	931	15.6	145	(5)
2019	1076	0	0	0	0	1076	987	-30	-4	-14	0	939	14.6	137	4
2020	1076	0	0	0	0	1076	995	-32	-4	-14	0	945	13.9	131	11
2021	1076	0	0	0	0	1076	1004	-28	-4	-14	0	958	12.3	118	26
2022	1076	0	0	0	0	1076	1013	-28	-4	-14	0	967	11.3	109	36
2023	1076	0	0	0	0	1076	1021	-32	-4	-14	0	971	10.8	105	41
2024	1076	0	0	0	0	1076	1030	-32	-4	-14	0	980	9.8	96	51
2025	1076	0	0	0	0	1076	1038	-32	-4	-14	0	988	8.9	88	60
2026	1076	0	0	0	0	1076	1046	-32	-4	-14	0	996	8.0	80	69
2027	1076	0	0	0	0	1076	1053	-28	-4	-14	0	1007	6.9	69	82
2028	1076	0	0	0	0	1076	1061	-33	-4	-14	0	1010	6.5	66	86

[a] Not included in load forecast
The values shown are the impacts coincident with the summer peak, not the maximum impacts.

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-024

REQUEST:

Please refer to the testimony of David Freeman, page 10. In his testimony, Mr. Freeman indicates that no energy efficiency programs included in 2008 IRP SO analysis were selected as economic because no additional generation resources were required until 2019. In light of this statement, please explain in detail why the company believes is appropriate to include recovery of avoided capacity costs in the proposed tariff if no new generation capacity is anticipated be constructed until 2019.

RESPONSE:

Even though the System Optimizer (SO) linear programming model did not select as economic the energy efficiency programs in the 2008 IRP analysis, Duke Energy Kentucky chose to develop portfolios with and without energy efficiency for the more detailed production cost analysis using Planning and Risk (PaR), a production costing model. This was done to further evaluate whether or not the energy efficiency programs were economic.

After these bundles were made part of the 2008 IRP plan, an analysis was performed using PaR to compare the economics of the 2008 IRP plan to a plan that did not contain any EE or DR programs. This analysis showed that the inclusion of these programs in the chosen plan was economic, by reducing the PVRR of the plan by approximately $2.5 million when compared to the same plan that did not contain any conservation or demand response programs.

The proposed energy efficiency programs offset future capacity needs. When the new generation required in the proposed energy efficiency programs is compared with new generation required in the 2008 IRP, a new 35 MW CT is delayed one year from 2019 to 2020 and a new 35 MW CT is cancelled in 2023 and replaced with 50 MW of Wind power in 2024. New generation after 2024 could possibly be delayed in the future if the regulatory treatment proposed by the Company were implemented, which would give the Company the incentives to pursue additional energy efficiency initiatives in the future.

AG-DR-01-025

REQUEST:

Please refer to the testimony of David Freeman, page 12. In his testimony, Mr. Freeman indicates that the company still envisions the need to obtain additional generation resources staring in the year 2019 and that over the long term the regulatory treatment proposed under the tariff should encourage the company to pursue additional energy efficiency initiative. Is the company claiming that it will not need such additional generation if its proposed tariff is approved? Please explain in detail.

RESPONSE:

No. Even if the proposed tariff is approved and the proposed save-a-watt programs are implemented, Duke Energy Kentucky sees the need for additional resources, as shown in Attachments DF-2 and DF-3 of David Freeman's direct testimony.

PERSON RESPONSIBLE: David E. Freeman

AG-DR-01-026

REQUEST:

Please refer to the testimony of David Freeman, page 12. Will the company agree to eliminate the addition of it proposed new generation discussed in its 2008 IRP if its proposed tariff is approved?

RESPONSE:

As stated in AG-DR-01-025, Duke Energy Kentucky will need additional new generation even if its proposed tariff is approved and the proposed save-a-watt programs are implemented. These are represented in Attachments DF-2 and DF-3 of David Freeman's direct testimony.

PERSON RESPONSIBLE: David E. Freeman

AG-DR-01-027

REQUEST:

Please refer to the testimony of Julia S. Janson, page 6. In her testimony, Ms. Janson states that existing financial incentives are inadequate to encourage energy efficiency investments and that current utility regulation favors new generation over conservation. Please explain in detail what level of recovery the company currently receives on its existing energy efficiency portfolio. Please explain in detail what level of recovery the company currently earns on its new Kentucky generation resources.

RESPONSE:

Objection. The question is unduly burdensome with respect to earnings on "new generation resources. Duke Energy Kentucky does not have this information as the Company does not have unbundled rates (i.e. distribution, transmission and generation are not broken out separately). The development of this information would require a complete cost of service study and the development of separate generation rates by class. Without waiving said objection, the Company responds as follows:

The Company's current energy efficiency mechanism permits the company to recovery its program costs, lost margins over three years and a shared savings component of 10% of the net benefits (where net benefits = (avoided costs – program costs) X 10%). Although Duke Energy Kentucky's generating resources are new to the Company in as much as they were existing plants transferred to Duke Energy Kentucky within the last three years, the company currently earns a return on the investment through base rates. The statement refers to the fact that under a traditional regulatory model to the extent a utility's earnings are dependent upon energy sales, as energy sales increase, its revenues increase. Conversely, as a utility's load decreases, so do sales and ability to achieve revenue requirements. The greater the customer load, the greater the incentive to invest in a supply side resource to meet customer load. A utility is able to recover its investment and earn a return on the supply side resource over the life of the plant.

PERSON RESPONSIBLE: Theodore E. Schultz

REQUEST:

Please refer to the testimony of James E. Rogers, page 7. In his testimony, Mr. Rogers states that utilities *generally* have the opportunity to achieve earnings on their supply-side investments, but that opportunity to achieve a comparable level of earnings is *typically* not available for demand-side investments. Please state whether Mr. Rogers includes Kentucky in this statement. As Duke Kentucky currently earns a fixed percentage of incentive for investments in energy efficiency programs, please explain in detail why Mr. Rogers feels this is inadequate? Is it Mr. Rogers assertion that such fixed percentage is unreasonable?

RESPONSE:

Although Kentucky's current demand-side model provides a return for the Company, its fixed percentage return does not encourage innovative program designs that maximize customer energy reductions at the lowest possible cost. The Company's proposal, on the other hand, does allow for such innovation at a reduced risk to customers. Because revenues (and ultimately earnings) in the Company's proposal are based on the costs avoided, the Company must offer programs that customers will adopt at a cost lower than the avoided costs. This encourages the utility to find new ways to reduce expenses, increase customer benefits, and understand what products will ultimately be utilized by customers. Furthermore, while the traditional model is low-risk for the utility, it carries significant risk for the customer if forecasted energy reductions from demand-side programs do not materialize. In such a scenario, customers would pay for both under-performing demand-side programs and supply-side generation to make up for the performance gap. Under the Company's proposal, this risk is borne by the Company and in turn provides an opportunity for a higher return.

PERSON RESPONSIBLE: Theodore E. Schultz

REQUEST:

Please refer to the testimony of James E. Rogers, page 9. In his testimony, Mr. Rogers states that although Duke Energy Kentucky has had good results with the existing shared savings mode, [Duke] need[s] substantially better results if [Duke] is to achieve its objectives of long-term energy security and sustainability. As no other electric utilities have raised the issue of needing additional recovery for their energy efficiency programs, why does Mr. Rogers maintain Duke needs additional recovery? Does he believe that the other electric utilities do a better job than Duke Energy Kentucky in their energy efficiency programs? Does Mr. Rogers believe that the objectives of long-term energy security and sustainability are more important than the Commission's long held goals of reasonable rates and reliable electric service? Please fully explain your answers.

RESPONSE:

At both the national and state level there has been much debate and discussion over incentive levels for energy efficiency. For example, in California, Oklahoma and North Carolina utilities have filed proposals for new recovery mechanisms for energy efficiency. Adoption of a cap-and-trade program for carbon emissions regulation and possible national renewable / energy efficiency portfolio standards are likely to dominate energy policy at both the state and national level for quite some time. The Company fundamentally believes greater investment in energy efficiency is necessary to mitigate the risk of higher rates, to reduce environmental impacts, and to provide reliable electric service for customers. Duke Energy is at the forefront of these national debates and believes all utilities will similarly look for ways to address these issues.

PERSON RESPONSIBLE: Theodore E. Schultz

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-031

REQUEST:

Please refer to the testimony of James E. Rogers, page 9. In his testimony, Mr. Rogers states that Duke believes the existing model of recovery does not create enough value for consumers or enough financial incentive for the company to drive innovation and investment necessary to fully realize the potential benefits of energy efficiency. Please state whether Duke believes that low rates and reliable service have value to customers greater than that of energy efficiency. Please state what investments Duke Energy Kentucky has not made in the state due to a perceived inability to recovery enough incentive to justify the expenditure.

RESPONSE:

Low rates and reliable service have value to customers. However, pending carbon legislation and rising fuel costs offer potential risks to consumers who have not yet become efficient consumers of electricity. By promoting greater energy efficiency, Duke Energy is attempting to help customers mitigate these risks.

PERSON RESPONSIBLE: Theodore E. Schultz/Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-032

REQUEST:

Please refer to the testimony of James E. Rogers, page 11. In his testimony, Mr. Rogers states that the company makes the investment in energy efficiency up front and assumes the risk that the program will work. Please quantify this alleged risk in light of the fact that the company will begin to recover from its customers immediately under the tariff on its proposed programs.

RESPONSE:

The risk referred to in Mr. Rogers testimony is referring to the risk that a customer may pay twice for the same energy. Under the traditional methodology, if the Company's estimates of energy and capacity reductions do not materialize, the customer must pay for the efficiency program and the generation needed to replace the shortfall. However, under the Company's proposal, if estimates of energy and capacity reductions do not materialize, the Company must refund the revenues associated with the shortfall.

Furthermore, immediate recovery based on the rider does not mean the Company is not spending money, incurring risk, or will be allowed to keep all of the revenue it collects. Because the Company receives no direct recovery of program costs, immediate recovery is necessary in order to ensure the company does not have negative cash flows. Additionally, the true-up process determines the allowed earnings based on measured and verified energy and capacity reductions. If the Company earns more than allowed, it will be required to refund that back to customers.

PERSON RESPONSIBLE: Theodore E. Shultz

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-033

REQUEST:

Please refer to the testimony of James E. Rogers, page 11. Please state whether the minimum recovery under the proposed tariff includes the company's program costs with minimum recovery of 5% over and above the company's program costs. Is there any scenario in which the company does not recover its program costs plus at least 5%? Please fully explain your answer.

RESPONSE:

The Company's minimum recovery is not program costs with a 5% return. There are multiple scenarios where the Company would earn less than this amount due to lower impacts (and thus lower avoided cost revenue) or higher program costs.

For instance, if the Company spends 30% more than expected to achieve 100% of impacts, its return will be negative. Alternatively, if the Company spending is on target, but impacts verified through the M&V process are 25% lower than expected, the Company will lose money.

PERSON RESPONSIBLE: Theodore E. Schultz

REQUEST:

Please refer to the testimony of James E. Rogers, page 14. In his testimony, Mr. Rogers states that the save-a-watt program can serve as a model to other utilities as a new way of thinking about energy efficiency. Please state whether Mr. Rogers or any other Duke representative has knowledge of any other utility proposal similar to Duke's save-a-watt currently before any regulatory body. If so, please provide the name of the utility and the jurisdiction.

RESPONSE:

The Company is unaware of any such proposal outside of other Duke Energy affiliates. The Public Utilities Commission of Ohio has approved this recovery mechanism.

PERSON RESPONSIBLE: Theodore E. Schultz

AG-DR-01-035

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 4. In his testimony, Mr. Schultz states that Duke Energy Kentucky recognizes energy efficiency as a reliable, valuable resource to meet the customers' growing need for electricity. Please sate the project growth in demand and capacity of Duke Energy Kentucky from 2008 through 2028. Would Mr. Schultz agree that Duke Energy projects only modest growth in its demand and capacity through 2028?

RESPONSE:

In the Company's 2008 Integrated Resource Plan, total energy was projected to grow at a 0.8% annual rate. Also, the summer peak demand was projected to grow at 0.8% per year. The Company's 2008 IRP represents a snapshot in time of forecasted load growth. Therefore, it is hard to define what is considered a modest growth rate.

PERSON RESPONSIBLE: Richard G. Stevie

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 6. In this testimony, Mr. Schultz states that the percentage of savings achieved is determined by dividing the actual avoided energy and capacity costs at the end of the four years by the total forecasted avoided energy and capacity costs over the same time period. Please explain in detail who determines the reasonableness of the projected avoided capacity and energy savings? Are these projections approved by the Commission on an annual basis? Please explain why the company believes that this ratio is reasonable. Doesn't this ratio encourage the company to under-estimate the achievable savings to boost its recovery? Why aren't the results reviewed on an annual basis rather than four years? Doesn't' waiting for four years provide the company with recovery through the tariff that could be substantially more or less than could be reflected at the end of the true up period? Couldn't this lead to substantial mismatch, which was a problem recently noted by the Commission in regard to Duke's current DSM program?

RESPONSE:

Discussion on the avoided costs is summarized in the testimony of Dr. Richard Stevie on pages 14 to 18. Avoided capacity costs are obtained from the Company's most recent avoided cost filing. Avoided energy costs are developed from the Integrated Resource Planning process.

Reasonableness of impacts can be determined in several ways, including but not limited to: evaluation, measurement, and verification (EM&V) studies performed on programs; engineering estimates provided by efficiency industry experts; past Company experience; and based on the input of the Company's collaborative partners.

However, the Commission ultimately approves the reasonableness of the avoided costs. All the ratio is doing is showing the achievement towards a projected goal of avoided costs. One could obtain similar information by comparing the kWh impacts obtained relative to total kWh impacts planned. However, this ignores the differences in value that occur based upon when the kWh impacts occur. In addition, the structure of the recovery proposal provides the Company with an incentive to pursue as much efficiency as possible. Results will be reviewed annually as we proceed through the four year period through measurement and verification studies. This information will be utilized to adjust the rider recovery during the four year period to reduce the risk of a large true-up.

Results are reviewed on a four year period for several reasons. First EM&V may take more than 12 months to evaluate a program, and not all programs begin on January 1. Thus, valid EM&V results for each year's programs will not be available until many months after that 12 month period has concluded. Next, markets for energy efficiency are volatile and may move up or down in any year based on the weather, economy, or general consumer trends. Because these results are so variable, the Company believes it is more appropriate to track results relative to a 4 year total, rather than on an individual year basis. On the other hand, Duke's current DSM program has annual updates. These updates show that market volatility can greatly affect the program from year-to-year. The Company wishes to avoid such volatility and believes that over a four year period such differences should offset one another, smoothing out the impact of any true-up.

In the Company's proposal, under-estimating achievable savings cannot boost the Company's ROI beyond agreed upon levels since the Company's proposal includes an earnings cap. Thus, there is no incentive to over or under-estimate results.

PERSON RESPONSIBLE: Theodore E. Schultz/Richard G. Stevie

AG-DR-01-037PUBLIC

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 6. Please provide an example calculation of the company's recovery under the existing method and the proposed method. For the purposes of these calculations the company can reference the results and costs reported in its most recent DSM filing for its existing programs.

RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

This response is being filed with the Commission under a Petition for Confidential Treatment.

PERSON RESPONSIBLE: Theodore E. Schultz

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-038

REQUEST:

Please refer to the testimony of Theodore E. Schultz, on page 10. In his testimony, Mr. Schultz states that Duke wishes to make program changes and reallocate resources among programs to optimize results for both customers and the company and that although programs will still continue to be filed and approved by the Commission, participation and spending levels by program will not be unduly restricted by pre-established limits. Does Mr. Schultz imply that funding could be increased or decreased, affecting the recovery sought by the company from its customers, without Commission approval? What if a program is popular with customers but is not a profitable for the company, is it the company's assertion that it has the ability under the tariff to unilaterally end such programs? Please fully explain your answer.

RESPONSE:

Such funding flexibility was requested so that money for programs which are being adopted at a less-than-anticipated rate can be shifted to programs that are being adopted at a faster-than-anticipated rate. This was not meant to imply the Company would stop existing or start new programs without regulatory approval. Please see response to AG-DR-01-010.

PERSON RESPONSIBLE: Theodore E. Schultz

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-039

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 11. In his testimony, Mr. Schultz states that Commission approval would be required to add or remove a program from the company's portfolio, however isn't it possible for the company to essentially "kill" a program by ending it's funding without Commission approval? If not, please fully explain your answer.

RESPONSE:

No. Please see response to AG-DR-01-038.

PERSON RESPONSIBLE: Theodore E. Schultz

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-040

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 15. Please describe how the company's Reach and Teach and Home Performance programs differ from the existing programs offered by the company.

RESPONSE:

The Reach & Teach (RTEC) Program is replacing Payment Plus (PP+) which is delivered by Northern Kentucky CAC. The existing program only reaches less than 100 participants per year whereas RTEC goal is to have approximately 1000 participants once fully implemented. In addition, PP+ only runs classes a maximum of 4 months per year whereas RTEC will be scheduled over all 12 months. Lastly, RTEC not only provides energy education but will also distribute compact fluorescent light bulbs to participants where as participants in PP+ once having completed all education sessions were eligible for arrearage assistance. Now all dollars will be spent on the customer and will not be returned to the company.

The Home Performance Program is a comprehensive audit program which is modeled after the Home Performance with Energy Star Program offered by many utilities across the U.S. The goal of the program is to provide the home owner with a comprehensive customized report and the ability to finance and install identified measures. Unlike the Home Energy House Call Program which is also part of the Duke Energy Kentucky portfolio, Home Performance performs a number of diagnostic tests e.g. blower door, thermo scanning, pressure pan testing and duct blasting to determine areas of energy loss which are not seen during a normal visual walk through audit. Each audit is customized for that customer's home along with the measures and incentives offered. Under the existing Home Energy House Call Program, measures are identified on a visual basis only and incentives are based off of the existing Smart Saver Program prescriptive amounts.

PERSON RESPONSIBLE: Michael Goldenberg

AG-DR-01-041

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 17. Does the company believe it is appropriate to earn enhanced returns on its educational and low income energy efficiency programs? If so, why? Please fully explain your answer.

RESPONSE:

Earnings from the Company's proposal are derived based on the overall performance of the portfolio rather than from specific programs. Thus, the company is not asking for "enhanced returns" on education or low income programs.

PERSON RESPONSIBLE: Theodore E. Schultz

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-042

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 17. Please provide a listing of the 40 new energy efficiency measures offered in the Smart Saver Program for non-residential customers. Please provide a listing of all measures offered previously.

RESPONSE:

Attachment AG-DR-01-042 contains a list of the measures offered previously and a list of the measures offered under the non-residential Smart saver program under the save-a-watt initiative. This shows the new measures being offered.

PERSON RESPONSIBLE: Richard G. Stevie

Current Measures	SAW Measures
Lighting	**Lighting**
	2 High Bay 6L T-5 High Output replacing 1000W HID.xls
	2 High Bay Fluorescent 8LF32T8 - Replacing 1000W HID.xls
42W 8 Lamp High Bay Compact Fluorescent .xls	42W 8 Lamp High Bay Compact Fluorescent .xls
Compact Fluorescent Fixture.xls	Compact Fluorescent Fixture.xls
Compact Fluorescent Screw in.xls	Compact Fluorescent Screw in.xls
High Bay 2L T-5 High Output.xls	High Bay 2L T-5 High Output.xls
High Bay 3L T-5 High Output.xls	High Bay 3L T-5 High Output.xls
High Bay 4L T-5 High Output.xls	High Bay 4L T-5 High Output.xls
High Bay 6L T-5 High Output.xls	High Bay 6L T-5 High Output.xls
High Bay 8L T-5 High Output.xls	High Bay 8L T-5 High Output.xls
High Bay Fluorescent 4 Lamp (F32 Watt T8).xls	High Bay Fluorescent 4 Lamp (F32 Watt T8).xls
High Bay Fluorescent 6 Lamp (F32 Watt T8).xls	High Bay Fluorescent 6 Lamp (F32 Watt T8).xls
High Bay Fluorescent 8 Lamp (F32 Watt T8).xls	High Bay Fluorescent 8 Lamp (F32 Watt T8).xls
High Performance Low Watt T8 4ft 1 lamp, replacing standard T8	High Performance Low Watt T8 4ft 1 lamp, replacing standard T8.xls
High Performance Low Watt T8 4ft 2 lamp, replacing standard T8	High Performance Low Watt T8 4ft 2 lamp, replacing standard T8.xls
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REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 18. Please explain how the company intends to account for funds from Federal or State resources under the LIHEAP or ratepayer fund from the company's HEA programs under the proposed tariff. Does the company intend that the energy savings of participants such receiving assistance will be included in its avoided costs? Does the company believe such treatment will "double-dip"? If not, why? Please fully explain your answer.

RESPONSE:

Both LIHEAP and HEA funds are not used for energy measures but for assistance in paying energy bills. Thus, no energy savings would be generated by participants using these funds.

PERSON RESPONSIBLE: Michael Goldenberg

AG-DR-01-044

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 19. In his testimony, Mr. Schultz states that many customers believe that they have already adopted simple, responsible behaviors, and they perceive energy efficiency alternatives as higher-priced, complicated, or unwelcome interferences with their lifestyle or business. Isn't this perception true as the company proposes to dramatically increase the cost to consumers of its energy efficiency programs? Further, isn't the perception that energy efficiency alternatives are unwelcome also true for business customers as Kentucky currently provides an exemption for industrial users? Is it the company's position that regardless of these perceptions, that consumers should be forced to pay even higher costs for energy efficiency programs they may not wish to participate in? Please fully explain your answers.

RESPONSE:

Mr. Schultz's testimony states on page 19, line 15, "many customers lack the capital to invest in energy efficiency." This statement does not imply customers are unwilling to pay more to participate in energy efficiency programs. Instead, it states customer research shows some customers prolong needed efficiency upgrades and instead focus on lowest-possible up-front cost when confronted with the high capital costs associated with major efficiency-related purchases such as replacement HVAC systems. In these circumstances, the Company is proposing to offer incentives to customers in order to reduce the customers' up-front outlay of cash so that they will make a more energy-efficiency purchase.

In addition, if customers decide that they do not want to participate in the Company's energy efficiency programs, whether because they believe they have already made changes to be energy efficient or another reason, then customers will not pay for the Company's energy efficiency programs. Under the save-a-watt proposal, if customers do not participate in the energy efficiency programs, then the Company will not achieve any load reductions or avoided costs. As a result, the Company will not be able to justify any revenues. This is the risk that the Company is taking on under this proposal. The Company needs to offer programs that customers want. Customers are not forced to pay, but allowed to choose.

PERSON RESPONSIBLE: Theodore E. Schultz/Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-045

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 19. In his testimony, Mr. Schultz acknowledges that few customers are willing to pay more to participate in energy efficiency programs. If this is the case, why is the company proposing to force ratepayers to pay even more for these programs? Please fully explain your answer.

RESPONSE:

Please see response to AG-DR-01-044.

PERSON RESPONSIBLE: Theodore E. Schultz/Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-046

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 23. Is the company proposing to take profits on savings measurers paid for by tax incentives? If so, why? If not, please indicate how such energy savings will be removed from consideration by the company. Please fully explain your answer.

RESPONSE:

If customers utilize tax incentives to help pay for the cost to implement energy efficiency measures, the Company can only claim the energy savings under the save-a-watt proposal if the Company also provided incentives to the customers or in some other way affected customers' decisions to implement energy efficiency measures.

PERSON RESPONSIBLE: Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-047

REQUEST:

Please refer to the testimony of Theodore E. Schultz, page 26. For the purposes of recovery, does the company intend to claim energy savings of its industrial customers who have implemented their own measures? If so, why does the company feel this is appropriate? Please fully explain your answer.

RESPONSE:

No. The Company only claims energy savings for those measures for which it has had an impact on the customer's adoption of the measure.

PERSON RESPONSIBLE: Richard G. Stevie

AG-DR-01-048

REQUEST:

Please refer to Attachment TES-2, page 2. Please state whether the company intends to provide the rebates described therein on gas appliances under the proposed tariff. If not, why? Please fully explain your answer.

RESPONSE:

No, because the Company is not providing incentives on gas measures.

PERSON RESPONSIBLE: Michael Goldenberg

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-049

REQUEST:

Please refer to Attachment TES-2, page 6. Please state whether the company will charge consumers interest on loans made through its proposed Efficiency Savings Plan. If so, will the interest costs be included in the company's recovery calculations?

RESPONSE:

The Company will not be funding the loans made under the Efficiency Savings Plan. Thus, any interest payments will go to the funding party and not Duke Energy Kentucky.

PERSON RESPONSIBLE: Michael Goldenberg

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Attorney General Data Requests
Date Received: March 16, 2009

AG-DR-01-050

REQUEST:

Please refer to Attachment TES-2, page 6. In regard to the company's proposed Efficiency Savings Plan, please provide details as to how customers will be affected should a foreclosure or sale of the property be made prior to the payoff of the proposed loan.

RESPONSE:

The financial agreement for the energy saving loan will include the consumer's responsibility to pay the full outstanding balance of the loan in the event of a change in ownership or foreclosure.

PERSON RESPONSIBLE: Michael Goldenberg

AG-DR-01-051

REQUEST:

Please refer to Attachment PGS-1, page 1. The company proposes that an entity that originally opted out of its energy efficiency program will be required to pay the entire rider amount for the opt out period prior to being allowed into the program. Please fully explain why the company believes it is appropriate to back charge such entities that received no benefits from the company during the opt out period. Additionally, please fully explain how such a policy complies with the PSC regulations and statutes governing the ability of a company to collect past obligations.

RESPONSE:

The Company believes that a customer who initially elects to opt out of Rider SAW, not to take advantage of benefits and accordingly avoid paying its fair share of costs, should be permitted to opt in at a later date. As programs evolve or are newly developed it is the Company's hope that customers who have opted out would reconsider their decision and decide instead to opt back into the program. However, the customer who later decides to opt in should be required to pay their fair share of the rider for the period. Otherwise, customers who either did not choose to opt out or who do not have the ability to opt out, end up subsidizing the returning customer's participation.

PERSON RESPONSIBLE: Theodore E. Schultz

CERTIFICATE OF SERVICE

The undersigned hereby certifies that a copy of Duke Energy Kentucky, Inc.'s Initial Data Request of Commission Staff served on the following by overnight mail, this 30th day of March 2009.

Rocco O. D'Ascenzo

Hon. Dennis G. Howard, II
Hon. Paul Adams
Assistant Attorneys General
1024 Capital Center Drive, Suite 200
Frankfort, Kentucky 40601

Hon. Michael L,. Kurtz
Attorney at Law
Boehm, Kurtz & Lowly
36 East Seventh Street
Suite 1510
Cincinnati, Ohio 45202
Counsel for Kroger Company

Hon. Anita Mitchell
Kentucky Public Service Commission
211 Sower Boulevard
Frankfort, Kentucky 40602

VERIFICATION

State of Ohio)
) SS:
County of Hamilton)

The undersigned, David E. Freeman, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Director, Integrated Resource Planning for Duke Energy Business Services, LLC; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

David E. Freeman, Affiant

Subscribed and sworn to before me by David E. Freeman on this 23 day of March 2009.

NOTARY PUBLIC

My Commission Expires:

NOTARY PUBLIC STATE OF OHIO

ANITA M. SCHAFER
Notary Public, State of Ohio
My Commission Expires
November 4, 2009

VERIFICATION

State of Ohio)
) SS:
County of Hamilton)

The undersigned, Richard G. Stevie, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Managing Director, Customer Market Analysis; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

Richard G. Stevie, Affiant

Subscribed and sworn to before me by Richard Stevie on this 26 day of March 2009.

NOTARY PUBLIC

My Commission Expires:

NOTARY PUBLIC STATE OF OHIO

ANITA M. SCHAFER
Notary Public, State of Ohio
My Commission Expires
November 4, 2009

VERIFICATION

State of North Carolina)
) SS:
County of Mecklenburg)

The undersigned, Theodore E. Schultz, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Vice-President Marketing & Energy Efficiency; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

Theodore E. Schultz

Theodore E. Schultz, Affiant

Subscribed and sworn to before me by Theodore E. Schultz on this 24th day of March 2009.

OFFICIAL SEAL
Notary Public, North Carolina
County of Cabarrus
DIANE M. WILKINSON
My Commission Expires July 12, 2009

NOTARY PUBLIC

Diane M. Wilkinson

My Commission Expires:

12 July 2009

VERIFICATION

State of Indiana)
) SS:
County of Hendricks)

The undersigned, Michael Goldenberg, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Director, Products and Service; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

Michael Goldenberg

Michael Goldenberg, Affiant

Subscribed and sworn to before me by Michael Goldenberg on this 24th day of March 2009.

Paula M. Roseman

NOTARY PUBLIC Paula M. Roseman

My Commission Expires: 3/17/17
Resident: Hendricks County

<u>VERIFICATION</u>

State of Ohio)
) SS:
County of Hamilton)

The undersigned, Paul G. Smith, being duly sworn, deposes and says that I am employed by the Duke Energy Corporation affiliated companies as Vice President, Rates – Ohio and Kentucky; that on behalf of Duke Energy Kentucky, Inc., I have supervised the preparation of the responses to the foregoing responses to information requests; and that the matters set forth in the foregoing response to information requests are true and accurate to the best of my knowledge, information and belief after reasonable inquire.

Paul G. Smith

Paul G. Smith, Affiant

Subscribed and sworn to before me by Paul G. Smith on this 30th day of March 2009.

Anita M. Schafer

NOTARY PUBLIC

My Commission Expires:

NOTARY PUBLIC STATE OF OHIO

ANITA M. SCHAFER
Notary Public, State of Ohio
My Commission Expires
November 4, 2009

TABLE OF CONTENTS

STAFF-DR-01-001

REQUEST:

Refer to pages 4-5 of the December 1, 2008, application of Duke Energy Kentucky, Inc. ("Duke Kentucky").

a. Regarding the proposed earnings caps, the text at the bottom of page 4 indicates that the caps will vary according to the level of avoided costs savings produced by the proposed energy savings ("save-a-watt") plan. The heading in the table at the top of page 5 reads "ROI Cap on Program Costs Percentage." Explain why the heading refers to "program costs" instead of "avoided cost savings."

b. Explain in detail how the specific earnings cap percentages in the table at the top of page 5 were developed.

RESPONSE:

a. The Company is proposing a cap on its earnings as determined by the return on investment (ROI). Return on investment is calculated by dividing the margin by program costs. Thus, if you spend program costs of $10 and earn $1 after taxes, you would have an ROI of $1/$10 or 10%.

   The Company's proposal includes four different ROI caps as found in the table at the top of page five: 15%, 12%, 9%, and 5%. If the Company achieves 90% or more of its avoided energy and capacity target, the Company proposes the 15% ROI cap would apply to its earnings. On the other hand, if the Company achieves between 80% and 89% of its avoided energy and capacity target, the Company proposes the 12% ROI cap would apply. Similarly, if the Company achieves between 70% and 79% of its avoided energy and capacity target, the Company proposes the 9% ROI cap would apply. Lastly, if the Company achieves less than 70% of its avoided energy and capacity target, the Company proposes the 5% ROI cap would apply.

b. The earnings cap percentages were developed in conjunction with stakeholders in both Ohio and Indiana. They were designed to provide an incentive for a utility to invest in energy efficiency resources comparable to investing in power plants. Additionally, the ability to earn a return is tied to performance. The Company's earnings will be lower (based on the proposed cap) if the Company fails to meet its performance targets. The earnings cap percentages and relative risk were also compared to other jurisdictions.

PERSON RESPONSIBLE: Theodore E. Schultz

STAFF-DR-01-002

REQUEST:

Refer to the bullets identifying the alleged benefits of the proposed save-a-watt plan, specifically, the second bullet, which appears to indicate that reduced consumption by Duke Kentucky's customers will result in reduced generation which will then result in reduced greenhouse gas emissions. If the plan results in displacing a portion of the electricity otherwise needed to meet Duke Kentucky's customers' energy requirements, explain how this will result in reduced generation rather than the generation that is "freed-up" being sold elsewhere to someone other than Duke Kentucky's jurisdictional customers.

RESPONSE:

The reduced consumption by Duke Kentucky, or "freed-up load", will be offered for sale into the MISO market. Incremental margin from such sales are shared with Duke Kentucky's customers under existing Rider PSM. This assumes that there is a market for the "freed-up load". For example, if the load reductions occur during off-peak periods there may not be a market for the generation.

PERSON RESPONSIBLE: Paul G. Smith

STAFF-DR-01-003

REQUEST:

Refer to the full paragraph on page 11 of the application which discusses why Duke Kentucky believes a change is needed in how energy efficiency is treated from a regulatory perspective. The text refers to suppy-side investment incentives being more favorable than demand-side investment incentives "because of the utility's opportunity to earn a reasonable return on and of its capital investments." The text refers to the statutory authority of the Commission to approve utility-sponsored demand-side management ("DSM") programs and incentive and cost recovery mechanisms having been in effect for several years.

a. Explain whether Duke Kentucky is aware of this Commission having denied a utility's request to be permitted to earn a return on its investment in DSM programs under the authority conferred upon the Commission by KRS 278.285.

b. Explain whether Duke Kentucky is aware of any jurisdictional utility having made a request to this Commission, pursuant to KRS 278.285, to be permitted to earn a return on its investment in DSM programs.

RESPONSE:

a. Duke Energy Kentucky is not aware of the Commission having denied a utility's request to be permitted to earn a return on its investment in DSM programs. The discussion in the application refers to the current DSM regime in Kentucky which encourages utilities to concentrate on supply side capital investments resulting in increased electric generation, rather than encouraging investment in demand side management programs and technologies that reduce electricity sales. The goal of the save-a-watt filing is to create greater parity between investments on the supply side and the demand side resulting in comparable earnings for the company.

b. Duke Energy Kentucky is not aware of any jurisdictional utility making a request to be permitted to earn a return on its investment in DSM programs. See response to Staff-DR-01-003(a) above.

PERSON RESPONSIBLE: N/A

STAFF-DR-01-004

REQUEST:

Refer to Attachment B to Duke Kentucky's application. The last paragraph refers to the information used to calculate the avoided costs for Rider SAW. Provide clarification as to the meaning of the last two sentences in the paragraph about the use of an alternative avoided energy cost in the current filing while future avoided energy costs will be calculated through the Integrated Resource Planning process.

RESPONSE:

In preparing the application for this case, the Company utilized a market projection of the cost of energy as the estimate of avoided energy cost. This estimate was used in conducting the cost-effectiveness tests for the proposed programs and measures. Energy efficiency cost-effectiveness, at a high level, must be linked with IRP model runs with and without the energy efficiency programs inserted as resource options. However, an up-front energy efficiency screening process is still necessary, because IRP production costing models are unable to accommodate a large number of energy efficiency resource options in the optimization modeling. So, pre-screening and bundling of energy efficiency options that are found to be cost-effective is a more efficient and effective approach. For this application, the avoided energy cost from a market cost projection was used for the screening of programs and measures. In future filings, the Company anticipates using the marginal energy costs from IRP analyses with and without the energy efficiency programs. The difference in the energy costs between the two runs represents an IRP based estimate of avoided energy costs.

PERSON RESPONSIBLE: Richard G. Stevie

STAFF-DR-01-005

REQUEST:

Refer to the text beginning on line 17 of page 8 of the Direct Testimony of David Freeman ("Freeman Testimony"). Given that Duke Kentucky's capacity reserve margin is not projected to drop below its 15 percent target until 2019, explain why it believes now is the appropriate time to increase its commitment to and investment in DSM and energy efficiency.

RESPONSE:

Pursuing conservation programs is beneficial to customers regardless of the reserve margin because such programs can reduce fuel costs, reduce emissions, and help customers prepare for carbon costs.

PERSON RESPONSIBLE: David E. Freeman

STAFF-DR-01-006

REQUEST:

Refer to pages 11-12 of the Freeman Testimony, specifically, the discussion of the impact on Duke Kentucky's Present Value Revenue Requirements ("PVRR") of implementing the proposed energy efficiency programs.

a. Provide the forecast period covered by the PVRR analysis which shows that implementing the proposed energy efficiency programs produces $97 million in savings compared to a supply-side-only case along with the total PVRR amounts that reflect the $97 million savings.

b. Provide the PVRR savings and the total PVRR amounts when the proposed energy efficiency programs scenario is compared to a continuation of the existing programs and cost recovery mechanism.

RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

This response has been filed with the Commission under a Petition for Confidential Treatment.

PERSON RESPONSIBLE: David E. Freeman

REQUEST:

Refer to page 11 of the Direct Testimony of Julia S. Janson and page 10 of the handout provided at the January 26, 2009 informal conference. The testimony refers to a "small rate increase" of approximately $0.18 per month that a customer using 1,000 kilowatt-hours ("kWh") will experience under Rider SAW. The graph in the handout indicates that revenues under Rider SAW will only slightly exceed revenues under Duke Kentucky's existing "shared savings" DSM cost recovery rider. Provide a detailed explanation of how such small increases provide the greater incentive which Duke Kentucky claims it needs to more aggressively pursue energy efficiency and DSM.

RESPONSE:

The need to change the DSM cost recovery rider was not predicated on a rate increase to customers. Instead it was developed to align utility and customer incentives, to achieve greater efficiency impacts, and to prepare for a carbon constrained environment. While the current model has resulted in a base level of energy efficiency progress, Duke Energy Kentucky believes a change is needed to encourage the further development of all forms of cost effective energy efficiency. The model in this proceeding better aligns and encourages the utility's investment in energy efficiency with incentives to encourage new development while reducing risk to customers.

PERSON RESPONSIBLE: Theodore E. Schultz

STAFF-DR-01-008

REQUEST:

Refer to pages 7-8 of the Direct Testimony of James E. Rogers, specifically, the answer starting on page 7, line 19 and continuing to page 8, line 9. The text refers to utilities not having the opportunity to achieve a comparable level of earnings on demand-side investments as they do on their supply-side investments. It refers to conventional regulatory treatment of DSM costs and lost revenues, stating that Kentucky allows a small incentive via a shared savings allowance, then refers to the fact that "energy efficiency programs actually reduce utilities' energy sales."

a. Confirm whether the approved shared savings allowance included in Duke Kentucky's current DSM surcharge is based on the percentage that was proposed by Duke Kentucky in a prior DSM case.

b. If it is not meant to imply that the current treatment of lost revenues is in some way inadequate, explain the purpose of the statement emphasizing that energy efficiency programs reduce energy sales.

RESPONSE:

a. Yes, Duke Energy Kentucky did propose its current DSM recovery mechanism in a prior DSM case. While the current model has resulted in a base level of energy efficiency progress, Duke Energy Kentucky believes a change is needed to encourage the further development of all forms of cost effective energy efficiency. The model in this proceeding better aligns and encourages the utility's investment in energy efficiency with incentives to encourage new development while reducing risk to customers. Because program costs are not directly recovered in the proposed model, and the utility incentive is tied to results, customers only pay for the results achieved.

b. Energy efficiency programs are designed to reduce customer consumption of electricity through their use of more efficient equipment. Because consumption is reduced, the utility's sales are also similarly reduced, affecting the utility's ability to collect its fixed costs and allowed return. The current treatment of lost revenues is one way to recover these expenses. The Company has not proposed a change to the treatment of lost revenues.

PERSON RESPONSIBLE: Richard G. Stevie

STAFF-DR-01-009

REQUEST:

Refer to pages 10-11 of the Direct Testimony of Theodore E. Schultz ("Schultz Testimony"), which describes the flexibility Duke Kentucky believes is necessary in offering and administering energy efficiency programs and which it plan to have under the proposed save-a-watt program. Explain whether Duke Kentucky has determined that the flexibility described herein cannot be achieved under a traditional DSM regulatory scheme and, if so, how it made the determination.

RESPONSE:

The flexibility mentioned above and in the direct testimony of Theodore Schultz refers to the ability of the Company to modify certain program elements (such as incentive levels or program funding) in response to rapidly-changing market conditions. If the Commission were to grant this level of flexibility, such a proposal could be possible under a traditional DSM regulatory scheme or under the Company's proposed save-a-watt methodology.

PERSON RESPONSIBLE: Theodore E. Schultz

STAFF-DR-01-010

REQUEST:

Refer to pages 16-17 of the Schultz Testimony, specifically, the discussion of the energy efficiency programs being offered under Duke Kentucky's save-a-watt proposal. Explain whether there are any features of the proposed programs, or any other considerations, which would prevent them from being offered under Duke Kentucky's existing DSM cost recovery surcharge mechanism.

RESPONSE:

The programs as proposed in the Schultz Testimony represent a departure in program design and implementation from traditional energy efficiency programs. The existing DSM cost-recovery surcharge mechanism provides limited incentive for ongoing utility investment and innovation in program design, along with new ways to reduce program costs while increasing energy and capacity reductions. In contrast, the Company's proposal provides a mechanism to promote greater investment and creativity in design and implementation to maximize customer benefits while reducing overall risk to customers if the Company is unable to achieve its projected results.

PERSON RESPONSIBLE: Theodore E. Schultz

STAFF-DR-01-011

REQUEST:

Refer to page 4 of the Direct Testimony of Paul G. Smith ("Smith Testimony") regarding the components included in the calculation of jurisdictional revenues under Rider SAW.

a. Explain in detail how the specific percentages used in the calculation, 75 percent and 50 percent were developed.

b. Generally speaking, capacity costs are typically considered long-term in nature, while energy costs are considered short-term. Describe in detail how Duke Kentucky determined that annual avoided capacity cost savings generated by demand response programs and the net present value of avoided energy and capacity costs applicable to conservation programs were the appropriate avoided cost components to include in Rider SAW (emphasis added).

RESPONSE:

a. These percentages were determined to create a revenue requirement which generates an ROI of approximately 15% on program costs.

b. For demand response programs, the Company has assumed there would not be any avoided energy costs, only avoided capacity costs. Even if capacity is avoided for only one year, there is still an avoided cost associated with the load reduction from demand response programs.

   For conservation programs, there are energy and capacity benefits that must be valued using the estimates of avoided capacity and energy costs. These avoided costs are present valued to incorporate the value of the impacts and benefits achieved over the life of the conservation measure.

   For both methods, contemporaneous for demand response and present value over time for conservation programs, the SAW approach for calculating revenue requirements aligns the timing of the benefits obtained with the expenditures or costs involved to achieve the load reductions.

PERSON RESPONSIBLE: Richard G. Stevie

STAFF-DR-01-012

REQUEST:

Refer to pages 16-17 of the Smith Testimony, specifically, the discussion of the rate impacts of Rider SAW on a residential customer using 1,000 kWh per month's cost under the existing DSM rate and the cost under Rider SAW.

a. Explain why, for comparison purposes, it is appropriate to remove the true-up component contained in the existing Rider DSMR.

b. The proposed Rider SAW residential rate of $0.001779 is 24 percent greater than the actual tariffed surcharge of $0.01416 in Rider DSMR. The $0.001779 is 12.5 percent greater than the current "adjusted" Rider DSM surcharge of $0.001596. After adjusting the Rider DSM surcharge upward in this manner, describe the need for and the purpose involved in netting out the effect of the "adjusted" Rider DSMR which results in the claimed increase of only 0.2 percent.

RESPONSE:

a. It is appropriate to remove the true-up component as it contains prior period over- or under-collections. Removing the true-up allows a fair comparison of the DSMR and SAW rates. In other words, it allows an "apples to apples" comparison of the current period cost.

b. The Rider SAW is replacing the Rider DSMR. Therefore, to determine the increase related to the implementation of Rider SAW, the appropriate calculation is the Rider SAW rate less the "adjusted" Rider DSMR rate.

PERSON RESPONSIBLE: Paul G. Smith

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Staff Data Requests
Date Received: March 16, 2009

STAFF-DR-01-013

REQUEST:

Refer to pages 8-9 of the Direct Testimony of Richard G. Stevie, PH.D. ("Stevie Testimony"). Provide copies of the decision orders which have been issued by the commissions in any of the other jurisdictions in which a Duke Kentucky affiliate has filed a version of the save-a-watt plan. If a settlement was reached between the Duke Kentucky affiliate and intervenors, provide copies of the settlement document.

RESPONSE:

See Attachment Staff-DR-01-013 (a) for the Public Utilities Commission of Ohio's Stipulation and Recommendation in Case No. 08-920-EL-SSO, *et al.* concerning the Save-a-Watt issue. See also Attachment Staff-DR-01-013(b) Opinion and Order, filed in the same case, at page 18-19 and pages 31-32 and page 42. In the Indiana Utilities Regulatory Commission Cause No. 43374 there are four settlement documents as Attachment Staff-DR-01-013(c).

PERSON RESPONSIBLE: N/A

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke Energy Ohio for Approval of an Electric Security Plan	)))	Case No. 08-920-EL-SSO
In the Matter of the Application of Duke Energy Ohio for Approval to Amend Accounting Methods	)))	Case No. 08-921-EL-AAM
In the Matter of the Application of Duke Energy Ohio for Approval of a Certificate of Public Convenience and Necessity to Establish an Unavoidable Capacity Charge(s)	)))))	Case No. 08-922-EL-UNC
In the Matter of the Application of Duke Energy Ohio for Approval to Amend its Tariffs	)))	Case No. 08-923-EL-ATA

STIPULATION AND RECOMMENDATION

Rule 4901-1-30, Ohio Administrative Code (O.A.C.) provides that any two or more parties to a proceeding may enter into a written stipulation covering the issues presented in such a proceeding. The purpose of this document is to set forth the understanding and agreement of the Parties who have signed below (Parties) and to recommend that the Public Utilities Commission of Ohio (Commission) approve and adopt this Stipulation and Recommendation (Stipulation), which resolves all of the issues raised by Duke Energy Ohio (DE-Ohio) in these cases relative to the Application to establish an Electric Security Plan (ESP) within DE-Ohio's certified territory.

This Stipulation is supported by adequate data and information; represents a just and reasonable resolution of the issues raised in these proceedings; violates no regulatory principle or precedent; and is the product of lengthy, serious bargaining among knowledgeable and capable Parties in a cooperative process, encouraged by this Commission and undertaken by the Parties representing a wide range of interests, including the Commission's Staff,[1] to resolve the aforementioned issues. While this Stipulation is not binding on the Commission, it is entitled to careful consideration by the Commission. For purposes of resolving all issues raised by these proceedings, the Parties stipulate, agree and recommend as set forth below.

Except for dispute resolution purposes, neither this Stipulation, nor the information and data contained therein or attached, shall be cited as precedent in any future proceeding for or against any Party, or the Commission itself. This Stipulation and Recommendation is a reasonable compromise involving a balancing of competing positions, and it does not necessarily reflect the position which one or more of the Parties would have taken if these issues had been fully litigated.

This Stipulation is conditioned upon adoption of the Stipulation by the Commission in its entirety and without material modification. Should the Commission reject or modify all or any part of this Stipulation, the Parties shall have the right to file an application for

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[1] Staff will be considered a party for the purpose of entering into this Stipulation by virtue of O.A.C. Rule 4901-1-10(c).

rehearing. If the Commission does not adopt the Stipulation without material modification upon rehearing, any Party may terminate and withdraw from the Stipulation by filing a notice with the Commission, including service to all Parties, in the docket within thirty (30) days of the Commission's Entry on Rehearing. Upon such notice filing, the Stipulation shall immediately become null and void.

Prior to the filing of this notice, the Party wishing to terminate agrees to work in good faith with the other Parties to achieve an outcome that substantially satisfies the intent of the Stipulation and, if a new agreement is reached, to file the new agreement for Commission review and approval. If the discussions to achieve an outcome that substantially satisfies the intent of the Stipulation are unsuccessful, the Commission may convene an evidentiary hearing such that the Parties will be afforded the opportunity to present evidence through witnesses, to cross-examine witnesses, to present rebuttal testimony, and to brief all issues that the Commission shall decide based upon the record and briefs as if this Stipulation had never been executed. If the discussions to achieve an outcome that substantially satisfies the intent of the Stipulation are successful, some, or all, of the Parties shall submit the amended Stipulation to the Commission for approval.

All the Signatory Parties fully support this Stipulation and urge the Commission to accept and approve the terms herein.

WHEREAS, all of the related issues and concerns raised by the Parties have been addressed in the substantive provisions of this Stipulation, and reflect, as a result of such discussions and compromises by the Parties, an overall reasonable resolution of all such issues. This Stipulation is the product of the discussions and negotiations of the Parties, and is not intended to reflect the views or proposals which any individual Party may have advanced acting unilaterally. Accordingly, this Stipulation represents an accommodation of the diverse interests represented by the Parties, and is entitled to careful consideration by the Commission;

WHEREAS, this Stipulation represents a serious compromise of complex issues and involves substantial benefits that would not otherwise have been achievable; and

WHEREAS, the Parties believe that the agreements herein represent a fair and reasonable solution to the issues raised in the cases set forth above concerning DE-Ohio's Application to establish an ESP;

NOW, THEREFORE, the Parties stipulate, agree and recommend that the Commission make the following findings and issue its Opinion and Order in these proceedings approving this Stipulation in accordance with the following:

1. DE-Ohio shall implement an ESP as set forth in its Application, including the generation, transmission and distribution price structure described on Stipulation Attachment 1, for a term of

three years, beginning January 1, 2009, and extending through December 31, 2011, except as modified by this Stipulation.

2. DE-Ohio's base generation charge (PTC-BG) (currently known as Little 'g') shall reflect the unbundled generation rate as approved in Case No. 99-1658-EL-ETP less the Regulatory Transition Charges (RTC), as adjusted to reflect the following:

   a. The RTC for residential customers shall be eliminated on December 31, 2008;

   b. The RTC for non-residential customers shall remain in effect, as an unavoidable charge, through December 31, 2010;

   c. The frozen fuel, purchased power and emission allowances currently recovered in Little 'g' (1.2453 ¢/kWh), shall be transferred to the fuel and purchased power rider (Rider PTC-FPP, currently known as Rider FPP). Such cost transfer will not increase the total price charged to customers; and

   d. A base generation charge increase for residential and non-residential customers on January 1, 2009, January 1, 2010, and for non-residential customers, on January 1, 2011, as further described in paragraph 3, below.

3. DE-Ohio shall implement the base generation charge, PTC-BG, as shown on Stipulation Attachment 2 and established in the attached tariff sheets. These charges reflect the adjustments described in paragraph 2, above.

4. DE-Ohio shall amend its Application to eliminate any requested price or cost deferral except as set forth in paragraphs 11 and 16.

5. DE-Ohio shall withdraw its proposed Rider PTC-IA.

6. DE-Ohio shall implement prices for the riders listed on Stipulation Attachment 1 as established in the attached tariffs. Such riders shall reflect the types of prices, charges, periodic adjustments, avoidability, and due process, including an opportunity for hearing, as described in DE-Ohio's Application, except as modified in this Stipulation. All prices will continue to be subject to the same existing types of charges that are currently applied to the Rate Stabilization Plan (RSP) prices, such as metering and tax charges, except as provided in this Stipulation.

7. The Parties agree to the following commitments with respect to Rider PTC-FPP:

   a. Rider PTC-FPP shall reflect the transfer of the frozen fuel, purchased power and emission allowances currently included in DE-Ohio's unbundled base generation charge as described in paragraph 2, above;

   b. Rider PTC-FPP shall include an allocation, as of the date on which this Stipulation is filed, of the actual delivered cost of fuel pursuant to the existing fuel and transportation agreements, the actual cost of net purchased power, including gains and losses resulting from the settlement of forward power contracts, and SO_2 and NO_x emission allowance inventories proportional to the expected generation share needed to serve DE-Ohio's Rider PTC-FPP customers. Recent court rulings make the NOx emission allowance inventory unclear. The parties agree to allocate the NOx emission allowance inventory, and any other emission allowance inventory established during the ESP period, proportional to the expected generation share needed to serve DE-Ohio's rider PTC-FPP customers, as of the date the allowances are granted to DE-Ohio; and,

c. After the Stipulation is filed, an actively managed commodity portfolio consisting of fuel, SO_2 and NO_x emission allowances, DE-Ohio owned and dedicated generation, and purchased power will be maintained with the objective of providing a least cost energy supply for the Rider PTC-FPP customers with the associated costs, gains and losses flowing to the Rider PTC-FPP customers.

d. DE-Ohio agrees to make a filing with the Commission proposing the manner of any true-up of Rider PTC-FPP revenues and costs through December 31, 2008. Such filing will be submitted during the first quarter of 2009, and will be subject to due process, including the audit for the eighteen month period ending December 31, 2008. Such audit shall be conducted by an independent third party auditor or Staff, at the Commission's discretion. DE-Ohio shall fund the audit and receive cost recovery through Rider PTC-FPP as approved by the Commission.

8. In order to maintain the same Rider PTC-FPP process as the current Rider FPP and to maintain the same Rider TCR process as the current Rider TCR, the Parties agree that the Midwest Independent System Operator, Inc. (MISO), costs for net congestion and losses shall be recovered through Rider PTC-FPP, including the net revenue received from financial transmission rights and auction revenue rights. The Parties also agree to recommend that the Commission grant DE-Ohio's request for a waiver from the proposed Commission's rules to permit such cost recovery through avoidable Rider PTC-FPP rather than avoidable Rider TCR. Ancillary services shall be recovered through Rider TCR.

9. Subject to Commission approval in these proceedings and Case No. 08-1025-EL-UNC, Rider PTC-AAC rate, currently known as Rider AAC, will be updated effective December 1, 2008. Annually thereafter during the ESP time period as proposed in DE-Ohio's application, DE-Ohio may request, subject to due process, including an opportunity for a hearing and Commission approval, the recovery of net incremental costs or credits associated with environmental compliance, homeland security, and changes in tax

law. The Parties further agree that DE-Ohio may also seek Commission approval for recovery through Rider PTC-AAC or Rider PTC-FPP of cost-effective generation projects not required for environmental compliance that would improve fuel flexibility, and the supporting Parties reserve the right to oppose any such application.

DE-Ohio agrees to make a filing with the Commission proposing the manner of any true-up of Rider PTC-AAC reagent revenues and costs through December 31, 2008. Such filing will be submitted during the first quarter of 2009, and will be subject to due process, including the audit for the eighteen month period ending December 31, 2008. Such audit shall be conducted by an independent third party auditor or Staff, at the Commission's discretion. DE-Ohio shall fund the audit and receive cost recovery through Rider PTC-AAC as approved by the Commission.

10. Eligible capacity purchases under Rider SRA-SRT shall be subject to the annual due process, including an opportunity for a hearing, approved in Case No. 03-93-EL-ATA, *et al.*:

    a. Shall include recovery of market capacity purchases for any duration up-to three-years, if approved by the Commission;

b. DE-Ohio shall solicit for capacity in an open, non-discriminatory, and competitive manner;[2]

c. Capacity contracts shall be awarded to the lowest and best offer submitted pursuant to the open, non-discriminatory, and competitive process conducted by DE-Ohio;

d. Rider SRA-SRT may include compensation for capacity owned by DE-Ohio or its affiliates that has never been used and useful in serving DE-Ohio load;

e. Compensation for DE-Ohio's capacity shall be determined through offer solicitation by DE-Ohio using one of the following two methodologies:

   i. Compensation shall equal the lowest offer price for the capacity pursuant to the open, non-discriminatory, and competitive offer solicitation process outlined in this paragraph; or,

   ii. If there are no offers for capacity other than from DE-Ohio, DE-Ohio shall be compensated at the price for the last actual competitively-priced, arms-length transaction.

   Nothing herein shall be construed as a requirement that DE-Ohio solicit bids through a formal request for proposal process overseen by an independent third party;

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[2] DE-Ohio may maintain confidential information within its bid solicitation process but within the due process review before the Commission shall provide information necessary to the parties and for the Commission to affirm the open, non-discriminatory, and competitive solicitation. Such information may be provided under seal or otherwise protected through appropriate agreements and other means.

f. Rider SRA–SRT shall be avoidable for all non-residential customers who agree not to return to the standard service offer for the remainder of the three-year term of the proposed ESP period. The agreement not to return shall be by contract or one of the methods approved for the Rate Stabilization Program[3] including the currently approved script and Competitive Retail Electric Service (CRES) provider initiated electronic sign up. A non-residential customer who pledges not to return to the ESP-SSO, but does so, shall pay the competitive retail electric service price specified in Stipulation paragraph 17; and

g. DE-Ohio shall develop and implement a tariff compensating non-residential customers with qualified backup generating facilities for use of their facilities as needed to maintain reliable generation service. Capacity compensation shall not exceed the average price per kW for capacity purchases recoverable in Rider SRA-SRT. The key provisions of the tariff are set forth as Stipulation Attachment 4. Participating capacity shall count toward DE-Ohio's market capacity purchases and shall be recovered through Rider SRA-SRT. DE-Ohio and the Greater Cincinnati Health Council have

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[3] Authorization in the Rate Stabilization Program included both a two page form and telephonic approval with use of an agreed to script with the customer response recorded as filed by Integrys Energy Services, Inc. on May 4, 2007 in case 03-93-EL-ATA .

agreed to the terms and conditions related to a capacity purchase program and other related items set forth on Stipulation Attachment 9.

h. DE-Ohio agrees to make a filing with the Commission proposing the manner of any true-up of Rider SRA-SRT revenues and costs through December 31, 2008. Such filing will be submitted during the first quarter of 2009, and will be subject to due process, including the audit for the eighteen month period ending December 31, 2008. Such audit shall be conducted by an independent third party auditor or Staff, at the Commission's discretion. DE-Ohio shall fund the audit and receive cost recovery through Rider SRA-SRT as approved by the Commission.

11. The Parties recommend Rider DR-IM for approval in this proceeding. Cost recovery for Rider DR-IM shall be on a cost per meter basis. The Parties agree to a January 1, 2009, implementation of distribution Rider DR-IM, limited to SmartGrid,[4] DE-Ohio's Gas Furnace Program as identified in paragraph 13,[5] and, if subsequently approved by the Commission pursuant to the process set forth in Paragraph 19 of this Stipulation, the Electronic Bulletin Board (EBB). Annual second quarter approval of Rider

4 As referenced in this Stipulation "SmartGrid" includes Advanced Meter Infrastructure (AMI) and Distribution Automation (DA).

5 Signatory Parties that were not also parties in Case No. 06-91-EL-UNC *et al*, do not express an opinion regarding the retention and funding of the Gas Furnace program.

DR-IM adjustments shall be subject to due process, including an opportunity for hearing, as set forth in the Application.

a. Rider DR-IM shall be initially set at zero. Thereafter, such charge shall be subject to an applicable annual second quarter due process and true-up contemporaneous with the SmartGrid, EBB, and Gas Furnace Program. The cost recovery methodology for the Gas Furnace Program shall remain the same as it is today under Rider DSM, thus having no effect on customers' rates. Rider DR-IM will be adjusted, following the effective date of the Commission's order in DE-Ohio's next base electric distribution rate case, to reflect the amount of SmartGrid, EBB and gas furnace program costs, if any, that are included in base rates.

b. Stipulation Attachment 3 sets forth the projected SmartGrid electric deployment investment, operating costs net of savings and revenue requirement through 2014. For each annual Rider DR-IM filing, 85% of the annual SmartGrid revenue requirement will be allocated to residential customers and recovered on a monthly price per meter. Non-residential customers served on the distribution system (excluding lighting) shall be allocated 15% of the annual SmartGrid revenue requirement, to be recovered on a monthly price per meter based on the currently approved weighted-average customer charge (see Stipulation Attachment 3, page 2 of 2).

c. The SmartGrid revenue requirement shall be recovered on a monthly price per meter for residential customers not to exceed $0.50 in 2009, $1.50 in 2010, $3.25 in 2011, $5.25 in 2012, $5.50 in 2013, and thereafter, pursuant to the process set forth in Paragraph 11(f) of this Stipulation.

d. DE-Ohio shall accrue Post-in-Service Carrying Charges at the most recently approved weighted average cost of long term debt and to defer depreciation and operating costs from the date that the applicable expenditures are incurred until such expenditures are included for recovery in Rider DR-IM. Such regulatory assets will be included in unique sub-accounts of Account 182.3, Other Regulatory Assets, and will be subject to review by all parties in the annual Rider DR-IM filing. The Parties also agree to the regulatory asset accounting treatment for replaced meters as described in DE-Ohio's Application, for which recovery shall be through existing depreciation rates as they may be amended from time to time.

e. The annual second quarter due process regarding Rider DR-IM shall include the projected deployment and implementation plan for the current year including its design requirements, performance goals, metrics, and milestones, and a Staff audit and verification of the previous year's SmartGrid costs and system performance levels. Also included will be a high level overview of the following year's plan and any associated details to the extent available. DE-Ohio will share this information contemporaneously with OCC as it is provided to Staff.

f. As part of the annual due process related to 2010 costs net of benefits, DE-Ohio shall include a mid-deployment program summary and review with the second quarter 2011 filing outlining its progress through 2010, including expenditures, deployment program summary and review. As part of the same filing DE-Ohio shall also outline deployment milestones, system performance levels and customer benefits versus the plan. The summary and review shall address deployment lessons learned, an updated allocation of the annual distribution revenue requirement, and the desirability of continuing the program beyond December 31, 2011.

g. DE-Ohio shall convene a working group or collaborative process for the purpose of exploring opportunities to maximize the benefits of the SmartGrid investment. Such opportunities shall include, but are not limited to, designing and implementing tariffs by December 31, 2009, including revenue-neutral critical peak pricing and enhanced power manager pricing programs, residential time of use, and improving access to meter information that will assist customers, especially low-income customers, in managing their electric costs. The working group or collaborative process shall be open to Staff, Marketers, PWC and other interested stakeholders.

h. DE-Ohio will focus initial SmartGrid deployment on circuits mostly in high density areas with a high percentage of inside meters. Such focus will eliminate the monthly need to access over 400,000 meters located inside customer premises, including many low-income customers. Remotely obtaining meter data for these locations will provide significant customer benefit.

i. DE-Ohio shall deploy SmartGrid technology in the Village of Terrace Park, Ohio during 2009.

j. It is the Parties' expectation that System reliability will be enhanced commensurate with the deployment of SmartGrid. Based on the deployment schedule in Attachment 3, DE-Ohio agrees to improve its targeted system average interruption frequency index (SAIFI) as set forth in O.A.C. 4901:1-10-10 from 1.50 in 2009, to 1.44 in 2010, to 1.38 in

2011, to 1.31 in 2012, to 1.24 in 2013, to 1.17 in 2014, and 1.10 in 2015. If DE-Ohio meets its deployment commitments, and the expected SAIFI target improvements do not materialize in any year during deployment, the parties agree that DE-Ohio may apply to the Commission to suspend deployment or seek amended SAIFI targets as may be appropriate. The pendency of that application does not absolve DE-Ohio of its requirement to meet the SAIFI targets outlined herein.

k. Rider AU, currently pending in Case No. 07-589-GA-AIR, represents the recovery of the SmartGrid costs allocable to DE-Ohio's gas distribution customers and is still under Commission consideration. The Parties recognize that DE-Ohio is a combination gas and electric utility and understand that benefits to customers may accrue by deploying both electric and gas SmartGrid at the same time. Therefore, DE-Ohio may apply to the Commission to discuss alternatives to the electric SmartGrid including the electric SmartGrid caps outlined in 11(c) and amendments to SAIFI targets outlined in 11(j) of this Stipulation as a result of the decision in 07-589-GA-AIR .[6]

[6] Signatory Parties that were not also parties in Case No. 07-589-GA-AIR *et al*, do not express an opinion concerning Rider AU.

12. DE-Ohio shall withdraw its request in this proceeding to implement a change in the distribution customer charges. Such proposed changes in the customer charge shall be determined in Case No. 08-709-EL-AIR.

13. Rider DR-SAW shall be implemented by January 1, 2009.

    a. Upon the implementation of Rider DR-SAW effective January 1, 2009, DE-Ohio will eliminate the existing charge in customer rates for Rider DSM. On or before March 31, 2009, DE-Ohio proposes to file a final report and reconciliation for the period July 1, 2008, through December 31, 2008, which represents the period that would not be covered by the upcoming November 15, 2008, Annual Report filing of programs under Rider DSM. To affect a final true-up of Rider DSM, DE-Ohio would seek the Commission's approval in its March 31, 2009, filing to add or subtract the resulting true-up from the July – December 2008 period to Rider DR-SAW at that time. The resulting adjustment to Rider DR-SAW would effectuate the close-out of Rider DSM. The energy efficiency programs approved under Rider DSM, as updated in the Supplemental Direct Testimony of Theodore E. Schultz, shall continue in effect under Rider DR-SAW subject to the same annual reporting and program approval requirements currently in effect under Rider DSM, which include due process and an opportunity for a hearing. The Rider DR-SAW true-up shall occur in the Second quarter of 2012 for programs operating from January 1, 2009, through December 31, 2011. The costs relating to the DSM Smart Saver/Summer Saver program for high-energy furnaces without electronically commutated motors (*i.e.*, Gas Furnace Program) shall be transferred for recovery to Rider DR-IM. Rider DR-SAW shall be amended effective January 1, 2009, as set forth in Supplemental Attachment PGS-1, filed on September 16, 2008.

b. Section 4928.66(A)(2)(c), Revised Code, provides that mercantile customers that commit their demand response or other customer-sited capabilities, whether existing or new, for integration into the electric distribution utility's demand-response, energy efficiency, or peak demand reduction programs may be exempted from a cost-recovery mechanism designed to recover the costs of utility programs created to meet the energy savings and peak demand reduction benchmarks set forth in divisions (A)(1)(a) and (b) of the statute. Pursuant to this statute, exemptions from Rider DR-SAW shall be available to customers that have a minimum monthly demand of 3 MW at a single site or aggregated at multiple sites within DE-Ohio's certified territory and agree to comply with the Commission's rules regarding exemption from cost-recovery mechanisms.

To obtain exemption, the customer shall file a joint application with DE-Ohio before the Commission seeking approval of the exemption.[7] To qualify for exemption, the applicant customer must demonstrate to the Commission that it has undertaken or will undertake self-directed energy efficiency and/or demand reduction programs that have produced or will produce annual percentage energy savings and/or peak demand reductions equal to or greater than the applicable annual percentage statutory energy savings and/or peak demand reduction benchmarks to which DE-Ohio is subject. The energy savings and demand reductions resulting from the customers' self-directed program shall be calculated using the same methodology used to calculate DE-Ohio's energy savings and demand reductions for purposes of determining compliance with the statutory benchmarks, including normalization adjustments to the baseline, where appropriate. As a part of the application, the customer shall provide a calculation of the customer baseline and independent measurement and verification of the level of energy savings and demand reduction achieved

[7] If DE-Ohio, for any reason, decides not to proceed with a joint application with a customer, the customer may file an application before the Commission on its own initiative.

or anticipated, and, to retain the exemption, shall, thereafter, on an annual basis, make a filing with the Commission demonstrating that it remains eligible for the exemption under the criteria set forth herein.

The Parties recognize that there may be customers that have previously implemented effective self-directed energy efficiency and demand reduction programs and that such existing programs may severely limit the ability of such customers to achieve additional savings and reductions. The Parties further recognize that such existing customer programs also affect DE-Ohio's ability to comply with the applicable statutory benchmarks by limiting the potential for savings and reductions that can be achieved under its own programs. Such a customer seeking exemption from Rider DR-SAW based on energy savings and/or demand reductions achieved under a self directed program shall demonstrate in its application that (i) such program was tailored to the particular energy consumption characteristics of the customers equipment and/or facilities and (ii) that the savings and/or reductions that have been achieved under its self-directed program have limited its ability to achieve meaningful additional cost-effective savings and/or reductions through participation in DE-Ohio's programs.

The parties recommend that the Commission determine the methodology to be employed to effectuate the integration of the committed capabilities of exempt customers into DE-Ohio's energy efficiency and peak demand reduction programs in determining DE-Ohio's benchmark compliance. DE-Ohio shall not be subject to penalties, including compliance payments, as a result of the failure of an exempted customer to achieve the anticipated level of energy savings and/or peak demand reduction claimed in the application for exemption.[8] The application for exemption, joint or otherwise, shall include proposed consequences for the customers' failure to achieve the energy savings and/or demand reductions claimed in the application.

Applicants for exemption may seek confidential treatment of materials provided in support of the application, including, but not limited to, customer name(s), price, and trade secret(s).

c. DE-Ohio shall administer Rider DR-SAW by applying to the Commission for approval of each Rider DR-SAW program except that approval of this Stipulation shall constitute

[8] The OCC does not support DE-Ohio's liability exemption for an exempted customer's failure to meet its energy efficiency commitment but recognizes the Stipulation is a compromise of views and will not litigate the issue. Nothing herein restricts OCC's legal rights to litigate this issue in any other proceeding before the Commission.

approval of the initial Rider DR-SAW program content as set forth in the Supplemental Direct Testimony of DE-Ohio witness Theodore E. Schultz. Program development shall be through DE-Ohio individually or collaboratively with other interested parties through the Duke Energy Community Partnership (DECP),[9] proposed manufacturers' collaborative or other collaborative or individual customers. Non-Company stakeholders in the DECP shall have one vote each for the purpose of advising DE-Ohio regarding energy efficiency program development which may include programs that bridge tax incentive gaps to the extent programs are projected to be cost effective and are approved by the Commission under Rider DR-SAW. DE-Ohio will consider collaborative advice regarding program development, evaluation, and effectiveness. DE-Ohio will share residential and non-residential energy efficiency information with the collaboratives except that all parties agree to protect confidential information disclosed in the collaborative process. Customers that do not become exempt shall be eligible for Rider DR-SAW programs applicable to their rate classification and shall pay Rider DR-SAW. Exempt

9 The DECP shall include as members the Cincinnati-Hamilton and Clermont County Community Action Agencies, Adams Brown Economic Opportunities, Inc., and the Community Action Partnership of the Greater Dayton Area.

customers, as set forth in division (b) of this paragraph, shall not be eligible for any Rider DR-SAW programs.

d. Non-residential Rider DR-SAW recovery shall be allocated between distribution and transmission service customers based on the allocation of distribution revenues as approved in the Company's most recent electric distribution rate case, as shown on Stipulation Attachment 8. A transmission service customer that participates in the Save-A-Watt program will be charged the Rider DR-SAW rate applicable to non-residential customers served on the distribution system, and this will in no way increase the DR-SAW rate charged to non-participating transmission service customers.

e. As an incentive for achieving energy efficiency above the statutory mandate over the ESP period, DE-Ohio shall be entitled to the following return on investment on its program costs up to the following caps:

% Mandate[10]	Return on Investment Cap
> 125%	15%
116 - 125%	13%
111 - 115%	11%
101 - 110%	6%
< or =100%	0%

[10] Mandate means the benchmarks and baseline for energy efficiency set pursuant to R.C. 4929.66.

Nothing herein may be used as precedent for any other proceeding except as may be needed to enforce the terms of this Stipulation.

f. The Parties agree that DE-Ohio will work with Staff and interested parties to develop a non-residential interruptible tariff as an energy efficiency program option. The key provisions of the tariff are set forth as Stipulation Attachment 4. DE-Ohio shall submit the non-residential interruptible tariff for Commission approval and upon approval shall implement the tariff. Participating load will receive compensation from DE-Ohio for interruption based upon specified conditions at specified prices. Participating load shall count toward DE-Ohio's statutory energy efficiency peak demand reduction mandate. Nothing herein prohibits DE-Ohio from offering an interruptible tariff that is not part of its energy efficiency and peak reduction program.

g. The Parties agree that DE-Ohio shall, with the assistance of the Ohio Manufacturers' Association, establish an energy efficiency, manufacturing collaborative (Manufacturing Collaborative) to develop and implement programs for manufacturers in DE-Ohio's certified territory that benefit both participants and the state of Ohio consistent with SB 221. The Ohio Manufacturers' Association and other participating statewide non-profit manufacturing advocacy organizations with manufacturing membership may participate in the Manufacturing Collaborative and provide volunteers to participate in program design, development and implementation working with DE-Ohio. DE-Ohio shall provide the Manufacturing Collaborative with an unrecoverable financial contribution of up to $100,000 per year during the ESP period, for research and development of energy efficiency programs for manufacturers. DE-Ohio further agrees to provide its expertise, in association with participating manufacturers and Staff, in developing energy efficiency programs targeted toward manufacturers in DE-Ohio's service territory. The Manufacturing Collaborative shall recommend cost-effective, energy efficiency programs to the Commission for adoption and recovery through Rider DR-SAW. DE-Ohio also agrees to participate in a statewide energy efficiency, manufacturing collaborative or similar organization if such a Manufacturing Collaborative or organization is formed.

h. All demand response program participation requirements shall be consistent with MISO's Load Serving Entities planning reserve requirements.

i. DE-Ohio shall perform measurement and verification as set forth in the Supplemental Testimony of Dr. Richard G. Stevie. DE-Ohio shall issue a request for proposal to hire an independent evaluator. Measurement and verification costs shall be capped at 5% of program costs.

j. If the Commission adopts a decoupling or straight fixed variable rate design for DE-Ohio, DE-Ohio agrees to discuss and implement appropriate adjustment to its recovery of lost margins pursuant to Rider DR-SAW. DE-Ohio agrees to conduct one educational decoupling workshop in Columbus, Ohio before November 30, 2009.

14. The Parties recommend that DE-Ohio shall recover delta revenues associated with reasonable arrangements through Rider DR-ECF, to the extent such arrangements and delta revenues are individually approved by the Commission. The allocation of delta revenues cost recovery rates between DE-Ohio and the customer classes shall be determined by the Commission. DE-Ohio shall not enter into arrangements for discounted rates without making a public application to the Commission and receiving the Commission's approval. If the Commission approves but modifies an application for a reasonable arrangement DE-Ohio and the customer reserve the right to withdraw such application.

15. The Parties recommend that the Commission approve an Economic Development Contract between DE-Ohio and the City of Cincinnati as a reasonable arrangement pursuant to R.C. 4905.31 and in compliance with the Commission's proposed rules under O.A.C. 4901:1-38-03. The City shall commit to create a minimum of twenty-five new jobs and DE-Ohio shall provide economic development funding as follows: (1) $0 in 2009; (2) $2 million in 2010; and (3) $1 million in 2011. The City of Cincinnati shall specify project milestones that include construction in progress and the procurement of additional public and private financing. DE-Ohio and the City shall file annual project reports before the Commission to verify job creation. DE-Ohio shall recover one-half the Economic Development Contract, or $1 million in 2010 and $500,000 in 2011, through Rider DR-ECF during the ESP period. The remaining one-half of the grant shall be funded by DE-Ohio. A copy of the anticipated arrangement between the City of Cincinnati and DE-Ohio is set forth as Stipulation Attachment 5. DE-Ohio and the City of Cincinnati shall file an application for approval of the economic development contract, conditioned on approval of this Stipulation, in a separate proceeding. The Parties further agree that DE-Ohio shall purchase from the City of Cincinnati 20,263 streetlights located in the DE-Ohio service territory at the cost of approximately $4 million. Stipulation Attachment 5 sets

forth the settlement terms and conditions for the streetlight purchase involving DE-Ohio and the City of Cincinnati.

16. Certain operating and maintenance costs of up to $50 million will be incurred at the Beckjord generating station beginning in 2009 in order to allow the continued operation of the station. These costs are to be deferred and amortized over a three (3) year period. The deferral and amortization expense is included for recovery in Rider SRA-CD. The Rider SRA-CD rate is equal to the Rider IMF rate that was approved by the Commission, and shall remain constant during the ESP period.

17. During the ESP period DE-Ohio shall permit non-residential customers that purchase competitive retail electric service from a CRES provider to avoid Rider SRA-SRT; provided that such customers agree to remain off its ESP-SSO service through December 31, 2011 and that if such customers desire to return to ESP-SSO service that they agree to return at 115% of DE-Ohio's ESP-SSO price, including only the generation riders set forth on Stipulation Attachment 1. Such non-residential customers shall also receive a generation price shopping credit equal to 6% of the current Little 'g' price as specified in Stipulation Attachment 6. Non-residential customers that purchase competitive retail electric service from a CRES provider but choose to pay Rider SRA-SRT

and waive the shopping credit may return to the ESP-SSO price at any time without notice.

18. The following customers who desire to return to ESP-SSO service need not pay 115% of DE-Ohio's ESP-SSO price:

    a. RSP-MBSSO period contract exclusion: non-residential customers who as of September 30, 2008, are purchasing competitive retail electric generation service from a CRES provider under a contract that expires on or after January 1, 2009, may elect the ESP-SSO price if the customer, no less than sixty (60) days prior to the expiration of their current CRES contract, excluding contract extensions, notifies DE-Ohio of its desire to enroll in the ESP-SSO.

    b. ESP period contract origination exclusion: non-residential customers that enter a contract for the provision of competitive retail electric service with a CRES provider after December 31, 2008, may elect to enroll in SSO service beginning January 1, 2012, if the customer, no less than sixty (60) days prior to January 1, 2012, notifies DE-Ohio of its desire to enroll in the ESP-SSO at the expiration of its current CRES provider contract, excluding extensions.

19. As reasonably practicable after Commission approval of the Stipulation in these proceedings, DE-Ohio shall initiate a collaborative process for the purpose of establishing an EBB as

generally proposed in its Application. DE-Ohio agrees that the CRES providers, Staff, and other interested parties may participate in the design of the EBB. The EBB shall be an open access platform and competitively neutral, and may utilize a third party independent operator. The design and cost of developing and maintaining the EBB shall be discussed in the collaborative process and to the extent the Commission approves such cost recovery, the EBB will be developed and the actual costs incurred to develop the EBB shall be recoverable through Rider DR-IM or otherwise as agreed upon.

20. Non-Residential customers (including Governmental Aggregation) and Non Residential Minimum Stay provisions:

   a. Non-residential customers who have switched to a CRES provider on or after December 31, 2008, including governmental aggregation customers, may return to DE-Ohio, but must pay 115% of the ESP-SSO price unless they qualify for the exemptions set forth in paragraph 18.

   b. DE-Ohio does not assess a separate charge for standby service or default service on non-residential customers.

   c. A non-residential customer that returns to ESP-SSO service and is subject to pay 115% of the ESP-SSO price shall have no minimum stay requirement and may contract with a CRES provider in accordance with the normal enrollment process except that mercantile customers as set forth in R.C. 4928.01(A)(19), must remain on DE-Ohio's SSO service for twelve consecutive billing cycles if they return between May 15, and September 16, of any year. If such customer wishes to purchase service from a CRES provider prior to the expiration of twelve billing cycles DE-Ohio, at its discretion, may negotiate an exit fee.

d. Non-residential customers in a Governmental Aggregation may avoid Rider SRA-SRT and receive the credit as established in Stipulation Attachment 6 if the Governmental Aggregator notifies DE-Ohio at least sixty (60) days prior to the start of Governmental Aggregation of its intent to maintain the Governmental Aggregation through the remainder of the ESP-SSO period and it agrees that returning non-residential customers shall return at a price equal to 115% of the ESP-SSO price.[11] Nothing herein prohibits an individual non-residential customer from contacting DE-Ohio to pay Rider SRA-SRT and Rider SRA-CD to return at the standard ESP-SSO price.

21. Residential customers (including Governmental Aggregation) and residential Minimum Stay provisions:

[11] The Parties agree that OCC shall have the right to carve out for litigation the issue of by-passability of charges and shopping credits for residential government aggregation customers.

a. Residential customers who have switched to a CRES provider on or after December 31, 2008, including residential governmental aggregation customers, shall have no minimum stay and may return to the ESP-SSO.

b. DE-Ohio does not assess a separate charge for standby service or default service on residential customers.

22. During the ESP period, DE-Ohio shall increase its funding for Home Energy and Weatherization Contracts to $1 million per year. Such contracts shall be extended for the duration of the ESP period as required.

23. DE-Ohio shall contribute $50,000 per year through 2011 to the Hamilton County Community Action Agency, or another non-profit organization in DE-Ohio's certified territory, to be used for distributing fans and/or air conditioners to qualifying customers.

24. DE-Ohio shall withdraw its request for approval of Rider SRA-NDC from these proceedings. The Parties recommend that the Commission authorize DE-Ohio to make market purchases with the objective of filling its short capacity position in a least cost manner with cost recovery through Rider SRA-SRT pursuant to paragraph 10.

25. DE-Ohio's Operational Support Plan shall remain as filed in these proceedings, except that existing waivers of Rider SRA-SRT (currently Rider SRT) shall remain in effect.

26. DE-Ohio's Corporate Separation Plan shall remain in effect as filed in these proceedings, except that DE-Ohio may transfer to an affiliate or sell to an unaffiliated party the following gas-fired generating assets: Lee Station; Hanging Rock Station; Washington Station; Fayette Station; and Vermillion Station, as these plants have never been used and useful in serving DE-Ohio load. Any such transfer is subject to approval by the Federal Energy Regulatory Commission (FERC) if necessary, but Commission acceptance of this Stipulation constitutes the approval of the Commission required under R.C. 4928.17. DE-Ohio agrees to withdraw from this proceeding and at FERC its request to transfer its previously used and useful assets. DE-Ohio may, however, during the ESP period, file an application before this Commission and at the FERC to transfer its previously used and useful assets effective no sooner than January 1, 2012.

27. The Parties recommend that the Commission find that DE-Ohio's ESP-SSO, as modified by this Stipulation, including its pricing and all other terms and conditions, plus any deferrals and future recovery of deferrals, is more favorable in the aggregate as compared to the expected results that would otherwise apply under R.C. 4928.142.[12]

[12] The signatory CRES providers take no position regarding Paragraph 26 and do not support the deferrals of any additional generation-related costs but recognize that this Stipulation is a compromise of interests and issues among the Parties.

28. The Parties agree that beginning in 2010, by May 15 of each year covered by this Stipulation, the Commission will implement the significantly excessive earnings test as follows:

DE-Ohio's return on ending common equity will be computed using DE-Ohio's prior year publicly reported FERC Form 1 financial statements, including off-system sales, subject only to the following specific adjustments:

- Net Income
  - o Eliminate all depreciation and amortization expense related to the purchase accounting recorded pursuant to the Duke Energy/Cinergy merger,
  - o Eliminate all impacts of refunds to customers pursuant to this paragraph,
  - o Eliminate all impacts of mark-to-market accounting,
  - o Eliminate all impacts of material, non-recurring gains/losses, including, but not limited to, the sale or disposition of assets.
- Common Equity
  - o Eliminate the acquisition premium recorded to equity pursuant to the Duke Energy/Cinergy merger.

Should the actual annual return on ending common equity for each review year, as adjusted pursuant to this paragraph, not exceed 15%, DE-Ohio's return on common equity shall be deemed to not be significantly in excess of the return on common equity that was earned during the same period by publicly traded companies that face comparable business and financial risks. If such return exceeds 15%, such excess shall be refunded on a grossed-up for taxes basis, to Rider PTC-FPP customers over a period not to exceed twelve-months, plus a true-up to avoid any over- or under-recovery. Any refund required shall not cause an adjustment to earnings for the years refunded to or from.

This Paragraph does not create a precedent for the computation of DE-Ohio's return on common equity or the applicability of the significantly excess earnings test set forth in R.C. 4928.143 regarding any SSO that DE-Ohio may implement subsequent to December 31, 2011.

29. Effective on the date of the Commission's Order approving this Stipulation, The Kroger Company shall have an one-hundred-eighty (180) day option to sell, and upon fifteen (15) days notice of The Kroger Company's election, to exercise such option, DE-Ohio shall purchase approximately 45 transformers located in the DE-Ohio service territory (as more specifically set forth and listed on Stipulation Attachment 7) at the cost of $287,000, which reflects the net book value of such transformers based upon DE-Ohio's original cost.

30. The Parties agree that DE-Ohio's ESP Application, as amended by this Stipulation, complies with the state policies set forth in R.C. 4928.02.

31. DE-Ohio shall continue its GoGreen program (Rider GP) through December 31, 2011. Rider GP is currently scheduled to expire at December 31, 2008. DE-Ohio shall work with any interested parties to revise the current REC tariff price to a price that is commensurate with the current market price and to include a R.C. 4928.64 residential REC purchase program by June 30, 2009. Upon inquiry by a consumer considering the installation of renewable energy generation at the consumer's site, DE-Ohio shall make information available to the consumer on net metering, interconnection and the REC purchase program.

32. Pursuant to R.C. 4928.143, and subject to DE-Ohio's legal rights, including but not limited to the right to comments, apply for rehearing, and appeal, DE-Ohio shall conform to the Commission's ESP rules as set forth in Case Nos. 08-777-EL-ORD and 08-888-EL-ORD.

33. DE-Ohio agrees to an annual audit review of compliance with its Corporate Separation Plan, including, but not limited to a review of its Cost Allocation Manual. Such audit shall be conducted by an independent third party auditor or Staff at the Commission's discretion. DE-Ohio shall fund the audit and receive cost recovery

through an appropriate rate mechanism approved by the Commission.

34. Effective January 1, 2009, and continuing through the ESP-SSO period, DE-Ohio shall contribute $700,000 annually to benefit electric consumers at or below 175% of poverty level and who do not participate in PIPP. The contribution shall be made directly to the Hamilton County and Clermont County Community Action Agencies, SEL in Butler County, CAP Dayton in Warren County, and Adams-Brown Community Action. DE-Ohio, CUFA and the aforementioned agencies shall agree to the amount of distribution to each agency, program parameters, and reporting requirements.

35. The Parties agree that all provisions of this Stipulation shall be effective January 1, 2009, except where specifically stated otherwise. Any adverse economic impact to DE-Ohio due to implementation delay, including carrying costs at the weighted average cost of long-term debt, shall be recoverable via the applicable rider(s) during the next rider filing.

The undersigned Parties hereby stipulate and agree and each represents that it is authorized to enter into this Stipulation and Recommendation this 27 day of October 2008.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I certify that a copy of the foregoing Stipulation and Recommendation was served on the following parties this 27th day of October, 2008 by regular U.S. Mail, overnight delivery or electronic delivery.

[signature]

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Stipulation Attachment 1

Electric Security Plan Price Structure (Note 1)

Generation

- Avoidable Generation Charges
  - Price-to-Compare (PTC)
    - Base Generation (PTC-BG)
    - Fuel, Purchased Power & Emission Allowances (PTC-FPP)
    - Annually Adjusted Component (PTC-AAC)
- Unavoidable Generation Charges
  - System Resource Adequacy (SRA)
    - Capacity Dedication (SRA-CD)
    - Market Capacity Purchases (SRA-SRT) (Note 2)
  - Regulatory Transition Charge (RTC)

Transmission

- Avoidable Transmission Charge (TCR)

Distribution

- Infrastructure Modernization (DR-IM)
- Energy Efficiency (DR-SAW)
- Economic Competitiveness Fund (DR-ECF)

Note 1: This price structure excludes various existing charges and riders that are not specifically identified in Duke Energy Ohio's ESP Application.

Note 2: Market Capacity Purchases (Rider SRA-SRT) may be avoidable by non-residential consumers under certain conditions further described in paragraph 17.

DUKE ENERGY OHIO

Electric Security Plan Revenue
($ in 000's)

Revenue Summary

	MWh (a)	PTC-BG (Little 'g') (b)	RTC (c)	Generation Riders[1] (d)	Transmission Distribution & Other (e)	Total Revenue (f)
2007 Actual Revenue						
Total Revenue	21,894,973	$ 794,616	$ 125,498	$ 436,562	$ 522,900	$ 1,879,576
Less: Shoppers	749,929	518	4,997	2,195	14,581	22,291
Total Non-Shopper Revenue	21,145,044	$ 794,098	$ 120,501	$ 434,367	$ 508,319	$ 1,857,285
2009 ESP Adjustments						
Transfer Base Fuel to PTC-FPP		(263,319)		263,319		-
Terminate Residential RTC			(47,299)	-		(47,299)
Base Generation Increase		83,327		-		83,327
Adjusted 2009 Non-Shopper Revenue		$ 614,106	$ 73,202	$ 697,686	$ 508,319	$ 1,893,313
2010 ESP Adjustments						
Base Generation Increase		38,047		-		38,047
Adjusted 2010 Non-Shopper Revenue		$ 652,153	$ 73,202	$ 697,686	$ 508,319	$ 1,931,360
2011 ESP Adjustments						
Terminate Non-Residential RTC			(73,202)	-		(73,202)
Base Generation Increase		97,196		-		97,196
Adjusted 2011 Non-Shopper Revenue		$ 749,349	$ -	$ 697,686	$ 508,319	$ 1,955,354

Note 1: Generation riders include PTC-FPP, PTC-AAC, SRA-CD and SRA-SRT. Such riders will be updated pursuant to the Application and/or Stipulation.

Revenue by Tariff (Non-Shoppers)

	2007			2009			2010			2011		
	Sales	PTC-BG	Total Revenue	PTC-BG	Total Revenue	% Increase	PTC-BG	Total Revenue	% Increase	PTC-BG	Total Revenue	% Increase
Rate RS - Residential	7,701,750	$ 312,468	$ 777,644	$ 277,629	$ 791,477	1.8%	$ 292,593	$ 806,441	1.9%	$ 292,593	$ 806,441	0.0%
Rate DS - Distribution Secondary	6,613,929	270,710	604,712	201,022	617,387	2.1%	214,203	630,568	2.1%	274,073	644,278	2.2%
Rate DM - Distribution Second Small	566,530	25,229	68,471	19,396	69,693	1.8%	20,668	70,965	1.8%	27,312	72,286	1.9%
Rate DP - Distribution Primary	2,525,438	80,073	182,108	52,243	185,727	2.0%	56,007	189,491	2.0%	70,330	193,405	2.1%
Rate TS - Transmission	3,494,041	98,311	200,404	59,144	204,748	2.2%	63,662	209,266	2.2%	78,652	213,964	2.2%
Rate EH - Electric Space Heating	81,852	2,172	5,872	1,261	5,981	1.9%	1,374	6,094	1.9%	2,039	6,212	1.9%
Rate GSFL - Unmetered Small Fixed	29,194	1,900	3,605	1,620	3,689	2.3%	1,707	3,776	2.4%	1,994	3,867	2.4%
Rate Lighting	123,535	2,958	13,726	1,560	13,855	0.9%	1,695	13,990	1.0%	2,106	14,130	1.0%
Rate ORH - Optional Heating	7,816	227	636	188	647	1.7%	199	658	1.7%	199	658	0.0%
Rate SFL-ADPL - Small Fixed Load	614	40	76	35	78	2.6%	36	79	1.3%	42	81	2.5%
Rate TD - Optional Time of Day	345	10	31	8	31	0.0%	9	32	3.2%	9	32	0.0%
	21,145,044	$ 794,098	$ 1,857,285	$ 614,106	$ 1,893,313	1.9%	$ 652,153	$ 1,931,360	2.0%	$ 749,349	$ 1,955,354	1.2%

Duke Energy Ohio

Electric Security Plan
PTC - BG and Rider RTC
(¢ per kWh except where noted)

	Existing Price			2009		2010		2011	
	Big 'G'	Rider RTC	Little 'g'	PTC-BG	Rider RTC	PTC-BG	Rider RTC	PTC-BG	Rider RTC
	A	B	C = A - B	D	E	F	G	H	I
Rate RS, Residential Service									
Summer, First 1000 kWh	5.0664	0.6484	4.4180	4.0238	-	4.2345	-	4.2345	-
Summer, Additional kWh	6.3534	0.7556	5.5978	5.3622	-	5.6265	-	5.6265	-
Winter, First 1000 kWh	5.0664	0.6484	4.4180	4.0238	-	4.2345	-	4.2345	-
Winter, Additional kWh	2.0546	0.3877	1.6669	0.8915	-	0.9770	-	0.9770	-
Rate ORH, Optional Residential Service									
Summer, First 1000 kWh	4.7202	0.7760	3.9442	3.6637	-	3.8601	-	3.8601	-
Summer, Additional kWh	5.6310	0.9044	4.7266	4.6109	-	4.8452	-	4.8452	-
Winter, First 1000 kWh	4.7200	0.7760	3.9440	3.6635	-	3.8599	-	3.8599	-
Winter, Additional kWh	2.5057	0.4640	2.0417	1.3608	-	1.4849	-	1.4849	-
Winter, kWh greater than 150 times demand	1.6156	0.3386	1.2770	0.4349	-	0.5021	-	0.5021	-
Rate TD, Optional Time-of-Day Rate									
Summer, On-Peak kWh	10.6570	1.6491	9.0079	9.8380	-	10.2813	-	10.2813	-
Summer, Off-Peak kWh	1.6734	0.3578	1.3156	0.4950	-	0.5646	-	0.5646	-
Winter, On-Peak kWh	8.4072	1.3261	7.0811	7.4982	-	7.8479	-	7.8479	-
Winter, Off-Peak kWh	1.6739	0.3578	1.3161	0.4956	-	0.5652	-	0.5652	-
Rate CUR, (Rev. Class 01, 02, 04, 16 & 18 only)									
Summer, First 1000 kWh	5.0664	0.6484	4.4180	3.3754	0.6484	3.5861	0.6484	4.4537	-
Summer, Additional kWh	6.3534	0.7556	5.5978	4.6066	0.7556	4.8709	0.7556	5.9014	-
Winter, First 1000 kWh	5.0664	0.6484	4.4180	3.3754	0.6484	3.5861	0.6484	4.4537	-
Winter, Additional kWh	2.0546	0.3877	1.6669	0.5038	0.3877	0.5893	0.3877	1.0658	-
Rate DS, Secondary Distribution Voltage									
First 1000 kW ($ per kW)	$ 7.6574	-	$ 7.6574	$ 7.9637	-	$ 8.2822	-	$ 8.6135	-
Additional kW ($ per kW)	$ 6.0574	-	$ 6.0574	$ 6.2997	-	$ 6.5517	-	$ 6.8138	-
Billing Demand Times 300	2.8568	0.8992	1.9576	0.8266	0.8992	0.9454	0.8992	1.9682	-
Additional kWh	1.6366	0.0100	1.6266	0.4468	0.0100	0.5148	0.0100	0.5957	-
Rate GS-FL, Optional Unmetered									
kWh Greater Than or Equal to 540 Hours	7.1760	0.6719	6.5041	5.5458	0.6719	5.8444	0.6719	6.8287	-
kWh Less Than 540 Hours	8.1484	0.6719	7.4765	6.5571	0.6719	6.8961	0.6719	7.9205	-
Rate SFL-ADPL, Optional Unmetered									
All kWh	7.1760	0.6719	6.5041	5.5458	0.6719	5.8444	0.6719	6.8287	-
Rate EH, Optional Electric Space Heating									
All kWh	3.3405	0.6719	2.6686	1.5569	0.6719	1.6959	0.6719	2.5123	-

Duke Energy Ohio

Electric Security Plan
PTC - BG and Rider RTC
(¢ per kWh except where noted)

	Existing Price			2009		2010		2011	
	Big 'G'	Rider RTC	Little 'g'	PTC-BG	Rider RTC	PTC-BG	Rider RTC	PTC-BG	Rider RTC
	A	B	C = A - B	D	E	F	G	H	I
Rate DM, Secondary Dist. Service, Small									
Summer, First 2800 kWh	7.0728	1.2166	5.8562	4.8938	1.2166	5.1880	1.2166	6.7106	-
Summer, Next 3200 kWh	1.8173	0.3221	1.4952	0.3226	0.3221	0.3962	0.3221	0.7989	-
Summer, Additional kWh	0.9004	0.2484	0.6520	(0.5573)	0.2484	(0.5188)	0.2484	(0.2325)	-
Winter, First 2800 kWh	5.6302	0.9822	4.6480	3.6279	0.9822	3.8621	0.9822	5.0879	-
Winter, Next 3200 kWh	1.8172	0.3203	1.4969	0.3243	0.3203	0.3999	0.3203	0.7988	-
Winter, Additional kWh	0.8633	0.2442	0.6191	(0.6917)	0.2442	(0.5558)	0.2442	(0.2742)	-
Rate DP, Service at Primary Dist.Voltage									
First 1000 kW ($ per kW)	$ 6.9150	-	$ 6.9150	$ 7.1916	-	$ 7.4793	-	$ 7.7784	-
Additional kW ($ per kW)	$ 5.4550	-	$ 5.4550	$ 5.6732	-	$ 5.9001	-	$ 6.1361	-
Billing Demand Times 300	2.8898	0.6850	2.2048	1.0751	0.6850	1.1953	0.6850	2.0053	-
Additional kWh	1.7782	0.0100	1.7682	0.5940	0.0100	0.6680	0.0100	0.7549	-
Rate TS, Service at Transmission Voltage									
First 50,000 kVA ($ per kVA)	$ 8.3830	-	$ 8.3830	$ 8.7183	-	$ 9.0671	-	$ 9.4297	-
Additional kVA ($ per kVA)	$ 6.0430	-	$ 6.0430	$ 6.2847	-	$ 6.5361	-	$ 6.7976	-
Billing Demand Times 300	1.9994	0.5590	1.4404	0.2751	0.5590	0.3583	0.5590	1.0038	-
Additional kWh	1.6481	0.0100	1.6381	0.4587	0.0100	0.5273	0.0100	0.6086	-
Rate TL, Traffic Lighting Service									
All kWh	1.9148	0.2290	1.6858	0.5171	0.2290	0.5967	0.2290	0.9086	-
Rate SL, Street Lighting Service									
Rate OL, Outdoor Lighting Service									
Rate NSU, Street Lighting									
Rate NSP, Private Outdoor Lighting									
Rate SE, Street Lighting Service									
All kWh	3.1094	0.2290	2.8804	1.7595	0.2290	1.8888	0.2290	2.2524	-
Rate SC, Street Lighting									
Energy Only - All kWh	1.3749	0.2290	1.1459	(0.0444)	0.2290	0.0128	0.2290	0.3013	-
Units - All kWh	3.1094	0.2290	2.8804	1.7595	0.2290	1.8888	0.2290	2.2524	-
Rate UOLS, Unmetered Outdoor Lighting									
All kWh	1.4148	0.2290	1.1858	(0.0029)	0.2290	0.0559	0.2290	0.3462	-

Stipulation Attachment 3
Page 1 of 2

Duke Energy Ohio
SmartGrid Component of Rider DR-IM

Residential Rate Cap ($ / monthly bill)	2009	2010	2011	2012	2013	2014
Residential Cumulative Rate Cap	$0.50	$1.50	$3.25	$5.25	$5.50	$6.50

Annualized Revenue Requirement	2008	2009	2010	2011	2012	2013
Gross Plant	$19,968,050	$59,904,149	$159,060,806	$261,131,407	$305,924,613	$337,169,767
Accumulated Depreciation	787,909	2,363,728	10,758,405	26,601,808	47,859,075	71,834,374
Net Plant	$19,180,141	$57,540,422	$148,302,400	$234,629,598	$258,065,538	$265,335,393
Accum Def Income Tax	1,375,793	4,127,379	16,413,701	36,168,285	59,315,449	81,904,255
Rate Base	$17,804,348	$53,413,043	$131,888,699	$198,361,313	$198,750,090	$183,431,138
Return on Rate Base (allowed)	11.69%	11.69%	11.69%	11.69%	11.69%	11.69%
Return on Rate Base	$2,081,328	$6,243,985	$15,417,789	$23,188,437	$23,233,886	$21,443,100
Operating Expenses						
Depreciation	$787,909	$1,575,818	$8,394,678	$15,843,403	$21,257,266	$23,975,299
Annualized Property Taxes	399,361	798,722	3,181,216	5,222,628	6,118,492	6,743,395
Amortization of PISCC	-	39,936	99,157	102,071	44,793	31,246
Metering (net of Severance)	79,099	158,199	(212,355)	(2,288,336)	(5,502,112)	(7,413,897)
IT & Communication Costs	539,160	1,078,319	4,150,635	7,557,169	9,815,892	11,027,998
Customer Service (net)	183,601	367,202	1,164,468	1,222,643	391,654	188,510
Distribution System	70,817	141,634	500,101	816,020	1,065,108	1,294,006
Other O&M Reductions (net)	-	-	(81,453)	(594,605)	(1,021,086)	(1,175,847)
Total Operating Expenses	$2,059,947	$4,159,831	$17,196,446	$27,880,993	$32,170,007	$34,670,709
Annualized Revenue Requirement	$4,141,276	$10,403,816	$32,614,235	$51,069,430	$55,403,892	$56,113,809

Revenue Requirement Allocation						
Residential Allocation	85%					
Residential Revenue Requirement	$3,520,084	$8,843,243	$27,722,099	$43,409,016	$47,093,308	$47,696,737
Non-residential Allocation	15%					
Non-residential Revenue Requirement	$621,191	$1,560,572	$4,892,135	$7,660,415	$8,310,584	$8,417,071

Duke Energy Ohio
SmartGrid Component of Rider DR-IM
Allocation of SmartGrid Revenue Requirement by Non-residential Tariff

			2009	2010	2011	2012	2013
Annual Revenue Requirement			$621,191	$1,560,672	$4,892,135	$7,660,415	$8,310,584
	# of Bills	Allocation	Projected Non-Residential Rate ($ / Monthly Bill)				
DS - Single Phase	53,386	4.8%	$0.56	$1.41	$4.43	$6.93	$7.52
DS - Single Phase Load Mgmt	12,610	1.1%	$0.56	$1.41	$4.43	$6.93	$7.52
DS - Three Phase	177,302	32.1%	$1.12	$2.82	$8.85	$13.86	$15.04
DS - Three Phase Load Mgmt	947	1.7%	$11.24	$28.24	$88.54	$138.65	$150.41
EH - Single Phase	2,398	0.2%	$0.56	$1.41	$4.43	$6.93	$7.52
EH - Three Phase	2,626	0.5%	$1.12	$2.82	$8.85	$13.86	$15.04
DM - Single Phase	351,836	31.8%	$0.56	$1.41	$4.43	$6.93	$7.52
DM - Three Phase	118,436	21.4%	$1.12	$2.82	$8.85	$13.86	$15.04
DP - Standard	2,785	5.0%	$11.24	$28.24	$88.54	$138.65	$150.41
DP - Load Mgmt	672	1.2%	$11.24	$28.24	$88.54	$138.65	$150.41

Allocation by Non-residential Tariff

	Per Case No. 05-59-EL-AIR			
	Customer Charge	Number of Customer Bills	Annual Customer Charge Amount	Annual Customer Charge % of Total
Distribution Secondary (DS)				
Single Phase	$7.50	53,386	$400,395	4.8%
Single Phase Load Mgmt	$7.50	12,610	$94,675	1.1%
Three Phase	$15.00	177,302	$2,659,530	32.1%
Three Phase Load Mgmt	$150.00	947	$142,050	1.7%
		244,245	$3,296,550	39.8%
Electric Space Heating (EH)				
Single Phase	$7.50	2,398	$17,985	0.2%
Three Phase	$15.00	2,626	$39,390	0.5%
		5,024	$57,375	0.7%
Distribution Secondary - Small (DM)				
Single Phase	$7.50	351,836	$2,638,770	31.8%
Three Phase	$15.00	118,436	$1,776,540	21.4%
		470,272	$4,415,310	53.3%
Distribution Primary (DP)				
Standard	$150.00	2,785	$417,750	5.0%
Load Mgmt	$150.00	672	$100,800	1.2%
		3,457	$518,550	6.3%
Total Non-residential		722,998	$8,287,785	100.0%

Note: Allocation excludes transmission customers (Rate TS)

Stipulation Attachment 4

Non-Residential Interruptible Program &
Backup Generating Facility Program
Key Provisions

- Contract Term: 1 - 3 years
- Capacity Payments:
  - Reliability Program: Based on avoided cost of generation resources, and validated against market-based capacity resources
  - Economic Program: None
- Energy Payments:
  - Reliability Program: Based on avoided MISO hourly LMP
  - Economic Program: Based on XX% avoided MISO hourly LMP (less $30/MWh)
- Advanced Notification: 10 minutes – 12 hours
- Buy-Through: Available during non-MISO declared events at 125% of hourly LMP
- Load Reduction: Customer selects fixed reduction or firm demand level
- Program Options: Summer program or Year-round program
- Generator Requirements:
  - Metering: Additional metering may be required
  - Periodic Testing: Required to demonstrate availability and capacity value
  - Load Shifting: Other load shifting resources allowed
- RTP Eligibility: Duplicate compensation for same demand reduction is not allowed
- Hours/Number of Interruptions per Year: Customer selects from available options
- Duke Energy: May call up to 2 interruptions/year without buy-through capability
- MISO Module E Requirements:
  - MISO may call 5 interruptions per year without buy-through capability
  - MISO can call whenever EEA 2, Step 1 Emergency Alert Level is declared (max 5)
  - Minimum event duration of 4 hours
  - MISO non-compliance costs based on 125% of hourly LMP and RSG prices
  - Failure to comply with MISO declared events could result in expulsion from program

Stipulation Attachment 5

Settlement Between DE-Ohio and the City of Cincinnati

A. Economic Development Contract

Duke Energy Ohio, Inc., (DE-Ohio) and the City of Cincinnati (City), desire to enter a contract to provide economic development funds to the City for the purpose of creating jobs and fostering economic development within the City of Cincinnati.

The City is a mercantile customer of DE-Ohio with an annual load in excess of 42 million MWH. This contract furthers the state policy set forth in R.C. 4928.02 by strengthening the economy within the City through the creation of a significant number of jobs over a three year time period during a time of general economic duress.

The project proposed by the City, the development of a street car system in downtown Cincinnati, extending to the Over-the Rhine neighborhood, is not a retail project and is projected to create both construction-phase jobs, as well as permanent jobs within the City. If, for any reason, the City does not go forward with the street car project it will, with the Commission's approval, substitute another economic development project set forth in its reports to the Commission. The City is committed to projects that create a minimum of twenty-five (25) jobs during the three-year ESP period. The average hourly rate of the jobs shall exceed 150% of the federal minimum wage.

The City is a major employer in the Cincinnati area. It has significant financial resources to draw upon. The street car project may include federal, state, local, and/or private support in addition to the monies approved by the Public Utilities Commission of Ohio, if any. There are significant ancillary benefits to the project including significant additional tax revenues. The largest benefit is expected to come from the economic and business development along the street car corridor. The streetcar system alone is expected to consume approximately 7.5 million kWh per year, once fully operational. The City agrees to maintain the incremental employment for a period of three years beyond the date of initial operation.

DE-Ohio agrees to provide the City $2 million during 2010, and $1 million during 2011. DE-Ohio shall apply for recovery of half the funds equal to $1 million during 2010, and $500,000 during 2011 through its Rider DR-ECF conditioned upon approval for recovery by the Public Utilities Commission of Ohio (Commission) through a case filed during 2009 and upon the City meeting project milestones including but not limited to the creation of jobs within the City of Cincinnati. The City agrees to create a minimum of twenty-five (25) jobs through direct employment or indirect employment. Direct employment shall be incremental employees dedicated to the project above those employed by the City on January 1, 2009. Indirect employment shall be new jobs associated with a project sponsored by the City.

The City shall maintain the increased level of employment for at least three years after the date of initial operation. If the City does not maintain the increased level of employment DE-Ohio shall refund $1.5 million to customers over a twenty-four (24) month period.

The City and DE-Ohio shall report to the Commission the number of jobs created and the forecast of incremental jobs annually beginning January 1, 2010, and ending Date TBD.

This Economic Development Contract shall terminate upon completion of reporting during the three years after initial operation.

B. Streetlights

DE-Ohio agrees to purchase from the City approximately 20,263 existing streetlights, which are identified in Attachment A, that are attached to DE-Ohio's utility poles located outside the City's central business district. The purchase is subject to the following terms and conditions:

1. The purchase price shall be approximately $4 million for all streetlights owned by the City outside of the City's central business district.

2. DE-Ohio shall remit the full purchase price to the City within 120 days of the execution of a Stipulation. The City shall execute a bill of sale transferring title to the streetlights to DE-Ohio when DE-Ohio remits the full purchase price. The $4 million shall be designated for the City's street car project, or another economic development project as determined by the City should the street car project not go forward. A portion of the $4 million may also be designated by the City to offset the cost of those streetlights required to be replaced under the terms of the agreement.

3. Upon payment of the purchase price by DE-Ohio, the City shall be charged consistent with the energy portion of Rate OULS (or its successor tariff) and with the maintenance portion of Rate OL-E (or its successor tariff). The existing streetlight maintenance contract will be rescinded. Should any of the 20,263 streetlights require replacement following transfer of the streetlights to DE-Ohio, such replacement shall be under the terms of the capital equipment portion of DE-Ohio's Rate OL-E (or its successor tariff) except as stated below. The term "streetlight" is inclusive of a bracket arm, luminaries and associated wiring.

4. For the first ten years following purchase, regardless of the actual number of streetlights replaced, DE-Ohio agrees to charge the City on an annual basis for the actual cost of streetlights replaced but not to exceed the replacement costs of 2000 streetlights. Should any more than 2000 streetlights be replaced within a calendar year, the capital and carrying

costs to replace those additional streetlights shall be carried over to the following calendar year and paid during that year, subject to the same 2,000 streetlight limit. At the end of the ten year period, the City shall be responsible for any balance remaining associated with streetlights replaced during the ten year period.

The Parties agree to work together to determine the cost-effectiveness of installing new energy efficient lighting technologies as replacement fixtures.

5. The Parties agree that DE-Ohio shall remove any third-party (non-City of Cincinnati) attachments that may exist on the streetlights.

C. Life Safety Signs

On or before December 31, 2009, the City will remove all "Life Safety Signs" from DE-Ohio's utility poles. Life Safety Signs are those signs described in Attachment B.

The City further agrees that it will not install any new or additional Life Safety Signs on DE-Ohio's utility poles.

In the event DE-Ohio discovers the attachment of Life Safety Signs to its utility poles after December 31, 2009, the Parties agree that the City will remove those signs within 30 days' notice from DE-Ohio.

D. Remaining, Existing Attachments

The Parties agree to work together to promptly address any situations where a City attachment may be a violation of the NESC. The Parties further agree that any known violations that create an immediate hazard may be repaired or removed without notice to the other Party.

The Parties will work together to establish a no-cost Application and Permit for Attachment Process and Sign Guidelines. The City shall not be required to perform an audit of its existing attachments. In addition, the City shall not be required to go through the Application and Permit Process for existing attachments until DE-Ohio notifies the City of the existence of non-permitted or unauthorized attachments. Upon such notification the City shall submit each such attachment to the agreed upon Application and Permit for Attachment Process within 30 days.

This provision is not intended to contradict or replace the terms and conditions to which they are subject pursuant to the Application and Permit for Attachment Process.

E. Future Attachments

The Parties agree that they will utilize the Application and Permit for Attachment Process and the Sign Guidelines to be jointly established by the Parties with respect to any future requests of the City to make attachments to DE-Ohio's utility poles.

F. Permit Fees

The Parties agree that DE-Ohio shall support a revision to the pole attachment (PA) tariff filed in connection with its electric distribution rate case, pending under Case No. 08-709-EL-AIR. The revision shall exempt municipalities from attachment fees provided those municipalities timely remove life safety signs, equipment, and lights from DE-Ohio's utility poles, enter into pole attachment agreements or otherwise submit to an application and permit process for any future pole attachments, submit any existing, non-permitted (*i.e.*, unauthorized) attachments to an application and permit process, and timely correct any attachments that violate NESC or other applicable regulation.

The above revision to the pole attachment tariff shall ensure that the City of Cincinnati will not be responsible for paying pole attachment fees for existing or new attachments now or in the future. If the revisions to the pole attachment tariff are not accepted by the PUCO, the City and DE-Ohio will enter into a pole attachment agreement which clarifies that the City will not be responsible for paying pole attachment fees for existing or new attachments now or in the future.

The Parties agree that effective January 1, 2009, that if the relocation of existing DE-Ohio overhead and/or underground electric facilities in the public rights-of-way are necessary to accommodate a City public improvement project, then the City shall not assess DE-Ohio street opening permit fees typically charged in order to compensate the City for its costs to review and process DE-Ohio's relocation proposal.

G. Future Audit

The Parties agree that DE-Ohio may, at its discretion and at its sole expense, conduct an audit of its system for purposes of identifying attachments.

The Parties further agree that if the audit reveals the existence of non-permitted or unauthorized City attachments or City attachments that violate the NESC or other applicable regulation, the Parties agree that the City will remove or make application for the attachments within 30 days' notice from DE-Ohio. The Parties further agree that any known violations that create an immediate hazard may be repaired or removed without notice to the other Party.

H. Miscellaneous Provisions

The City agrees that it will not assert any opposition to the proposed pole attachment tariff within DE-Ohio's electric distribution rate case, pending under Case No. 08-709-EL-AIR.

On Behalf of DE-Ohio

On Behalf of the City of Cincinnati

Stipulation Attachment 8

Duke Energy Ohio

Electric Security Plan Shopping Credit
(¢ per kWh except where noted)

	Big 'G' A	Rider RTC B	Little 'g' C = A - B	Shopping Credit D = 6% X C
Rate CUR, (Rev. Class 01, 02, 04, 16 & 18 only)				
Summer, First 1000 kWh	5.0664	0.6484	4.4180	0.2651
Summer, Additional kWh	6.3534	0.7556	5.5978	0.3359
Winter, First 1000 kWh	5.0664	0.6484	4.4180	0.2651
Winter, Additional kWh	2.0546	0.3877	1.6669	0.1000
Rate DS, Secondary Distribution Voltage				
First 1000 kW ($ per kW)	$ 7.6574	-	$ 7.6574	$ 0.4594
Additional kW ($ per kW)	$ 6.0574	-	$ 6.0574	$ 0.3634
Billing Demand Times 300	2.8568	0.8992	1.9576	0.1175
Additional kWh	1.6366	0.0100	1.6266	0.0976
Rate GS-FL, Optional Unmetered				
kWh Greater Than or Equal to 540 Hours	7.1760	0.6719	6.5041	0.3902
kWh Less Than 540 Hours	8.1484	0.6719	7.4765	0.4486
Rate SFL-ADPL, Optional Unmetered				
All kWh	7.1760	0.6719	6.5041	0.3902
Rate EH, Optional Electric Space Heating				
All kWh	3.3405	0.6719	2.6686	0.1601
Rate DM, Secondary Dist. Service, Small				
Summer, First 2800 kWh	7.0728	1.2166	5.8562	0.3514
Summer, Next 3200 kWh	1.8173	0.3221	1.4952	0.0897
Summer, Additional kWh	0.9004	0.2484	0.6520	0.0391
Winter, First 2800 kWh	5.6302	0.9822	4.6480	0.2789
Winter, Next 3200 kWh	1.8172	0.3203	1.4969	0.0898
Winter, Additional kWh	0.8633	0.2442	0.6191	0.0371
Rate DP, Service at Primary Dist.Voltage				
First 1000 kW ($ per kW)	$ 6.9150	-	$ 6.9150	$ 0.4149
Additional kW ($ per kW)	$ 5.4550	-	$ 5.4550	$ 0.3273
Billing Demand Times 300	2.8898	0.6850	2.2048	0.1323
Additional kWh	1.7782	0.0100	1.7682	0.1061
Rate TS, Service at Transmission Voltage				
First 50,000 kVA ($ per kVA)	$ 8.3830	-	$ 8.3830	$ 0.5030
Additional kVA ($ per kVA)	$ 6.0430	-	$ 6.0430	$ 0.3626
Billing Demand Times 300	1.9994	0.5590	1.4404	0.0864
Additional kWh	1.6481	0.0100	1.6381	0.0983
Rate TL, Traffic Lighting Service				
All kWh	1.9148	0.2290	1.6858	0.1011
Rate SL, Street Lighting Service				
Rate OL, Outdoor Lighting Service				
Rate NSU, Street Lighting				
Rate NSP, Private Outdoor Lighting				
Rate SE, Street Lighting Service				
All kWh	3.1094	0.2290	2.8804	0.1728
Rate SC, Street Lighting				
Energy Only - All kWh	1.3749	0.2290	1.1459	0.0688
Units - All kWh	3.1094	0.2290	2.8804	0.1728
Rate UOLS, Unmetered Outdoor Lighting				
All kWh	1.4148	0.2290	1.1858	0.0711

Stipulation Attachment 7

Kroger Co.
List of Transformers

Address	Surburb	Vintage year	Transformer #	Size	Serial #
11390 Montgomery Rd	Montgomery	1988	X24-24	750	88JG207279
550 Old St Rt 74	Mt Carmel	1996	6C-2874	500	HI2844223296
550 Old St Rt 74	Mt Carmel	1985	6C-2873	500	8560000578
2443 Harrison	Westwood	1973	K9-3	500	K855325T73AA
428 Oxford State Rd	Amanda	1990	BTO-2532	1000	21353724D1
6725 Dick Flynn Bl	Goshen	2000	CLO-3651	750	HI1250030300
3760 Paxton	Hyde Park	1989	HMO-5303	1500	89j451144
1260 Ohio Pk	Amelia	1994	20C 2092	1000	93B50078
3491 North Bend Rd W	White Oak	1988	J14-C-6	750	88JG203005
2900 US Rt 22-3 W	20 Mi Stand	1986	W83-243	1000	86JA601214
1868 Seymour	Bond Hill	1990	Q15-18	500	90A39476
7132 Hamilton	N Coll Hill	2001	HMO-3286	750	HI3267004301
6401 Colerain	Grosbeck	1986	K16-15	1000	86JB606082
6950 Miami Rd	Madeira	2002	HMO-5318	750	HI3763654202
8241 Vine	Hartwell	1981	P17-5	500	NO17837TLSA
1 Corry W	Corryville	1981	O9-11-33-11	500	81ZB61A001
800 Main	Milford	1993	CLO 11	1500	SQ930117A1
800 Loveland Maderia Rd	Loveland	1980	Z30-1	750	79JM111212
5575 Galbraith Rd E	Kenwood	1988	V17-47	500	88J246229
7401 Wooster Pk	Plainville	2000	W-11-363	1000	8HI4470994799
4777 Kenard	Winton Pl	1994	O12-652	750	Q248514TWJ
4777 Kenard	Winton Pl	1996	O12-651	500	3480424395
12164 US Rt 42	Sharonville	1994	U26-236	750	93B50067
5420 Liberty Fairfield Rd	Maustown	1998	58BT-1493	750	HI3930354697
8800 Beechmont	Cherry Grv	1988	5C 2888	750	88J241314
2280 Ferguson Rd	Westwood	1995	J8-682	750	
10595 Springfield Rd	Woodlawn	2000	P22-215	1000	HI4286254499
5830 Harrison	Dent	2000	HMO-255	1000	HI4402044200
2100 Beechmont	Mt Wash	2002	V6-600	2000	HI3301783503
210 Sterling Run Blvd	Mt Orab	2000	BRO-87	1000	H12912572300
4001 St Rt 128	Hooven	1999	HMO-1950	1000	HI3776894398
5100 Terra Firma Dr	Mason R	2003	WRO-3462	750	HI2874553003
11350 Grooms	Blue Ash	1994	V24-500	300	939004973
4530 Eastgate Bl	Glen Este	1989	6C 460	500	88JH22403
9690 Colerain	Bevis	1997	J20-346	750	19572101597
7580 Beechmont	Forestville	2003	HMO-7553	2000	HI3654894003
8328 Princeton Glendale F	Port Union	1990	BTO-3784	750	90J761221
1093 St Rt 28	Mulberry	1991	25C-1931	750	P814107TWF
560 Wessel Dr	Fairfield	2002	BTO-3779	1000	HI1676431102
1212 Kemper Rd W	Forest Pk	1987	N25-15	750	876007549
5080 Delhi	Delhi Hls	2002	J5-34	750	HI3962754502
7855 Tylersville Rd	Maud	1973	78BT-77	750	2-56191
6165 GLENWAY AVE.	WESTWOOD	2005	HMO-7726	750	HI509059004

Stipulation Attachment 8

THE CINCINNATI GAS & ELECTRIC COMPANY
SETTLEMENT DISTRIBUTION RATES
CASE NO. 05-59-EL-AIR

LINE NO.	RATE CODE (A)	CLASS / DESCRIPTION (B)	CUSTOMER BILLS (C)	SALES (D)	DISTRIBUTION REVENUE (F)	% OF REVENUE (G)
				(KWH)	($)	(%)
	RESIDENTIAL					
1	RS	RESIDENTIAL SERV	7,753,637	7,137,886,740	177,285,069	
2	ORH	OPTIONAL HEATING SERVICE	2,447	7,872,162	155,362	
3	TD	OPTIONAL TIME OF DAY SERVICE	653	416,418	13,224	
4	TOTAL RESIDENTIAL		7,756,737	7,146,175,320	177,453,655	100.00%
	NON-RESIDENTIAL					
5	DS	SEC DISTRIBUTION SERV	244,245	7,362,160,419	82,130,326	66.77%
6	DS RTP	SEC DISTRIBUTION SERV RTP	346	9,972,922	183,871	0.15%
7	GSFL	UNMTRED SMALL FIXED LOAD	4,651	29,437,207	474,650	0.39%
8	EH	ELEC SPACE HTG	5,024	106,271,601	1,264,195	1.03%
9	DM	SEC DIST SERV-SMALL	470,272	535,560,094	17,595,273	14.30%
10	DP	PRIM DIST VOLTAGE	3,457	2,221,867,890	19,525,563	15.87%
11	DP RTP	PRIM DIST VOLTAGE RTP	300	78,956,543	594,805	0.48%
12	TOTAL DISTRIBUTION		728,295	10,344,225,676	121,768,683	99.00%
13	TS	TRANSMISSION SERV	629	3,270,715,976	1,196,189	0.97%
14	TS RTP	TRANSMISSION SERV RTP	69	71,528,044	36,017	0.03%
15	TOTAL TRANSMISSION		698	3,342,244,020	1,232,206	1.00%
	TOTAL NON-RESIDENTIAL		728,993	13,686,470,696	123,000,889	100.00%

CASE NO. 08 -920-EL-SSO, ET AL
STIPULATION ATTACHMENT 9

1. Reserve Capacity. DE-Ohio will provide existing distribution reserve capacity at no charge for existing load during the ESP period[1] for GCHC member hospitals.
2. Additional Feeder. DE-Ohio will provide an additional distribution feeder to any GCHC member hospital, without an existing second feed, requesting such service. The cost of the additional feeder will be recovered from the requesting GCHC member through an applicable rate Rider or Excess Facilities Charge using a rate of return component no greater than that approved by the Commission in Duke's distribution rate case, Case No. 08-709-EL-AIR.
3. Payment for Available Emergency Generation Capacity. DE-Ohio agrees to compensate GCHC member hospitals who participate in a non-residential capacity pilot program as follows:
    a. During the first year of the ESP period, participating GCHC members who participate in an approved program consistent with MISO Module E requirements will receive capacity payments at the higher of the market based price or $40/kW per year. The Parties recommend that DE-Ohio recover Capacity payments through Rider SRA-SRT. If cost recovery is denied DE-Ohio may prospectively adjust capacity payments to a level where the Commission is expected to permit cost recovery. In such event, participating GCHC members shall have the right to withdraw from the program.
    b. Capacity credits during subsequent years of the ESP period will be based upon DE-Ohio's avoided cost of generation capacity and verified against market-based capacity resources. The Parties recommend that credits be recovered through Rider SRA-SRT. Participating GCHC members shall have the right to withdraw from the program if approved credits are unsatisfactory to them.
    c. DE-Ohio agrees to compensate GCHC program participants for energy during a capacity call based on the DE-Ohio's avoided cost of energy during an interruption period. During the first year of the ESP period,

[1] The ESP period is defined as the period beginning January 1, 2009 and ending December 31, 2011.

GCHC members participating in the program will receive energy payments at a rate of $0.11 /kWh. The Parties recommend that DE-Ohio recover Energy payments through Rider PTC-FPP. If cost recovery is denied DE-Ohio may prospectively adjust Energy payments to a level where the Commission is expected to permit cost recovery. In such event, participating GCHC members shall have the right to withdraw from the program.

d. The maximum number of capacity call hours during any calendar year of the ESP period will be limited to 400 hours.

e. The program shall be applicable to existing and new generation capacity of GCHC's participating member hospitals during the ESP period. Duke Energy Ohio guarantees that members of the GCHC having surplus generating assets will be provided each year of the ESP the opportunity to contract that capacity to DE-Ohio as well as additional Capacity up to 3 MW they might add at various times during the ESP.

4. Energy Improvement/Efficiency, Demand-Response and Patient Safety - DE-Ohio agrees to provide funds of $150k annually (to be paid quarterly beginning January 1, 2009) during the ESP period to GCHC for GCHC to use in support of energy initiatives for its member hospitals, long-term care facilities and other affiliate members including but not limited to, such purposes as energy-related programs for patient safety, reliability, energy efficiency, cost-control, alternative resources, research and development and any related program or administrative expenses.

5. Onsite Generation Service Tariff – DE Ohio agrees to work with GCHC member hospitals, long-term care facilities and affiliate members to develop an onsite generation service tariff for Commission review and approval. The tariff will include back-up service from DE-Ohio owned on-site generation assets. In case of failure of DE-Ohio on-site generators, the load served by such generator will return to the DE-Ohio system provided such service is available.

6. Service Improvement for GCHC Hospital Members – DE-Ohio will work with GCHC member hospitals to develop:

a. Coordinated Work Plans that enhance communication, advance notice and coordination of operations and maintenance of distribution feeders with

BEFORE

THE PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Duke Energy Ohio, Inc., for Approval of an Electric Security Plan.	)	Case No. 08-920-EL-SSO
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Amend Accounting Methods.	)	Case No. 08-921-EL-AAM
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval of a Certificate of Public Convenience and Necessity to Establish an Unavoidable Capacity Charge(s).	)	Case No. 08-922-EL-UNC
In the Matter of the Application of Duke Energy Ohio, Inc., for Approval to Amend its Tariff.	)	Case No. 08-923-EL-ATA

OPINION AND ORDER

The Commission, coming now to consider the testimony and other evidence presented in these proceedings, hereby issues its opinion and order.

APPEARANCES

Paul A. Colbert, Rocco O. D'Ascenzo, and Elizabeth H. Watts, 155 East Broad Street, 21st Floor, Columbus, Ohio 43215; Amy B. Spiller, Room 2500, ATII, 139 East Fourth Street, Cincinnati, Ohio 45201; and Catherine E. Heigel, 526 South Church Street, Charlotte, North Carolina 28202, on behalf of Duke Energy Ohio, Inc.

McNees, Wallace & Nurick LLC, by Samuel C. Randazzo and Joseph M. Clark, Fifth Third Center, Suite 1700, 21 East State Street, Columbus, Ohio 43215, on behalf of Industrial Energy Users-Ohio.

Boehm, Kurtz & Lowry, by David F. Boehm and Michael L. Kurtz, Suite 1510, 36 East Seventh Street, Cincinnati, Ohio 45202, on behalf of Ohio Energy Group.

David C. Rinebolt and Colleen L. Mooney, Fourth Floor, Suite 5, 337 South Main Street, Findlay, Ohio 45839, on behalf of Ohio Partners for Affordable Energy.

Bricker & Eckler LLP, by Thomas J. O'Brien, 100 South Third Street, Columbus, Ohio 43215, on behalf of the city of Cincinnati.

Chester, Willcox & Saxbe, LLP, by John W. Bentine, Mark S. Yurick, and Matthew S. White, Suite 1000, 65 East State Street, Columbus, Ohio 43215, on behalf of the Kroger Company.

Vorys, Sater, Seymour and Pease LLP, by M. Howard Petricoff and Stephen M. Howard, 52 East State Street, Columbus, Ohio 43216, on behalf of Constellation NewEnergy, Inc.; Constellation Energy Commodities Group, Inc.; Integrys Energy Services, Inc.; and Direct Energy Service, LLC.

Christensen, Christensen, Donchatz, Kettlewell & Owens LLP, by Mary W. Christensen, 100 East Campus View Boulevard, Columbus, Ohio 43235, on behalf of People Working Cooperatively.

Bell & Royer Co., LPA, by Barth E. Royer, 33 South Grant Avenue, Columbus, Ohio 43215, on behalf of the Ohio Environmental Council and Dominion Retail, Inc.

McDermott, Will & Emery, by Grace C. Wung, 600 Thirteenth Street, NW, Washington, DC 20005, on behalf of Wal-Mart Stores East, LP; Sam's Club East; and Macy's Inc.

Janine L. Migden-Ostrander, Ohio Consumers' Counsel, by Ann M. Hotz, Michael E. Idzkowski, and Jacqueline Lake Roberts, Assistant Consumers' Counsel, Office of the Ohio Consumers' Counsel, 10 West Broad Street, Suite 1800, Columbus, Ohio 43215, on behalf of residential utility customers of Duke Energy Ohio, Inc.

Sheryl Creed Maxfield, First Assistant Attorney General of the State of Ohio, Duane W. Luckey, Section Chief, by Thomas W. McNamee and William L. Wright, Assistant Attorneys General, 180 East Broad Street, Columbus, Ohio 43215, on behalf of the staff of the Commission.

OPINION

I. BACKGROUND AND HISTORY OF THE PROCEEDINGS

Duke Energy Ohio, Inc., (Duke) is a public utility as defined in Section 4905.02, Revised Code, and, as such, is subject to the jurisdiction of this Commission. Duke currently provides electric service under the rate stabilization plan (RSP) approved in *In the Matter of the Application of The Cincinnati Gas & Electric Company to Modify its Nonresidential Generation Rates to Provide for Market-Based Standard Service Offer Pricing and to Establish an Alternative Competitive-Bid Service Rate Option Subsequent to the Market Development Period*, Case No. 03-93-EL-ATA, et al.

On April 23, 2008, the Ohio legislature adopted Amended Substitute Senate Bill No. 221 (SB 221), which became effective on July 31, 2008. Among the provisions of SB 221 were changes to Section 4928.14, Revised Code, requiring electric utilities to provide customers with a default standard service offer (SSO), consisting of either a market rate offer (MRO) or an electric security plan (ESP). The law provides that the first SSO application must include an application for an ESP.

On July 31, 2008, Duke filed an application for approval of an SSO, pursuant to Section 4928.141, Revised Code. Along with that application, Duke filed the direct testimony of Barry W. Wood Jr., James B. Gainer, Todd W. Arnold, Tony R. Adcock, William Don Wathen Jr., Charles R. Whitlock, Sandra P. Meyer, Theodore E. Schultz, Richard G. Stevie, Christopher D. Kiergan, Judah L. Rose, James M. Lefeld, James S. Northrup, Daniel L. Jones, and Paul G. Smith. Duke filed supplemental direct testimony of witnesses Smith, Schultz, and Stevie on September 16, 2008.

Motions to intervene were filed, on various dates, by the Ohio Energy Group (OEG); the Ohio Consumers' Counsel (OCC); the Kroger Company (Kroger); the Ohio Environmental Council (OEC); Industrial Energy Users – Ohio (IEU); the city of Cincinnati (Cincinnati); Ohio Partners for Affordable Energy (OPAE); Constellation NewEnergy, Inc., and Constellation Energy Commodities Group, Inc. (jointly, Constellation); Dominion Retail, Inc. (Dominion); Communities United for Action (CUFA); the Sierra Club, Ohio

Chapter (Sierra); the Natural Resources Defense Council (NRDC); National Energy Marketers Association (NEMA); Integrys Energy Services, Inc. (Integrys); Direct Energy Services, LLC (DES); the Ohio Manufacturers' Association (OMA); Greater Cincinnati Health Council (GCHC); People Working Cooperatively (PWC); the Ohio Farm Bureau Federation (OFB); the village of Terrace Park (Terrace Park); the American Wind Association, Wind on Wires, and Ohio Advanced Energy (jointly, Wind); the University of Cincinnati (UC); the Ohio Association of School Business Officials, the Ohio School Boards Association, and the Buckeye Association of School Administrators (jointly, Schools); Morgan Stanley Capital Group, Inc. (MSCG); and Wal-Mart Stores East, LP, Sam's Club East, and Macy's Inc. (jointly, the Commercial Group). All of such motions were granted.[1]

On August 5, 2008, the attorney examiner assigned to the proceedings issued an entry, setting a procedural schedule, including a technical conference and an evidentiary hearing, the latter of which was set to commence on October 20, 2008. In addition, the examiner announced that local public hearings would be established by subsequent entry. On August 26, 2008, OCC, OEC, and OPAE jointly filed a motion for the setting of local public hearings. The movants specifically asked that three public hearings be scheduled during November or early December in Cincinnati, Mason, and Middletown. On that same day, the same movants filed a separate motion asking the Commission to grant a 60-day continuance of the evidentiary hearing date and an extension of the discovery deadline or, in the alternative, a 15-day continuance and extension. Duke filed a memorandum contra the motion for the continuance and extension, on August 29, 2008, and the movants replied on September 4, 2008. On September 5, 2008, the examiner ruled on the motion, agreeing to continue the evidentiary hearing until November 3, 2008, and to extend the procedural schedule.

On September 17, 2008, the examiner issued an entry scheduling two local public hearings. On September 19, 2008, OCC filed another motion for a continuance and an extension of time. In this motion, OCC requested a 30-day continuance and extension or, alternatively, an order compelling discovery. On September 22, 2008, OCC, Sierra, NRDC, and CUFA filed a joint interlocutory appeal and request for certification, asserting that the local public hearing schedule established by the examiner allowed for only 20 days' notice and that such notice was insufficient. Duke filed memoranda in opposition to the motion for the further delay in the hearing and to the interlocutory appeal, on September 19 and 22, 2008. OCC replied to the memorandum in opposition to the motion for continuance. On October 1, 2008, the examiner denied the motion for the continuance, granted OCC's motion to compel discovery, denied the appellants' request for certification, and scheduled an additional local public hearing.

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1 CUFA filed its motion to intervene beyond an established deadline, together with a motion for leave to file out of time. Such motion is hereby granted, together with its motion to intervene.

On September 29, 2008, OCC, OPAE, CUFA, Sierra, and NRDC filed a motion to stay negotiations between Duke and the other parties to the proceedings. Duke opposed on October 3, 2008. The movants replied on October 8, 2008. The examiner did not issue such a stay. However, on October 15, 2008, the examiner did alter the schedule to allow additional time for negotiations, retaining November 3, 2008, as the date for commencement of the evidentiary hearing. Also, on October 21, 2008, OCC requested an extension of time to file intervenor testimony, which request was granted on October 22, 2008. The procedural schedule was further modified, at the request of Duke, on October 31, 2008.

On October 27, 2008, Duke filed a stipulation and recommendation and an addendum to that stipulation. The stipulation was signed by Duke, staff of the Commission, PWC, GCHC, Integrys, NRDC, Sierra, CUFA, Constellation, OPAE, OEC, Kroger, OCC, OEG, OMA, and the Commercial Group.[2] A separate addendum between Duke and CUFA was also filed on October 27, 2008. On November 10, 2008, Cincinnati filed a letter indicating that it was joining the stipulation. On November 19, 2008, Terrace Park similarly advised the Commission that it was joining the stipulation. Although OCC signed the stipulation, it reserved one issue for litigation, as discussed in this opinion and order. IEU did not sign the stipulation and litigated one issue.

Also on October 27, 2008, IEU filed testimony of Kevin M. Murray and the Commercial Group filed testimony of Michael Gorman. On October 28, 2008, Duke filed the second supplemental testimony of witness Smith. Staff of the Commission filed testimony by Tamara S. Turkenton on October 31, 2008. On November 5, 2008, OCC filed testimony by Wilson Gonzalez and IEU filed supplemental testimony by Kevin Murray.

The first local public hearing was held on October 7, 2008, at Cincinnati State Technical and Community College. At that midday hearing, held before Alan R. Schriber, chairman of the Commission, and Valerie A. Lemmie, commissioner, eight witnesses testified. Although most expressed opposition to rate increases, they also encouraged energy conservation and renewable energy and discussed affordability, rational rate structure, infrastructure repairs, and responses to emergencies. The second local public hearing, before Chairman Schriber, was held on October 7, 2008, in the evening, at the Union Township Civic Center. At that hearing, 17 witnesses testified in opposition to the proposed rate case. The witnesses expressed concern that rate increases would be hardest on customers with fixed incomes, suggested that rate increases should only be granted if the economy and customer service improve, and opposed using rate increases to fund infrastructure improvements. The final local public hearing was held on October 15, 2008, before Chairman Schriber, in the evening, at the Lakota East High School. Fifteen

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2 Wal-Mart Stores East LP also signed individually but is included within the Commercial Group.

witnesses testified, expressing opposition to rate increases and concerns regarding reliability, competition, energy sources, billing, and low-income programs.

The evidentiary hearing occurred on November 10, 2008. At that hearing, the examiners admitted, without cross-examination, the testimony of Duke's witnesses Adcock, Arnold, Gainer, Kiergan, Lefeld, Meyer, Rose, Wathen, Whitlock, and Wood. Witnesses Jones, Schultz, Smith, and Stevie appeared at the hearing, on behalf of Duke, and were cross-examined. Tamara Turkenton testified on behalf of staff, Kevin Murray testified on behalf of IEU, and Wilson Gonzalez testified on behalf of OCC.

Following the hearing, Duke, OEC, OEG, IEU, OCC, and staff submitted initial briefs on November 17, 2008. Staff, OCC, IEU, OEC, and OEG filed reply briefs on November 26, 2008.

II. DISCUSSION

A. Applicable Law

Chapter 4928 of the Revised Code provides an integrated system of regulation in which specific provisions were designed to advance state policies of ensuring access to adequate, reliable, and reasonably priced electric service in the context of significant economic and environmental challenges. In reviewing Duke's application, the Commission is cognizant of the challenges facing Ohioans and the electric power industry and will be guided by the policies of the state as established by the General Assembly in Section 4928.02, Revised Code, as amended by SB 221.

Section 4928.02, Revised Code, states that it is the policy of the state, *inter alia*, to:

(1) Ensure the availability of adequate, reliable, safe, efficient, nondiscriminatory, and reasonably priced retail electric service.

(2) Ensure the availability of unbundled and comparable retail electric service.

(3) Ensure diversity of electric supplies and suppliers.

(4) Encourage innovation and market access for cost-effective supply- and demand-side retail electric service, including, but not limited to, demand-side management, time-differentiated pricing, and implementation of advanced metering infrastructure.

(5) Encourage cost-effective and efficient access to information regarding the operation of the transmission and distribution

systems in order to promote both effective customer choice and performance standards and targets for service quality.

(6) Ensure effective retail competition by avoiding anticompetitive subsidies.

(7) Ensure retail consumers protection against unreasonable sales practices, market deficiencies, and market power.

(8) Provide means of giving incentives to technologies that can adapt to potential environmental mandates.

(9) Encourage implementation of distributed generation across customer classes by reviewing and updating rules on issues such as interconnection, standby charges, and net metering.

(10) Protect at-risk populations, including when considering implementation of new advanced energy or renewable energy resource.

In addition, SB 221 amended Section 4928.14, Revised Code, which now provides that, beginning on January 1, 2009, electric utilities must provide customers with an SSO, consisting of either an MRO or an ESP. The SSO is to serve as the electric utility's default SSO. The law provides that electric utilities may apply simultaneously for both an MRO and an ESP; however, at a minimum, the first SSO application must include an application for an ESP. Section 4928.141, Revised Code, specifically provides that an SSO shall exclude any previously authorized allowances for transition costs, with such exclusion being effective on and after the date that the allowance is scheduled to end under the electric utility's rate plan. In the event an SSO is not authorized by January 1, 2009, Section 4928.141, Revised Code, provides that the current rate plan of an electric utility shall continue until an SSO is authorized under either Section 4928.142 or 4928.143, Revised Code.

Duke's application in these proceedings proposes an ESP, pursuant to Section 4928.143, Revised Code. Paragraph (B) of Section 4928.141, Revised Code, also requires the Commission to hold a hearing on an application filed under Section 4928.143, Revised Code, to send notice of the hearing to the electric utility, and to publish notice in a newspaper of general circulation in each county in the electric utility's certified territory.

Section 4928.143, Revised Code, sets out the requirements for an ESP. Under paragraph (B), an ESP must include provisions relating to the supply and pricing of generation service. The plan, according to paragraph (B)(2) of Section 4928.143, Revised Code, may also provide for the automatic recovery of certain costs, a reasonable allowance for certain construction work-in-progress (CWIP), an unavoidable surcharge for the cost of certain new generation facilities, certain charges relating to customer shopping, automatic increases or decreases, provisions to allow securitization of any phase-in of the SSO price, provisions relating to transmission-related costs, provisions related to distribution service, and provisions regarding economic development.

The statute provides that the Commission is required to determine whether the ESP, including its pricing and all other terms and conditions, including deferrals and future recovery of deferrals, is more favorable in the aggregate as compared to the expected results that would otherwise apply under an MRO. Section 4928.143(C)(1), Revised Code. In addition, a surcharge for CWIP or for new generation facilities may not be authorized if the benefits derived for any purpose for which the surcharge is established are not reserved or made available to those that bear the surcharge. Section 4928.143(B)(2)(c), Revised Code.

The Commission may, under Section 4928.144, Revised Code, order any just and reasonable phase-in of any rate or price established under Sections 4928.141, 4928.142, or 4928.143, Revised Code, including carrying charges. If the Commission does provide for a phase-in, it must also provide for the creation of regulatory assets by authorizing the deferral of incurred costs equal to the amount not collected, plus carrying charges on that amount. It also must authorize collection of the deferrals through an unavoidable surcharge.

The Commission has adopted new rules concerning SSOs, corporate separation, and reasonable arrangements for electric utilities, pursuant to Sections 4928.14, 4928.17, and 4905.31, Revised Code.[3]

B. Summary of the Application and Stipulation

Duke's application in these proceedings notes Governor Strickland's objectives of ensuring affordable and stable energy prices, attracting jobs to the state through an advanced energy portfolio standard, modernizing Ohio's energy infrastructure, and empowering consumers to make reasonable energy choices through transparent processes and states that it accomplishes the goal of favoring reliable generation service at reasonable prices for all energy consumers. Duke explains that the proposal is its best effort to provide relatively stable prices while maintaining a financially viable utility. Summarizing the major elements of its proposed ESP, Duke points out that it includes dedicated efficient generating assets, reasonably priced capacity additions to reduce its

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3 *See In the Matter of the Adoption of Rules for Standard Service Offer, Corporate Separation, Reasonable Arrangements, and Transmission Riders for Electric Utilities Pursuant to Sections 4928.14, 4928.17, and 4905.31, Revised Code, as amended by Amended Substitute Senate Bill No. 221*, Case No. 08-777-EL-ORD (Finding and Order, September 17, 2008).

short position and to supply consumers' future needs, a renewable and energy efficiency portfolio to meet statutory mandates, and opportunities to enhance economic development within Duke's certified territory. Duke believes that approval of its proposal will allow the continued development of the competitive market, thereby providing consumers with more choices and greater transparency regarding the SSO price, enhancing consumers' ability to compare pricing, and facilitating the Commission's oversight of competitive prices. (Duke Ex. 20, at 1-3.)

Duke proposes a three-year ESP, ending December 31, 2011. According to Duke, the ESP includes four base components. The first base component is an avoidable price-to-compare (PTC) charge that would compensate Duke for base generation costs (comparable to "little g" in Duke's RSP); costs of fuel, emission allowances, energy from renewable resources, economy purchased power costs, congestion and losses, and financial transmission rights (consistent with the fuel and purchased power tracker, or FPP, in Duke's RSP); environmental compliance, homeland security, and changes in tax law costs (consistent with the annually adjusted component, or AAC, in Duke's RSP); and a consumer price index adjustment to account for future inflationary pressures on the base generation component of the PTC. The second base component described in Duke's application includes an unavoidable system resource adequacy (SRA) charge that would compensate Duke for market capacity purchases (consistent with the system reliability tracker, or SRT, in Duke's RSP), for the dedication of capacity for reliability purposes to retail load in Duke's certified territory (consistent with the infrastructure maintenance fund, or IMF, in Duke's RSP), and for capacity newly dedicated to retail load in Duke's certified territory, including capacity designed to produce renewable energy. Duke's third base component is an avoidable transmission cost recovery (TCR) tracker (consistent with the TCR tracker in its RSP). The final component is an unavoidable distribution charge, consisting of three charges: an infrastructure modernization (IM) rider to recover incremental costs associated with maintaining and modernizing distribution infrastructure, including SmartGrid investments, as well as the costs incurred to set up an electronic bulletin board (EBB) to provide consumers with market choices; a rider (known as Save-a-Watt, or SAW) to compensate Duke for its costs incurred to achieve its statutory energy efficiency mandates; and a rider (known as economic competitiveness fund, or ECF) to assess prices associated with economic development and maintenance contracts approved by the Commission. The regulatory transition charges (RTC) would expire on December 31, 2008, for residential customers and on December 31, 2010, for nonresidential customers. All riders, according to the application, are subject to adjustment by Duke, with the approval of the Commission. (Duke Ex. 20, at 4-6.)

The stipulation signed by many of the parties to these proceedings specifies that Duke shall implement an ESP as set forth in the application, except as modified by the stipulation. Therefore, we will review the application and the stipulation jointly. This discussion is not intended as a restatement of all matters that are included in either the application or the stipulation but is, rather, a summary of those documents. The omission of any particular provision from this summary should not be construed as a deletion of that item from Duke's proposed or adopted ESP.

The stipulation includes a useful summary of the ESP price structure. We will reproduce it here, in relevant part, and will follow the order of this outline in our discussion of the proposed ESP.

Generation
- Avoidable Generation Charges [first component discussed above]
  - Price-to-compare (PTC)
    - Base Generation (PTC-BG)
    - Fuel, Purchased Power & Emission Allowances (PTC-FPP)
    - Annually Adjusted Component (PTC-AAC)
- Unavoidable Generation Charges [second component discussed above]
  - System Resource Adequacy (SRA)
    - Capacity Dedication (SRA-CD)
    - Market Capacity Purchases (SRA-SRT) [avoidable in some cases]
  - Regulatory Transition Charge (RTC)

Transmission [third component discussed above]
- Avoidable Transmission Charge (TCR)

Distribution [Unavoidable] [fourth component discussed above]
- Infrastructure Modernization (DR-IM)
- Energy Efficiency (DR-SAW)
- Economic Competitiveness Fund (DR-ECF)

(Jt. Ex. 1 at Attachment 1.) We would also note that certain riders were proposed in the application but were not included in the agreed-upon price structure that the stipulating parties submitted for our consideration. Those omitted riders will not be discussed in detail below and are not part of the structure that we are approving in this opinion and order.

1. Generation Riders

(a) Base Generation

The base generation price rider (PTC-BG), according to the application, is the Commission-approved unbundled generation price, less the RTC, and would be adjusted to compensate Duke for generation production, associated operation and maintenance, and the dedication of existing generating assets (including fuel). Those adjustments would include avoidable capacity charges, rather than adjusting the unavoidable capacity dedication rider. As stated in the application, this approach is an effort by Duke to assist in the development of the competitive retail electric service market by minimizing unavoidable charges. Similarly, Duke proposes to move its historic fuel and emission allowance price out of PTC-BG and into Rider PTC-FPP in order to increase transparency for consumers. (Duke Ex. 20, at 7-8.)

The stipulating parties modified the proposal, relative to PTC-BG. The stipulation provides that PTC-BG would reflect the unbundled generation rate approved in Case No. 99-1658-EL-ETP, less the RTC, provided that the RTC for residential customers would be eliminated on December 31, 2008, and for nonresidential customers on December 31, 2010. It also states that the costs associated with frozen fuel, purchased power, and emission allowances currently recoverable in "little g" (i.e., 1.2453 cents per kilowatt hour [kWH]) should be transferred to Rider PTC-FPP but that such transfer would not increase the total price charged to customers. The stipulation also provides for specified base generation charge increases for all customers on January 1 of 2009 and 2010 and for nonresidential customers on January 1, 2011. (Jt. Ex. 1 at paras. 2, 3.)

(b) Fuel, Purchased Power & Emission Allowances

The application describes rider PTC-FPP as a continuation of its current FPP rider, recovering all fuel and economy purchased power costs; any costs for environmental emission allowances, including but not limited to SO_2, NO_x, carbon, and/or mercury emission allowances; and renewable energy costs. Further, Duke asserts that it will move certain costs that are currently embedded in the generation charge into this rider, in order to create a more complete and transparent Rider PTC-FPP. Duke proposes to continue the quarterly adjustment of this rider, although it also asks for authority to make interim updates as necessary to minimize significant over- or underrecovery. Duke suggests that it submit to an audit, with due process, on or about June 1 of each year, in order to review the prior year's PTC-FPP rider. (Duke Ex. 20, at 8-9.)

The stipulating parties agree that Rider PTC-FPP should reflect the transfer of frozen fuel, purchased power, and emission allowances currently included in the frozen base generation rate. Under the stipulation's provisions, the PTC-FPP rider should include an allocation, as of the date the stipulation was docketed, of the actual delivered cost of fuel under existing fuel and transportation agreements; the actual cost of net purchased power, including gains and losses resulting from the settlement of forward power contracts; and SO_2 and NO_x emission allowance inventories proportional to the expected generation share needed to serve Duke's PTC-FPP rider customers. Noting that recent court rulings are unclear as to the NO_x emission allowance inventory, the stipulating parties agree to allocate that inventory, and any other emission allowance inventory established during the ESP period, in proportion to the expected generation share needed to serve Duke's rider PTC-FPP customers, as of the date the allowances are granted to Duke. The parties agree that an actively managed commodity portfolio consisting of fuel, SO_2, and NO_x emission allowances, Duke-owned and dedicated generation, and purchased power will be maintained, with the objective of providing a least-cost energy supply for the PTC-FPP customers, with the associated costs, gains, and losses flowing to those customers. Duke agrees, in the stipulation, to make a filing, during the first quarter of 2009, to propose the manner of any true-ups of rider PTC-FPP revenues and costs through December 31, 2008, and that such filing will be subject to due process and will include an audit for the 18-month period ending December 31, 2008. That audit would be conducted by an independent third-party auditor or staff, at the Commission's discretion, with Duke funding the audit and receiving cost recovery through rider PTC-FPP, as approved by the Commission. Annual audit filings would also be made during the first quarter of subsequent years. The parties also agree that, in order to maintain consistency with the current process, MISO[4] costs for net congestion and losses shall be recovered through rider PTC-FPP, including the net revenue received from financial transmission rights and auction revenue rights. Finally, the stipulating parties agree to recommend that the Commission grant Duke's request for a waiver to permit such cost recovery through the avoidable rider PTC-FPP rather than through the avoidable rider TCR. (Jt. Ex. 1 at paras. 7-8.)

(c) Annually Adjusted Component

In its application, Duke proposes to continue rider PTC-AAC to recover incremental costs associated with environmental compliance, including a return of and on incremental investment in plant and associated operating expenses, homeland security, and changes in tax law. The environmental costs, according to the application, would include expenses for reagents, a return of and on capital expenditures required to increase fuel flexibility, and, consistent with current practice, a return on CWIP from the date such expenditures begin. Adjustments would be made annually, allowing Duke and interested parties appropriate due process. Duke notes that the calculation would be substantially identical to the current rider AAC except that Duke would include, subject to the Commission's preapproval during each annual process, new cost-effective generation projects that are not required for environmental compliance but that would reduce PTC-FPP costs and would benefit consumers. (Duke Ex. 20, at 9-10.)

The stipulation notes that rider PTC-AAC will be updated, effective December 1, 2008, subject to the Commission's approval in Case No. 08-1025-EL-UNC. Further, it states that Duke may request annual updates, subject to due process. The parties to the stipulation agree that Duke may seek approval for recovery, through the PTC-AAC or the PTC-FPP, of cost-effective generation projects not required for environmental compliance that would improve fuel flexibility, although the stipulating parties reserve the right to oppose such a request. In addition, Duke agrees to propose to the Commission the manner of any true-up of rider PTC-AAC reagent revenues and costs through December

4 Midwest Independent System Operator, Inc.

31, 2008, with such filing to be made during the first quarter of 2009. The audit, by staff or an independent auditor, of the period ending December 31, 2008, will be subject to due process and will be funded by Duke. (Jt. Ex. 1 at para. 9.)

(d) Capacity Dedication

Rider SRA-CD, as proposed in the application, is an unavoidable charge that is part of Duke's system resource adequacy component which, as a whole and with the base generation rate in PTC-BG, is described as allowing Duke to fulfill its provider-of-last-resort (POLR) obligations. Duke also contends that the system resource adequacy component allows Duke to obtain additional capacity on behalf of retail customers, in order to maintain an adequate long-term supply of capacity and to earn a reasonable return on its investment. Rider SRA-CD, specifically, is Duke's proposed stated charge for (a) providing customers first call on its capacity and foregoing the opportunity to sell capacity currently dedicated through its RSP to the competitive electric service markets; (b) permitting customers to switch to competitive retail electric service (CRES) providers; and (c) assuming the risk associated with maintaining a reasonably stable capacity price offer during the ESP period. Duke believes that its proposal will provide customers a price that is below market and will, also, provide Duke reasonable compensation for making those commitments. (Duke Ex. 20, at 11-12, 13-14.)

The stipulating parties agree that the rate of rider SRA-CD is equal to the rate of the current IMF rider and will remain constant through the ESP period. With regard to avoidability of rider SRA-CD, the stipulation addresses governmental aggregation customers separately, as discussed below. The stipulation points out that Duke will incur up to $50,000,000 in operating and maintenance costs at the Beckjord generating station, beginning in 2009, in order to allow its continued operation. It provides that such costs are to be deferred and amortized over three years and that such deferral and amortization expense is included for recovery through rider SRA-CD. The SRA-CD rider rate will equal the current rate charged for Duke's rider IMF under its RSP and will remain constant throughout the ESP period. (Jt. Ex. 1 at para. 16.)

(e) Market Capacity Purchases

Duke proposes, in its application, to continue its current unavoidable rider SRT, although moving to a three-year planning cycle instead of the current one-year cycle, thus permitting it to take advantage of opportunities to obtain low-priced capacity beyond the subsequent year. It asks that the annual due process and quarterly filings associated with the SRT continue, as rider SRA-SRT. Duke suggests that, because system reliability is paramount, it will continue to purchase capacity necessary to maintain an offer of firm generation service and to provide default service to all consumers in its certified territory. Duke explains that it currently purchases 115 percent of the capacity necessary to serve all its load, whether switched or unswitched, and that it would continue to obtain the higher of the Commission's or MISO's planning reserve requirements. According to the application, Duke would make such purchases from its then-available gas-fired generating assets not previously used and useful, where such purchases are economic, subject to staff's audit. Duke points out that such assets have always been merchant plants and have never been included in its rate base. (Duke Ex. 20, at 12-13.)

The stipulation addresses a number of aspects of the SRA-SRT. It specifies that the SRA-SRT may include the recovery of market capacity purchases for any duration up to three years, with Commission approval, and that Duke must solicit for capacity in an open, nondiscriminatory, and competitive manner. Duke is required, under the stipulation, to award capacity contracts to the lowest and best offer submitted. The stipulation also provides that rider SRA-SRT may include compensation for capacity owned by Duke or its affiliates that has never been used and useful in serving Duke's load, provided that compensation for that capacity must be determined through offer solicitation by Duke using one of two methodologies: Compensation may equal the lowest offer price for the capacity pursuant to an open, nondiscriminatory, and competitive offer solicitation process or, if there are no offers for capacity other than from Duke, then Duke will be compensated at the price of the last, actual, competitively priced, arm's-length transaction. The stipulation clarifies that it does not require Duke to solicit bids through a formal request for proposal process overseen by an independent third party. Duke is required, under the stipulation, to implement a tariff to compensate nonresidential customers with qualified backup generating facilities for the use of such facilities, as needed to maintain reliable generation service, with compensation for that capacity not to exceed the average price per kilowatt for capacity purchases that are recoverable in rider SRA-SRT. The stipulation clarifies that such capacity would count toward Duke's market capacity purchases and the compensation paid for that capacity would be recovered through rider SRA-SRT. Duke agrees to make a filing, during the first quarter of 2009, to propose the manner in which rider SRA-SRT revenues and costs through December 31, 2008, would be trued up, including an audit of the 18-month period ending December 31, 2008, to be paid for by Duke and the costs of which would be recoverable, with Commission approval, through the SRA-SRT. (Jt. Ex.1 at para. 10.)

Under the stipulation, rider SRA-SRT would be avoidable for all nonresidential customers who agree not to return to the standard service offer for the remainder of the three-year term of the ESP, with that agreement documented by contract or, as approved for the RSP, by a two-page form or specified telephonic approval process. In addition, the stipulating parties would allow those customers to receive a shopping credit equal to six percent of the current "little g" (which is an amount that is equal to the cost of rider SRA-CD). However, such customers could return, according to the stipulation, only by paying 115 percent of Duke's generation charges, along with 100 percent of transmission and distribution riders, but would not be subject to any minimum stay. Nevertheless, under that stipulation provision, a mercantile customer, as defined in Section 4928.01(A)(19), Revised Code, that returns to Duke between May 15 and September 16 of any year, is required to remain on Duke's SSO service for twelve consecutive billing periods or risk being charged an exit fee by Duke. In addition, the stipulation excepts, from the 115 percent requirement, nonresidential customers who are, as of September 30, 2008, purchasing CRES service under a contract that expires on or after January 1, 2009, if such a customer notifies Duke at least 60 days prior to the expiration of their current contract (including extensions) that it intends to enroll in the SSO. Finally, the stipulation proposes that nonresidential shoppers who enter into a CRES contract after December 31, 2008, may enroll in Duke's SSO after the expiration of the ESP only if they provide Duke with notice, at least 60 days before January 1, 2012, of their desire to enroll in the SSO at the expiration of their contract, including extensions. (Jt. Ex. 1 at paras. 10.f, 17, 18, 20.)

The stipulation also continues the RSP's provision that nonresidential shoppers (including those in a governmental aggregation) may return to the SSO price at any time without notice if they choose to pay rider SRA-SRT and waive the shopping credit. (Jt. Ex. 1 at paras, 17, 20.)

(f) Regulatory Transition Charge

The application proposed the elimination of the RTC for all residential customers on December 31, 2008, and for nonresidential customers on December 31, 2010. This was left unchanged by the stipulation. (Duke Ex. 20, at 6; Jt. Ex. 1 at para. 2.a, b.)

2. Transmission Rider

The application proposes a TCR rider similar to the current TCR rider, noting that transmission charges remain fully regulated by the Commission but are fully avoidable, as CRES providers also must provide transmission service for their customers. Because Duke intends to maintain its current cost recovery structure, to the extent necessary Duke requests a waiver of Appendix (B) of Rule 4901:1-35-03, Ohio Administrative Code (O.A.C.). (Duke Ex. 20, at 16-17.)[5]

3. Distribution Riders

(a) Infrastructure Modernization

The application describes Duke's proposed rider DR-IM as permitting a reasonable revenue requirement to maintain distribution system reliability and to purchase and deploy SmartGrid technology. Duke also anticipates establishing an electronic bulletin board (EBB), accessible through the internet and by telephone, that would permit Duke, its

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5 The Commission believes that Duke's reference is to Rule 4901:1-35-03, O.A.C., as it has been adopted by the Commission in Case 08-777-EL-ORD. That rule is not yet effective. Therefore, no waiver is currently necessary. Duke may request a waiver, if and when the proposed rule becomes effective.

customers, and CRES providers to participate in the CRES market through transparent price offerings by allowing Duke and CRES providers to post market prices for consideration by customers. The application provides that any customer who switches to an EBB-posted price would be required to remain at that EBB-posted price, or to receive service from a CRES provider, for the duration of the ESP. The anticipated $9,000,000 cost of establishing the EBB service would be recovered through rider DR-IM as an unavoidable charge. (Duke Ex. 20, at 18-19.)

In the stipulation, rider DR-IM is to be initially set at zero and is recommended for approval only with regard to the proposed deployment of SmartGrid, Duke's gas furnace program, and, if subsequently approved by the Commission, the EBB.[6] The stipulation states that cost recovery for the SmartGrid project would be on a cost-per-meter basis, with all annual, second-quarter adjustments of rider DR-IM being subject to due process. The cost recovery process for the gas furnace program would, under the stipulation, remain as it currently is approved under rider DSM, thus having no effect on customers' rates. The stipulating parties state that rider DR-IM should be adjusted following the effective date of the Commission's order in Duke's next base electric distribution rate case to reflect the amount of SmartGrid, EBB, and gas furnace program costs, if any, that are included in base rates. The stipulation also includes projections of investments in SmartGrid deployment, as well as operating costs net of savings and revenue requirements through 2014. The parties to the stipulation propose that, for each annual rider DR-IM filing, 85 percent of the annual SmartGrid revenue requirement would be allocated to residential customers and recovered through a monthly price per meter. Similarly, nonresidential customers served on the distribution system (excluding lighting) would be allocated the remaining 15 percent, to be recovered through a monthly price per meter, based on the currently approved, weighted average customer charge. Such monthly charges are agreed not to exceed $0.50 in 2009, $1.50 in 2010, $3.25 in 2011, $5.25 in 2012, $5.50 in 2013. (Jt. Ex. 1 at para. 11.)

Duke agrees to accrue post-in-service carrying charges at the most recently approved weighted average cost of long-term debt and to defer depreciation and operating costs from the date the expenditures are incurred until they are included for recovery in rider DR-IM. The parties also agree to the regulatory asset accounting treatment for replaced meters, as described in the application, for which recovery would be made through existing depreciation rates, as amended from time to time. Duke would, according to the stipulation, make an annual filing in which it would include the projected deployment and implementation plan for the current year, including its design requirements, performance, goals, metrics, and milestones. The stipulation states that staff would audit and verify the previous year's costs and system performance levels, together with an overview of the following year's plan, which information would be shared with

6 Stipulating parties who were not parties to Case No. 06-91-EL-UNC express no opinion as to retention and funding of the gas furnace program.

OCC contemporaneously with staff. The stipulating parties agree that the 2010 review would include a mid-deployment program summary and review and that the 2011 review would include progress through 2010, including expenditures, deployment program summary, and review. Duke also agreed to outline deployment milestones, system performance levels, customer benefits versus the plan, deployment lessons learned, an updated allocation of the annual distribution revenue requirement, and the desirability of program continuation beyond 2011. (Jt. Ex. 1 at para. 11.)

The parties also agreed that Duke should convene a working group or collaborative process to explore opportunities to maximize the benefits of the SmartGrid investment, that it would focus initially on deployment on circuits in high density areas with a high percentage of inside meters, and that it would deploy the technology in the village of Terrace Park during 2009. Because the stipulating parties expect that system reliability will be enhanced by SmartGrid deployment, Duke agrees on improved reliability targets and the parties agree that Duke may request suspension of deployment if it meets the deployment commitments but reliability does not improve as expected. Finally, the stipulating parties note that, as a combination gas and electric utility, Duke has also addressed SmartGrid issues relating to the gas distribution portion of its business and that Duke may apply to the Commission for approval of alternatives to certain provisions in the stipulation. (Jt. Ex. 1 at para. 11.)

With regard to the proposed EBB, the stipulating parties agree only that Duke will initiate a collaborative process to establish an EBB as generally proposed in the application and note that the EBB would be an open access platform that is competitively neutral and may utilize a third-party independent operator. The design and cost of developing and maintaining the EBB shall be discussed in the collaborative process and, to the extent the Commission approves such cost recovery, the EBB will be developed and the actual costs incurred to develop the EBB shall be recoverable through Rider DR-IM or otherwise as agreed upon. (Jt. Ex. 1 at para. 19.)

(b) Energy Efficiency

Duke's application describes the company's desire to take an aggressive approach to energy efficiency program design, implementation, development, and cost recovery, proposing the establishment of rider DR-SAW (save-a-watt) as a replacement for the current rider DSM. Duke states that DR-SAW would permit it to increase its energy efficiency research and development efforts and would permit CRES customers to participate in efficiency programs. In order to encourage implementation of energy efficiency measures by low-income customers, Duke also seeks approval of a pilot program that would protect up to 10,000 low-income customers from the impact of Duke's rate design proposal. (Duke Ex. 20, at 19-20.)

The stipulation states that rider DR-SAW should be implemented by January 1, 2009, and specifies that the current rider DSM should be eliminated at the same time, with the older rider being reconciled and subjected to a final true-up and with any true-up amounts being added to or subtracted from rider DR-SAW. Energy efficiency programs that had been approved under rider DSM would continue, pursuant to the stipulation, with the same reporting and program approval requirements as are currently in effect, which include due process and an opportunity for a hearing. The stipulation provides that the DR-SAW true-up would occur in the second quarter of 2012.

Pointing to Section 4928.66(A)(2)(c), Revised Code, the stipulating parties agree that mercantile customers with a minimum monthly demand of three megawatts (MW) at a single site or at multiple, aggregated sites within Duke's territory may take certain actions to be exempted from payment of rider DR-SAW if they commit their demand response or other such capabilities to Duke's energy efficiency and demand reduction programs. Under the stipulation, in order to qualify for exemption, the applicant customer must demonstrate to the Commission that it has undertaken or will undertake self-directed energy efficiency and/or demand reduction programs that have produced or will produce annual percentage energy savings and/or peak demand reductions equal to or greater than the applicable statutory annual percentage energy savings and/or peak demand reduction benchmarks to which Duke is subject.

The stipulating parties also agree that Duke will apply to the Commission for approval of DR-SAW programs other than those set forth in the application in these proceedings, with programs being developed by Duke or through a collaborative. With regard to allocating of nonresidential rider DR-SAW recovery between distribution and transmission service customers, the stipulation states that the allocation of distribution revenues approved in Duke's most recent electric distribution rate case would be followed. The stipulation sets forth, as an incentive to Duke for achieving energy efficiency above the statutory mandate, additional levels of return on investment on the program costs based on the level of efficiency achieved. The stipulating parties also agree that Duke will develop a nonresidential interruptible tariff as an energy efficiency option, which program will be submitted to the Commission for approval. Duke also agrees to work with OMA to establish an energy efficiency manufacturing collaborative and to provide that collaborative with an investor-funded contribution of $100,000 per year for research and development of energy efficiency programs for manufacturers. According to the stipulation, all demand response program participation requirements will be consistent with MISO's load serving entities planning reserve requirements. Finally, the parties agree that, if the Commission adopts a decoupling or straight fixed variable rate design, Duke will discuss and implement appropriate adjustment to its recovery of lost margins under rider DR-SAW. (Jt. Ex. 1 at para. 13.)

(c) Economic Competitiveness Fund

Duke's application proposes the establishment of a rider for an economic competitiveness fund, rider DR-ECF, that would permit Duke and the Commission to support public and private economic development, including green infrastructure for public entities and public renewable energy projects, as well as public and private job creation and job retention initiatives and requests by business customers for generation service discounts. The application suggests that the Commission would review contracts or grants where Duke seeks recovery of costs through rider DR-ECF. The rider would be adjusted quarterly and would be audited annually, according to the application. (Duke Ex. 20, at 21-22.)

The stipulating parties agree that Duke should be authorized to recover, through rider DR-ECF, delta revenues associated with reasonable arrangements, to the extent individually approved by the Commission. They also recommend that the Commission approve an economic development contract with the city of Cincinnati under Section 4905.31, Revised Code. (Jt. Ex. 1 at paras. 14-15.)

4. Other Matters

(a) Corporate Separation

Duke points out, in its application, that it is operating under a corporate separation plan approved by the Commission in prior cases and that the Commission has granted it a waiver such that it is not required to transfer its generating assets prior to December 31, 2008. In the application, Duke asks for approval to transfer its generating assets to an affiliated entity or entities that will directly or indirectly own or have rights to the capacity of the units. (Duke Ex. 20, at 23-25.)

The stipulation states that Duke's corporate separation plan shall remain in effect as filed in these proceedings, except that Duke may transfer to an affiliate or sell to an unaffiliated party five gas-fired generating assets, with such transfer subject to approval by the Federal Energy Regulatory Commission (FERC), if necessary. Further, Duke agrees to withdraw, from these proceedings and from FERC, its request to transfer its previously used and useful assets. However, the stipulation notes that Duke may subsequently file an application for a transfer to be effective no earlier than January 1, 2012. (Jt. Ex. 1 at para. 26.)

(b) Market Price

Duke's application notes that its witnesses testify that the ESP price is less than the price would be under a market option. (Duke Ex. 20, at 25-26.) The stipulation recommends that the Commission find that the ESP price, terms, and conditions, including deferrals and future recovery of deferrals, as modified by the stipulation, is more favorable in the aggregate than the expected results that would otherwise apply under Section 4928.142, Revised Code. (Jt. Ex. 1 at para. 27.)

(c) Excessive Earnings

Duke's application also states that its witnesses address the fact that no ESP component materially affects Duke's earnings and, also, propose a test to determine if Duke's earnings are significantly excessive at the end of each year of the ESP. (Duke Ex. 20, at 25-26.) The stipulation proposes that, beginning in 2010, and by May 15 of each year covered by the stipulation, the Commission implement a significantly excessive earnings test as set forth in the stipulation by the parties. (Jt. Ex. 1 at para 28.)

(d) Governmental Aggregation

The application notes that there currently no active governmental aggregators in Duke's certified territory and that, therefore, there are no phase-in charges allocated to consumers in such groups. According to Duke, because the law permits governmental aggregators not to receive "standby service" but lacks a definition of that term, it proposes to credit governmental aggregation customers five percent of its SRA-SRT and SRA-CD rider charges as a proxy for the standby service charge that should be avoidable by governmental aggregators. (Duke Ex. 20, at 26-27.)

In the stipulation, residential and nonresidential customers in governmental aggregations are treated separately. With regard to nonresidential customers in governmental aggregations, the stipulation provides that they can avoid the SRA-SRT and receive a shopping credit equal to six percent of "little g" (an amount that is equal to the cost of rider SRA-CD) if the aggregator provides Duke with 60 days' notice of its intent to maintain the aggregation throughout the remainder of the ESP period and agrees that returning nonresidential customers will pay 115 percent of Duke's generation charges. Residential customers in governmental aggregations are not allowed to avoid rider SRA-SRT or receive the shopping credit, but are allowed to return to the ESP pricing at any time. The parties to the stipulation specifically agree that Duke "does not assess a separate charge for standby service or default service." (Jt. Ex. 1 at paras. 17, 20, 21.)

(e) Assistance to Certain Customers

Duke agrees, in the stipulation, that it will increase funding for home energy and weatherization contracts during the ESP to $1,000,000 per year. It also agrees to contribute $50,000 per year, through 2011, to a specified nonprofit organization in Duke's certified territory to be used for distributing fans and/or air conditioners to qualifying customers. Additionally, Duke agrees to contribute $700,000 each year for the benefit of electric customers who are at or below 175 percent of the poverty level and who do not participate in the percentage of income payment plan program. Finally, Duke also agrees with CUFA to provide $100,000 each year through 2011 to fund an energy education program. (Jt. Ex. 1 at paras. 22, 23, 34, addendum.)

(f) Withdrawal of Certain Riders

Duke's application requested approval of an avoidable inflation adjustment rider. Duke proposed an increase of three percent annually. (Duke Ex. 20, at 10-11.) The stipulation provides for Duke to withdraw its request for Rider PTC-IA. (Jt. Ex. 1 at para. 5.)

Duke had also applied for approval of an unavoidable rider to recover certain costs of newly dedicated capacity. (Duke Ex. 20, at 14-16.) The stipulation provides for withdrawal of that request, with the stipulating parties recommending that the Commission authorize Duke to make market purchases with the objective of filling its short capacity position in a least cost manner, with cost recovery through the SRA-SRT. (Jt. Ex. 1 at para. 24.)

(g) Continuation of Rider GP

The stipulation states that Duke's current rider GP, covering its GoGreen program, should be extended through 2011, rather than expiring at the end of 2008 as currently scheduled, with certain plans for revision. (Jt. Ex. 1 at para. 31.)

C. Consideration of the Stipulation

Rule 4901-1-30, O.A.C., authorizes parties to Commission proceedings to enter into a stipulation. Although not binding on the Commission, the terms of such an agreement are accorded substantial weight. *See, Consumers' Counsel v. Pub. Util. Comm.*, 64 Ohio St.3d 123, 125 (1992), *citing Akron v. Pub. Util. Comm.*, 55 Ohio St.2d 155 (1978).

The standard of review for considering the reasonableness of a stipulation has been discussed in a number of prior Commission proceedings. See, e.g., *Cincinnati Gas & Electric Co.*, Case No. 91-410-EL-AIR (April 14, 1994); *Western Reserve Telephone Co.*, Case No. 93-230-TP-ALT (March 30, 1004); *Ohio Edison Co.*, Case No. 91-698-EL-FOR, *et al.* (December 30, 1993); *Cleveland Electric Illum. Co.*, Case No. 88-170-EL-AIR (January 30, 1989); *Restatement of Accounts and Records (Zimmer Plant)*, Case No. 84-1187-EL-UNC (November 26, 1985). The ultimate issue for our consideration is whether the agreement, which embodies considerable time and effort by the signatory parties, is reasonable and should be adopted. In considering the reasonableness of a stipulation, the Commission has used the following criteria:

(1) Is the settlement a product of serious bargaining among capable, knowledgeable parties?

(2) Does the settlement, as a package, benefit ratepayers and the public interest?

(3) Does the settlement package violate any important regulatory principle or practice?

The Supreme Court of Ohio has endorsed the Commission's analysis using these criteria to resolve issues in a manner economical to ratepayers and public utilities. *Indus. Energy Consumers of Ohio Power Co. v. Pub. Util. Comm.*, 68 Ohio St.3d 559 (1994) (*citing Consumers' Counsel, supra,* at 126). The court stated in that case that the Commission may place substantial weight on the terms of a stipulation, even though the stipulation does not bind the Commission (*Id.*).

We will first analyze the two substantive issues that are specifically asserted by certain of the parties and then will proceed to consider the three criteria just described.

1. Specific Issues Raised by Parties

(a) Residential Governmental Aggregation Customers

OCC raises an issue regarding POLR charges and residential customers of governmental aggregations.

(1) Governing Law

Section 4928.143, Revised Code, allows an electric utility to file an application for an ESP. A number of topics that may be included in an ESP are set forth in division (B)(2) of that section. One of those permissible topics is described, in division (B)(2)(d), as follows:

> Terms, conditions, or charges relating to limitations on customer shopping for retail electric generation service, bypassability, standby, back-up, or supplemental power service, default service, carrying costs, amortization periods, and accounting or deferrals, including future recovery of such deferrals, as would have the effect of stabilizing or providing certainty regarding retail electric service.

SB 221 dealt specifically with governmental aggregation in Section 4928.20(J), Revised Code. The first three sentences of that section are relevant to this issue and are as follows:

> On behalf of the customers that are part of a governmental aggregation under this section and by filing written notice with the public utilities commission, the legislative authority that formed or is forming that governmental aggregation may elect not to receive standby service within the meaning of division (B)(2)(d) of section 4928.143 of the Revised Code from an electric distribution utility in whose certified territory the governmental aggregation is located and that operates under an approved electric security plan under that section. . Upon the filing of that notice, the electric distribution utility shall not charge any such customer to whom electricity is delivered under the governmental aggregation for the standby service. Any such consumer that returns to the utility for competitive retail electric service shall pay the market price of power incurred by the utility to serve that consumer plus any amount attributable to the utility's cost of compliance with the alternative energy resource provisions of section 4928.64 of the Revised Code to serve the consumer.

(2) OCC's position

According to OCC, because it did not agree to the stipulation's provisions with regard to residential governmental aggregation customers, the "[s]tipulation has not established a course with regard to this issue." Thus, OCC believes that the Commission's standards for approving partial stipulations do not apply. Rather, noting that the burden of proof in this proceeding should be on Duke, OCC asserts that the Commission may approve Duke's ESP only if Duke proves it to be more favorable in the aggregate than the expected results of a market rate offer. (OCC brief at 3; OCC reply at 3.)

OCC reviews the applicable statutory provisions, beginning with the opportunity for governmental aggregators to elect to avoid standby charges. However, although OCC correctly quotes the statute, it introduces the provision with a description stating that it allows governmental aggregators to elect to avoid "provider of last resort charges . . .." OCC reaches this conclusion by reading Section 4928.143(B)(2)(d), Revised Code, as a definitional provision and stating that Section 4928.143(B)(2)(d), Revised Code, "defines 'standby service' broadly to encompass provider of last resort service." Thus, OCC reaches the conclusion that Section 4928.20(J), Revised Code, authorizes "governmental aggregators to opt-out of most provider of last resort services . . .." From this interpretation, OCC determines that residential governmental aggregation customers should have the opportunity to elect not to pay the SRA-SRT and to receive the six percent shopping credit that compensates for payment of rider SRA-CD, in return for agreeing not to return to the ESP. Without this opportunity, OCC contends that the proposed ESP would be discriminatory and would not be more favorable in the aggregate than the expected results under a market rate offer. (OCC brief at 4-15; OCC reply at 4-6, 12-14.)

OCC also disagrees with the stipulation's proxy[7] for a *market rate upon the return* of a governmental aggregation customer. Although the stipulating parties have set 115 percent of the ESP price as, in essence, a proxy for the market rate that is mandated by SB 221, OCC believes that residential customers of governmental aggregations should be allowed to pay the lower of the actual market price or 115 percent of the ESP price. (OCC Ex. 1, at 12-13; Tr. at 168, 169; OCC brief at 15-16; OCC reply at 14-16.)

(3) Stipulating Parties' Positions

Duke challenges OCC's assertion that Duke has failed to meet its burden of proof on the issue of whether the ESP is more favorable in the aggregate than a market rate offer, pointing out that OCC did not disagree with the stipulation on this issue. Staff agrees, and notes that OCC did not include this argument in the issue that it carved out of the stipulation for litigation. (Duke reply at 6; Staff reply at 7-8.)

With regard to shopping by residential customers of governmental aggregations, it is Duke's position that the statute does not address the avoidance of riders SRA-SRT and SRA-CD. Duke contends that OCC misinterprets the statutory provisions and the terms of the stipulation. According to Duke, the statute does not define the term "standby service" as being "synonymous with POLR obligations." The stipulation, as Duke points out, deals with standby service charges separately from provider of last resort obligations, meaning that they are not synonymous. As Duke sums up, "although governmental aggregators may avoid charges for standby service pursuant to [Section 4928.20, Revised Code], they cannot similarly, and by statute, avoid charges for [Duke's] POLR obligations. Thus the OCC cannot compel such a result here." (Duke brief at 16; Duke reply at 6-7.)

Staff also submits that OCC's statutory interpretation is in error and that the "standby" charges that the statute makes avoidable cannot be equated with POLR requirements. Staff points out that Section 4928.20(J), Revised Code, refers only to the avoidance of charges for "standby service within the meaning of division (B)(2)(d) of section 4929.143 of the Revised Code . . .." The cited division, it says, is not a definition of "standby service," as suggested by OCC but is, rather, "part of an extensive listing of things that can be included in an ESP." To interpret the meaning of "standby service," staff chooses to look to the term's use in a different section. It points out that "standby service" is used in Section 4928.02(K), Revised Code, to refer to charges imposed by utilities on customers who rely on distributed generation to compensate the utility for standing by in case the customer's equipment fails. Staff believes that its interpretation avoids paradoxical problems that would exist if we adopted OCC's reading of the statutory language. (Staff reply at 2-6.)

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7 While the stipulation does not refer to this as a "proxy," we will use this term to more clearly distinguish the stipulation's preset market price from the actual market price that OCC believes should be calculated at the time a residential customer might return to Duke's service.

Duke also disagrees with OCC's contention that residential customers of governmental aggregators should be allowed to return at the lower of market price or 115 percent of the ESP price. First of all, it notes, this issue was not reserved for litigation. The applicable footnote in the stipulation, by means of which OCC noted its reservation of one issue for litigation, reads, "The parties agree that OCC shall have the right to carve out for litigation the issue of bypassability of charges and shopping credits for residential government aggregation customers." Thus, the return price is not at issue, according to Duke. (Duke brief at 16; Staff brief at 13-14; Staff reply at 9.)

On the substance of the issue, Duke notes that OCC provided no definition of a market price, no proposed market price calculation method, and no estimate of what the market price might be. Thus, OCC's proposal is, in Duke's opinion, unsubstantiated. Duke notes OCC's argument that residential customers should not be discriminated against with regard to avoidance of the SRA-SRT and the SRA-CD and points out that, when it came to the return price, OCC argued in favor of a different treatment of residential and nonresidential customers. Because the statute, in Duke's approach, does not require the SRA-SRT and SRA-CD to be avoidable upon request by a governmental aggregator, Duke believes that it can treat residential and nonresidential customers differently in this regard, if the groups are differently situated. Duke contends that, because residential customers are not in as good a position as nonresidential customers to make appropriate choices regarding risk, this differential treatment is permissible. (Duke brief at 16-19; Duke reply at 7-10.)

(4) Commission Analysis and Determination

We will first address the issue of whether rider SRA-SRT should be avoidable by residential customers of governmental aggregations and whether those customers should be able to receive the six percent shopping credit to compensate for payment of rider SRA-CD. We agree with OCC that Section 4928.20(J), Revised Code, allows the Commission no discretion with regard to the right of governmental aggregations to elect not to receive standby service and, therefore, to avoid charges for that service. The only question to be determined in this regard is the statutory interpretation of the meaning of the term "standby service."

Contrary to OCC's contention, Section 4928.143(B)(2)(d), Revised Code, is not a definition of the term "standby service." Rather, as argued by staff, that section is part of a lengthy itemization of the provisions that may be included in an ESP. Unfortunately, although that section includes several similar terms (including "standby service") that apparently could cover POLR service, the section allowing aggregators to elect out of standby service is much more specific. The list of allowable ESP provisions allows for inclusion of "standby, back-up, or supplemental power service, default service . . .." The aggregation section specifies only "standby service" as the service that aggregators may elect not to receive. Searching for an implied definition, staff recommends that we look to a different section within Chapter 4928. While we do not necessarily disagree with staff's interpretation of the term in the section it reviews, we find it inappropriate to look to a different section, if evidence of the legislature's intent can be gleaned by considering subsequent language in the section that we are interpreting. Immediately after directing that the electric utility shall not charge aggregation customers, if the election has been made, for standby service, the statute goes on to provide that "[a]ny such consumer that returns to the utility for competitive retail electric service shall pay the market price of power incurred by the utility to serve that consumer . . .." Section 4928.20(J), Revised Code. The legislature had first provided that an aggregation could elect out of an aspect of the electric utility's service. Then it said that the electric utility could not charge the aggregation's customers for that service. This was immediately followed by a description of the price that the electric utility would therefore be allowed to charge if one of those customers returned to that service. Clearly, the legislature's intent was that the service for which the customers were not being charged was the electric utility's standing ready to serve those customers at the SSO price if they were to choose to return. This statutory provision, then, must mean that governmental aggregations may elect not to receive that service and not to pay for it.

OCC claims that both rider SRA-SRT and rider SRA-CD would be encompassed by this statutory provision. We will review each of those riders in order to determine whether they fall within the scope of Section 4928.20(J), Revised Code, as we have interpreted it. Rider SRA-SRT will compensate Duke for its "purchase [of] capacity necessary to maintain an offer of firm generation service and [provision of] default service to all consumers in its certified territory; . . . whether switched or unswitched." (Duke Ex. 20, at 12.) The purchase of capacity to allow Duke to maintain default service for switched customers, we find, is clearly within the scope of the intent of Section 4928.20(J), Revised Code. Rider SRA-CD is quite different, however. That rider is intended to compensate Duke for providing customers with a first call on its capacity, foregoing the opportunity to sell capacity that is currently dedicated to its standard service offer, permitting customers to switch to competitive suppliers, and assuming the risk associated with maintaining a reasonably stable price during the ESP period. (Duke Ex. 20, at 13-14.) The only aspect of the SRA-CD that relates to shopping is one that notes that Duke will permit customers to switch to a competitive supplier but does not address Duke's potential costs upon their return. The statutory provision we are considering only referred to the price that the electric utility could charge upon the return of customers who have avoided payment of particular riders. Thus, rider SRA-CD does not appear to be encompassed within the intent of Section 4928.20(J), Revised Code. We conclude that, if a residential governmental aggregation elects not to receive Duke's promise to stand ready to serve the customers at the SSO price if they were to choose to return, the customers in that aggregation should not be charged for rider SRA-SRT, but would be obligated for rider SRA-CD.

OCC's second issue is the appropriate return price to be charged to residential governmental aggregation customers. We agree, as Duke and staff point out, that this issue was not one that OCC reserved, in the stipulation, for litigation. Therefore, we can only conclude that, at the time OCC executed the stipulation, it intended to agree with the return price provisions. We should also note that, even if we were considering the issue, we would conclude that residential and nonresidential customers are not differently situated in any way to justify what would then be different return pricing provisions.

We also wish to address OCC's contention that, because its aggregation issue was reserved for litigation, the three-pronged stipulation test does not apply and Duke must satisfy the comparison with a market rate offer. There are two problems with this argument. First, even if OCC did not agree with the aggregation provisions of the stipulation, that does not mean that there was no stipulation as to that issue. Rather, OCC's refusal to agree with those provisions means only that one of the several stipulating parties did not agree to that portion of the stipulation. Others remained in agreement as to this provision. Therefore, the three-pronged test for stipulations is still applicable. Second, we recognize that OCC stipulated that the ESP, with the aggregation issue undecided, would be more favorable in the aggregate than a market rate offer. (Jt. Ex. 1 at para. 27.) Thus, this issue is no longer open for OCC to dispute.

(b) Exemption from Rider DR-SAW

IEU raises, as an issue, the restrictions on availability of the rider DR-SAW exemption, which are set forth in provision 13.b of the stipulation. As discussed above, rider DR-SAW is intended by the stipulating parties to collect costs associated with meeting energy efficiency and peak demand reduction requirements under Section 4928.66, Revised Code, and allows certain large, nonresidential users to avoid payment by committing their own demand response or other similar capabilities to Duke's programs. The threshold for a nonresidential customer to qualify to avoid payment of rider DR-SAW is, under the stipulation, that it have a minimum monthly demand of three MW at a single site or at multiple sites within Duke's certified territory. In addition, in order to qualify for the exemption, the stipulation's terms would require the customer's self-directed energy efficiency and/or demand reduction programs to produce energy savings and/or peak demand reductions equal to or greater than the statutory benchmarks to which Duke is subject. IEU states that it opposes this provision of the stipulation.

(1) Governing Law

The first three sentences of Section 4928.66(A)(2)(c), Revised Code, are critical to the analysis of this issue. They are, here, split apart for more convenient reference in the ensuing discussion:

> Compliance with divisions (A)(1)(a) and (b) of this section shall be measured by including the effects of all demand-response programs for mercantile customers of the subject electric distribution utility and all such mercantile customer-sited energy efficiency and peak demand reduction programs, adjusted upward by the appropriate loss factors.
>
> Any mechanism designed to recover the cost of energy efficiency and peak demand reduction programs under divisions (A)(1)(a) and (b) of this section may exempt mercantile customers that commit their demand-response or other customer-sited capabilities, whether existing or new, for integration into the electric utility's demand-response, energy efficiency, or peak demand reduction programs, if the commission determines that that exemption reasonably encourages such customers to commit those capabilities to those programs.
>
> If a mercantile customer makes such existing or new demand-response, energy efficiency, or peak demand reduction capability available to an electric distribution utility pursuant to division (A)(2)(c) of this section, the electric utility's baseline under division (A)(2)(a) of this section shall be adjusted to exclude the effects of all such demand-response, energy efficiency, or peak demand reduction programs that may have existed during the period used to establish the baseline.

(2) IEU's Position

IEU presented the testimony of one witness, Kevin M. Murray, to support its argument that paragraph 13.b of the stipulation should be rejected by the Commission. Mr. Murray identifies himself as a technical specialist employed by counsel for IEU and states that his education consists of a Bachelor of Science degree in Metallurgical Engineering. (IEU Ex. 1, at 1-2.) Admittedly, Mr. Murray is not an attorney. (IEU Ex. 1, at 4.) Mr. Murray's testimony begins with his belief that the purpose of paragraph 13.b of the stipulation is "to limit and narrow the opportunity for a mercantile customer to secure an exemption from the cost recovery mechanism regardless of the case the customer might otherwise make to the Commission in favor of such an exemption." (IEU Ex. 1, at 5-6.) Continuing, Mr. Murray evaluates the language in the stipulation and compares it to the requirements and definitions in SB 221. He expresses his opinion that the Ohio General Assembly is responsible for making public interest determinations, only giving the Commission the ability to make case-by-case determinations on exemption requests. Based on his interpretation of the language in the statute, he believes that the "arbitrary cut-off" contained in the stipulation, which prohibits exemptions for mercantile customers using less than three MW per year, is contrary to the legislature's expression of the public interest. (IEU Ex. 1, at 7.) Mr. Murray also testifies that the stipulation's requirement that a customer be in a position to reduce usage by an amount equal to Duke's benchmark is fundamentally wrong and could serve to discourage mercantile customers' efforts toward efficiency. (IEU Ex. 1, at 9-12.) Ultimately, Mr. Murray proposes that, "[i]f the Commission is presented with a request for an exemption by a mercantile customer that can only commit towards some portion of an electric distribution company's portfolio obligation, rather than committing a full proportionate share, it can make a specific determination based upon the facts presented to it in that proceeding, as to whether a full exemption, no exemption, or some middle ground is reasonable." (IEU Ex. 1, at 12.) (*See, also*, Tr. at 128-131.)

Relying on the testimony of Mr. Murray, IEU, in its brief, first discusses its contention that the stipulation violates the law by being more restrictive than the governing statute with regard to which customers may seek exemption from rider DR-SAW. IEU explains that Section 4928.66(A)(2)(c), Revised Code, provides that "the Commission may exempt mercantile customers that commit their demand-response, energy efficiency, or peak demand reduction capabilities to the electric utility from mechanisms designed to cover those costs . . .." (IEU brief at 7.) IEU then goes on to indicate that the term "mercantile customers" is defined by Section 4928.01(A)(19), Revised Code, to mean a commercial or industrial customer that consumes more than 700,000 kWh per year or that is part of a national account involving multiple facilities. (IEU brief at 7; IEU Ex. 1, at 6-7.) On the other hand, IEU points out that the stipulation requires a customer to have a minimum monthly demand of three MW at a single site or at multiple sites within Duke's territory. (IEU brief at 5-6; IEU Ex. 1, at 6.) IEU believes that the higher threshold in the stipulation would violate the terms of Section 4928.66(A)(2)(c), Revised Code. It contends that the Ohio legislature has "specified the eligibility which determines which customers may seek [the] exemption" and argues that the Commission may not "redraw the exemption eligibility lines" set by statute. (IEU brief at 8.) In IEU's opinion, because it violates the law, the stipulation also violates important regulatory principles or practices, does not benefit ratepayers, and is not in the public interest.

IEU also quarrels with a provision in the stipulation that would, in addition to the minimum demand requirement, necessitate a showing by the customer that its demand response, energy efficiency, or peak demand reduction programs equal or exceed the statutory benchmarks then applicable to Duke. As with the eligibility requirement, IEU claims that the proposed stipulation provision would violate the law, as the governing statute does not include this requirement. IEU asserts that, by approving the stipulation, the Commission would "preemptively rewrite Ohio law to include more prescriptive terms," as the benchmarks are not applicable to mercantile customers. (IEU brief at 8-10.) IEU believes, also, that this limitation is not in the public interest as it would result in some energy efficiency improvements being discouraged. IEU, rather, argues for a case-by-case approach by the Commission, with individual exemptions being granted or denied by Commission action. (IEU brief at 10; IEU Ex. 1, at 12.)

IEU also raises one evidentiary argument, claiming that, because no witness testified in support of the restrictions proposed by this provision of the stipulation, the Commission is without record support to approve it. IEU points out that Section 4903.09, Revised Code, requires the Commission to have evidentiary support for its conclusions. Because there is no testimony in support of the restrictions discussed by IEU, it concludes that the Commission must reject that provision. (IEU brief at 11-12.)

(3) Stipulating Parties' Positions

The stipulating parties disagree with IEU's arguments and conclusions on this issue. Duke, in its reply brief, argues that IEU fails to accept that Section 4928.66(A)(2)(c), Revised Code, is permissive; that there is no absolute right to an exemption. It also notes that Section 4928.66(A)(2)(d), Revised Code, permits mercantile customers to request approval from the Commission of a reasonable arrangement under which they may offer their own demand response, energy efficiency, or peak demand reduction capabilities to the company. (Duke reply at 2.)

Similarly, pointing to the statutory prohibition against approval of an exemption that does not have the effect of encouraging customers to commit their capabilities to the programs, OCC argues that "[t]he law only limits the Commission's discretion according to those that it may not approve." Thus, OCC believes that this provision of the stipulation does not violate any important regulatory principal. (OCC reply at 17.)

OCC also emphasized the tremendous administrative burden that would be placed on the Commission, OCC, and other interested parties if a substantial number of exemption applications were filed by small mercantile customers, as well as the difficulties and costs that would be involved in changing Duke's billing system to allow for many full or partial exemptions. In addition, OCC noted the ongoing expense of monitoring continuing compliance by those exempted customers. Thus, OCC strongly believes that it is both reasonable and appropriate to place limitations on the extent to which rider DR-SAW may be avoided. Indeed, without restrictions such as are included in the stipulation, OCC believes that the Commission would be obligated to reject the stipulation as not being in the public interest and not benefitting ratepayers. (OCC reply at 18-20.)

OEC also starts its argument with a focus on the permissive language in the statute, pointing out that, although IEU's witness admitted, "I am not an attorney," the examiners allowed his testimony into the record. (IEU Ex. 1 at 4.) OEC contends that the bulk of Mr. Murray's testimony is purely legal argument. Pointing to the second sentence of the section in question, OEC recounts that Mr. Murray believes this language evidences the legislature's determination that it is in the public interest that all mercantile customers have the opportunity to seek an exemption from rider DR-SAW, with requests decided on a case-by-case basis. In contrast, OEC stresses that the legislature could have enacted a statute that said that the rider "shall" exempt such mercantile customers, rather than using the term, "may." OEC summarizes its position on this point, saying, "Because there is no mandatory requirement that the mechanism designed to recover the costs of an electric utility's energy efficiency and demand reduction programs provide for any exemption, it necessarily follows that limiting the availability of the exemption by including any eligibility threshold is legally permissible." (OEC brief at 10.) OEC goes on to argue that the statute does not require Duke to integrate the capabilities of a mercantile customer but, rather, places the onus of meeting the statutory benchmarks on Duke. It points out that offering relief from DR-SAW is a detriment to other ratepayers and is, therefore, inappropriate if Duke is able to satisfy the benchmarks through its own programs. In addition, OEC argues that the signatories to the stipulation cannot be faulted for failing to produce a witness to respond to legal arguments because legal arguments are the subject for briefs not testimony. (OEC brief at 4-5, 8-12; OEC reply at 3.)

Staff also believes that the word "may" in the second sentence of the section results in it being permissive, rather than mandatory. Recognizing that the rider could allow the exemption of all mercantile customers that make the commitments or, on the other hand, could refuse to exempt any, staff submits that the stipulation strikes a reasonable balance, "recognizing that some large customers may have efficiencies that can reasonably be captured, verified and accounted for, while not expending the reach beyond what can be managed." Staff points out that this provision is part of an ESP that lasts for only three years and that it is a period during which the Commission and the parties will gain actual knowledge and experience on which to base further refinements. (Staff brief at 9-12; staff reply at 9.)

Regarding IEU's contention that Duke must allow a mercantile customer to commit less than Duke's benchmark, with consideration on a case-by-case basis, Duke believes it would be illogical to reach this conclusion as the purpose of the exemption from payment of rider DR-SAW is to develop a means by which it may meet its mandate. Duke argues that allowing an exemption without requiring the customer to commit its equivalent share of efficiency would leave Duke at risk and, to the extent that the customer falls short of the mandate, would require other customers to bear the costs of meeting the mandate and would necessarily create an illegal cross-subsidy. Duke also points out that IEU's witness did not know how many mercantile customers would qualify under its proposal or what standard should be used by the Commission to consider such applications. (Duke reply at 3-5.)

OEC controverts this IEU argument, as well. Honing in on Mr. Murray's testimony that prudent mercantile customers will not undertake energy efficiency and demand reduction measures that are not cost-effective, OEC reviews various alternatives. First, in its analysis, a measure under consideration by a mercantile customer may be deemed cost-effective "in its own right" and will, therefore, be undertaken without further incentive. Second, if the payback period for investment in a measure does not satisfy the mercantile customer's internal rate of return calculus, Duke may provide a program to induce it to proceed; indeed, Duke plans to establish a collaborative process to develop such programs. Third, according to OEC, Duke could enter into a special arrangement with an individual mercantile customer in order to provide specially tailored incentives. The final option under OEC's rationale would be to exempt that customer from payment of rider DR-SAW. As it is the last of several options, all of which may encourage efficiency and demand reduction, OEC argues that the exemption may appropriately, under the statute, be limited to instances in which integration of that customer's capabilities will produce a meaningful contribution to Duke's ability to comply with the benchmarks, especially as it is at risk for failure to comply with those benchmarks. Finally, as to the requirement that customers must commit programs to save energy at the benchmark level if they wish to be exempted, OEC submits that the statute does not provide for partial exemptions from riders. OEC also addresses the IEU proposal that the Commission exempt customers on a case-by-case basis, advising that this approach is unworkable. (OEC brief at 12-17.)

As to IEU's evidentiary argument, Duke initially notes that it is generally sufficient for the Commission to consider the stipulation itself, together with testimony that the signatory parties collectively agreed to its terms, and the factors supporting the three-pronged test. It also indicates that its witness, Theodore Schultz, discussed the original proposal for allowing certain customers to opt out of rider DR-SAW in his direct testimony and that Duke witness Paul G. Smith explained the provision as a public benefit. Duke notes that Mr. Smith testified that IEU's objections were addressed in the testimony of Duke witnesses Richard G. Stevie and Theodore Schultz. (Duke reply at 2-3 [referring to Duke Exs. 9, 11, and 18].)

On this subissue, OCC submits that IEU's witness Murray provided mostly a discussion of statutory interpretation and little factual evidence, contrary to IEU's claims that its witness provided the only record evidence as to how this paragraph meets the Commission's three-pronged test. According to OCC, the evidence that he did provide failed to address how IEU's proposed approach would assist Duke in meeting the savings benchmarks. (OCC reply at 22-22.) OEC agreed that Mr. Murray's testimony on this subject was not actually evidence, but pure legal argument by a non-lawyer. "Legal argument is the subject for briefs, not testimony." (OEC reply at 4-5.)

(4) *IEU's Position on Reply*

IEU's reply brief, in addition to reviewing its previously expressed arguments, addresses certain points made in other parties' briefs. It contends that a three-year term is unreasonable on its face, as its "only possible virtue" is the avoidance of an evaluation of earnings that would otherwise be required. IEU also believes that it is unreasonable to approve a stipulation in which some provisions have proposed impacts that exceed the ESP's three-year term. It expresses a concern for Duke's Save-a-Watt program, for the predetermined excessive earnings test formula, the ability to transfer generating assets, and Duke's ability to lock in its earnings growth, all of which are included in the stipulation package. (IEU reply at 7-12.)

With regard to the overriding question of whether the statute prevents the stipulation from limiting which mercantile customers may be exempted, IEU asserts that "the Commission's discretion is limited to determining whether an exemption would reasonably encourage customers to commit their energy efficiency and peak demand reduction capabilities for integration into an electric utility's programs, not which customers may seek an exemption." (IEU reply at 13.) IEU challenges the suggestion that a mercantile customer that does not meet the requirements for an exemption could still seek to enter into a reasonable arrangement otherwise, explaining that such an approach would defeat the apparent intent of the exemption limitation. (IEU reply at 13-15.)

IEU also disagrees with OEC's statement that Duke would not be required, under the statute, to integrate the capabilities of a mercantile customer into its own programs. To make its point, IEU refers to the first sentence of statutory provision, in which it is made clear that mercantile customers' programs are to be included in measuring the electric utility's efficiency efforts. (IEU reply at 16-17.)

IEU disputes Duke's cross-subsidy argument, noting, among other things, that a mercantile customer electing to commit its customer-sited capabilities for integration is taking steps to distinguish itself from others and, thereby, providing the basis for a determination that it is not similarly situated to other customers. (IEU reply at 20.)

(5) Commission Analysis and Determination

As reviewed above, IEU claims that the stipulation violates the law and, therefore, fails to satisfy the second and third prongs of the Commission's traditional evaluation stipulations, both because of the three MW threshold and because of the requirement that customers meet Duke's benchmark in order to receive an exemption. In addition, IEU believes that paragraph 13.b is unsupported by record evidence, leaving the Commission with no evidentiary basis upon which to approve it. In evaluating the arguments we will, first, consider whether the paragraph at issue violates the face of the governing statute. We will subsequently evaluate the provision's other potential benefits or detriments to customers and to the public interest.

Mr. Murray testified as to the specific issues under consideration. To the extent that he presented factual evidence or expert opinion testimony, we will consider his testimony in our analysis. However, we note that multiple parties moved to strike portions of Mr. Murray's testimony on the ground that he is not an attorney and the testimony appeared to be a legal argument. Although the attorney examiners denied the motions to strike, they cautioned that the Commission would recognize that the witness is not an attorney in evaluating the weight to be given to his testimony. (*See, e.g.*, Tr. at 101.) Our analysis, at this point in the discussion, is one of determining whether the proposed stipulation provision violates the law and necessitates a legal interpretation of the meaning of the governing statute.

As referenced at the start of our analysis of this issue, division (A)(2)(c) of Section 4928.66, Revised Code, includes four sentences, the first three of which have relevance to our discussion or were referenced by parties. While we will not repeat the text of those sentences here, we will summarize them. The first sentence provides that calculation of the electric utility's compliance with the benchmarks should include the effects of all mercantile customers' programs. That first sentence includes no reference to whether or not such programs are capabilities that have been "committed" to the electric utility's own programs. The second sentence allows the Commission to approve a rider that exempts, from its coverage, mercantile customers who commit their capabilities to the electric utility's programs, if the Commission finds that the exemption encourages the customers to commit their capabilities. The third sentence goes back to the calculation methodology and requires the electric utility's baseline to be adjusted to exclude the effect of committed capabilities of mercantile customers.

Although IEU's discussion on brief relies in part on the first sentence, that sentence does not relate to the issue of the possible exemption. Even if rider DR-SAW included no exemption language, the first sentence would still apply to the calculation of Duke's compliance with the section as a whole. Therefore, our focus must not be on the first sentence. Similarly, the third sentence merely explains how calculation of compliance with the benchmark should be made, in the event that customers' capabilities have been committed to the electric utility's programs. Thus, it is also not relevant to our analysis of which customers may be exempted. The second sentence, on the other hand, is key to our analysis. In both halves of this issue, that is, the three MW minimum discussion and the benchmark parity discussion, the stipulating parties seek to narrow the coverage of the second sentence of the division.

No one debates the definition of the term "mercantile customer." Section 4928.01(A)(19), Revised Code, defines that term to mean a commercial or industrial customer that consumes more than 700,000 kWh per year or that is part of a national account involving multiple facilities. Rather, the stipulating parties focus, largely, on the permissive aspect of this division of the statute: the verb in the sentence is "may exempt." Clearly, a rider to be approved by the Commission need not exempt mercantile customers who commit their capabilities to an electric utility's programs, even if such an exemption might reasonably encourage such commitment. The question, as we see it, is whether, because of the permissive tenor of the sentence, a rider may exempt some such mercantile customers while refusing to exempt others.

We note, in this regard, that the legislature has not, in SB 221, changed the policy of this state such that it would not include "ensur[ing] the availability to consumers of . . . nondiscriminatory . . . retail electric service." Section 4928.02(A), Revised Code. Indeed, the legislature enacted language to require electric utilities to provide service "on a comparable and nondiscriminatory basis . . .." Section 4928.141(A), Revised Code. Without the existence of the second sentence in the provision that we are considering, a rider such as DR-SAW would have to make the exemption open to any of its customers that could meet the reasonable terms of that exemption. The impact of that second sentence, therefore, is to allow the exemption to be discriminatory to the extent of the specifications set forth in the sentence. The sentence we are considering says nothing about limiting the availability of the exemption to mercantile customers with an annual usage over three MW. It also says nothing about limiting the availability of the exemption to mercantile customers with capabilities equal to the benchmark then applicable to the electric utility. It does, however, allow us to determine whether the exemption "reasonably encourages" the customers' commitment of their capabilities to the electric utility's programs. We find that this does allow us some limited flexibility in the consideration of the structure of a rider's exemption provisions. We will, under this approach, consider each of the proposed limitations.

Turning first to the benchmark parity issue, we recognize that, if an exempted customer did not have to commit capabilities equal to the electric utility's applicable benchmark, then either the customer would be exempted only from a corresponding percentage of the cost recovery rider or the customer would still be exempted from the entire cost recovery rider. As noted by Duke, if a customer committing less than the benchmark were exempted from the entire rider, other customers would have to bear an increased burden of Duke's cost recovery. We find such a result to be inequitable. On the other hand, requiring Duke and the Commission to calculate and review percentages of exemptions that are appropriate for each customer would be time consuming and expensive, the cost of which would have to be borne by ratepayers. Similarly, other interested parties would likely need to review those calculations, in order to ensure that their constituencies were not to be overcharged. We also note that the governing statute makes no reference to the possibility of a partial exemption. Therefore, we find it reasonable and appropriate for the rider to limit the availability of an exemption to those customers whose capabilities meet or exceed the applicable benchmark in any given year, as proposed by the stipulation.

The proposal that the exemption only be available to larger mercantile customers is more problematic. Here, the concerns raised by the parties are primarily that a large number of applications would create a substantial administrative burden. However, we would note that the potential for such a burden is reduced by the requirement that an exempted customer meet the applicable benchmark. Due to the existence of that provision, a small mercantile customer with only limited capabilities will not be applying *for an exemption.* We are also aware that the legislature has deemed it important to encourage innovation, to provide incentives to technologies that can adapt successfully to environmental mandates, and to encourage the education of small business owners to encourage their use of energy efficiency programs. Section 4928.02, Revised Code, at divisions (D), (J), and (M). We do not believe, therefore, that the legislature intended us to approve a rider that bases the availability of the exemption on a different usage level than that approved in the definition of "mercantile customer." We also do not believe that the administrative concerns regarding the number of possible applications are tenable. Therefore, we will not approve that portion of the stipulation that raises the minimum annual usage, for qualification to apply for the exemption, to three MW. Thus, the ability to apply for the exemption should be available to all mercantile customers, if their capabilities meet or exceed the applicable benchmark. With this modification, we find that the exemption would reasonably encourage mercantile customers to commit their energy efficiency and peak demand reduction capabilities for integration into Duke's programs.

Finally, we will comment on IEU's claim, discussed above, that we cannot approve this provision of the stipulation because no proponent testified specifically with regard to the terms of that particular provision. We note that, at the same time that it makes this evidentiary assertion, it also suggests, in its reply brief, that the Commission consider information that is not a part of the evidentiary record developed in these proceedings. (IEU reply at 8-11.) While we will not consider the material referenced by IEU that is outside the record, we will point out that, in reviewing evidence in support of stipulations, we have never made it a prerequisite for approval that every provision be supported by a witness. Such a test could necessitate multiple witnesses, would unnecessarily lengthen proceedings, and would increase the litigation expenses for all parties. Rather, our review of stipulations focuses, as required by the Supreme Court of Ohio, on the stipulation as a whole and our determination of whether the stipulation meets the three-pronged test.

2. Serious Bargaining

No party argues that the stipulation was not the result of serious bargaining among capable, knowledgeable parties. Duke points out that its witness, Paul Smith, testified that the stipulation resulted from lengthy bargaining sessions, with parties represented by capable counsel and technical experts, and that all parties were invited to attend all settlement discussions. (Duke brief at 4-5, citing Duke Ex. 18, at 3-4.) Staff's witness Tamara Turkenton similarly noted that settlement meetings were noticed to all parties and opined that the settlement, being the product of an open process, with extensive negotiations and analysis on complex issues, is the product of serious bargaining among knowledgeable parties. (Staff Ex. 1, at 2.) (*See, also,* OEG brief at 1.) We conclude that this test has been satisfied.

3. Benefits to Customers and the Public Interest

Staff's witness Turkenton also testified as to various ways in which the stipulation benefits ratepayers and promotes the public interest. Among other things, she referenced the fact that the stipulation establishes fair and reasonable increases in the base price of generation, establishes a rider to recover costs relating to SmartGrid technology and requires Duke to explore ways to maximize SmartGrid benefits, provides incentives for Duke to achieve energy efficiency above statutory mandates, allows Duke to recover revenues associated with economic competitiveness arrangements, and provides shareholder funding for customer assistance to low income customers. (Staff Ex. 1, at 3-5.)

Similarly, Duke's witness Smith provided a list of benefits to consumers and the public interest. Some of the most critical of those benefits include the following: Mr. Smith states that the stipulation provides rate stability for customers, financial stability for Duke, and continued development of the competitive market. He also maintains that customers' service through the ESP period will include only modest, annual, predictable increases, at a substantially lower price increase than Duke had supported in its application. He points out that stipulated price increases for residential customers, under the stipulation's terms, would be approximately two percent in 2009 and 2010 and zero percent in 2011. The corresponding increases for nonresidential customers would be approximately two percent in each of the three years. Mr. Smith points out the price transparency in the stipulation and the fact that Duke has agreed to withdraw from these proceedings its proposed change in distribution customer charges and its proposed annual inflation-based price adjustment. Mr. Smith's list of benefits includes Duke's agreement to defer and amortize up to $50,000,000 to be spent at the Beckjord generating station in order to allow its continued operation. He notes, also, that the stipulation provides for the establishment of a collaborative process to design an EBB that will further enhance the continue development of the competitive retail market. Mr. Smith also points out several benefits that are included for low-income customers. (Duke Ex. 18, at 6-12.) (*See, also,* OEG brief at 1.)

We also note that, on December 15, 2008, Duke filed a letter in the docket, indicating that its overall rates, including the effects of the proposed ESP and the adjustments to riders FPP and SRT, will decrease. Duke calculates that rates for typical residential customers will decrease by 3.8 percent, that rates for typical commercial customers will decrease by 4.4 percent, and that rates for typical industrial customers will decrease by 5 percent. With regard to the future design of the EBB, the Commission encourages Duke to include other electric utilities in its discussions. We have previously addressed the concerns raised by OCC and IEU. With the modifications that we have already found appropriate, we conclude that the stipulation, as modified, provides many benefits to customers and is in the public's interest.

4. Violation of Policies and Practices

Both Mr. Smith and Ms. Turkenton testified that the stipulation, as presented, does not violate any important regulatory principles or practices. While we recognize that the stipulation resolves certain issues related to the statutorily required test for excessive earnings during the effective period of the stipulation, we recommend that Duke participate in any Commission-sponsored workshops on this issue, with regard to the period subsequent to the stipulation. As we have previously discussed, OCC and IEU each disputed that contention with regard to identified issues. (*See, also,* OEG brief at 1.) With our resolution of those particular issues, we find that the stipulation, as modified, satisfies this criterion.[8]

D. Implementation

On December 10, 2008, Duke filed proposed tariffs in the docket of these proceedings. We will proceed, at this point to a review of those proposed tariffs. First, we note that Duke has proposed to modify riders PTC-FPP, SRA-SRT, and TCR. We will consider each of those modifications individually.

Rider PTC-FPP, according to the stipulation, is to be based on the same process as the FPP rider under the currently effective RSP, with a true-up filing to be submitted during the first quarter of 2009 and with that true-up being subject to due process and including an audit for the eighteen-month period ending December 31, 2008. (Jt. Ex. 1 at paras. 7, 8.) Rider FPP has, under the RSP, been adjusted through quarterly filings with the Commission, at least 30 days prior to the start of each quarter. The year's charges were then audited, reviewed, and subjected to any necessary true-ups, in the context of an annual proceeding. During the RSP, that proceeding was commenced on about September 1 of each year, with the audit generally covering a period from July 1 to June 30. On December 2, 2008, Duke filed an update to rider FPP in Case No. 07-974-EL-UNC, also proposing to modify it to meet the stipulation's provisions for rider PTC-FPP. Although no fourth quarter audit was commenced, a substitute for the audit is included in the stipulation, with the audit expected to occur during the first quarter of 2009. We find that Duke's filed update of rider FPP is in compliance with the process that has been followed throughout the RSP and is, therefore, in compliance with the process to be established under the stipulation. Therefore, we will allow rider PTC-FPP to be set on the basis of that filing.

Rider SRT, under the RSP, was set by Commission action each year and was then subject to quarterly adjustment by Duke. It was subject to an annual audit and true-up, on

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8 We would note that, with regard to the EBB, we are approving only the initiation of a collaborative process to design an EBB. We are not, in this opinion and order, approving the substance of any design, or the structure of any EBB offerings, that may be developed through that collaboration.

the same schedule as the FPP. In the stipulation, Duke agreed to file a proposal as to the manner of any true-up of rider SRA-SRT revenues and costs through December 31, 2008. That proposal is due to be filed during the first quarter of 2009 and is to be subject to due process and an audit of the eighteen-month period ending December 31, 2008. As it has in the past, on December 30, 2008, Duke filed a proposed quarterly adjustment of rider SRT in Case No. 07-975-EL-UNC. We find that, like the PTC-FPP, its filed update is in compliance with the process that has been followed and is a reasonable continuation for the establishment of rider SRA-SRT under the terms of the stipulation. Therefore, we will allow the SRA-SRT to be set on the basis of that filing.[9]

The TCR rider also needs to be established. The application, unchanged by the stipulation, provides that the rider TCR mechanism will remain similar to the current rider TCR. The current TCR process allows Duke to make semi-annual modifications of the TCR rate, through a filing made 45 days prior to the date on which it is to be effective. Interested persons are allowed to file comments no later than 20 days after the initial filing. If the Commission does not suspend a proposed modification, it becomes effective on the 46th day after filing. The last proposal to modify rider TCR was filed, in Case No. 05-727-EL-UNC, on October 17, 2008, and reflected tariffs that were proposed to become effective with the first billing cycle of January 2009. No comments were filed in that docket and the Commission sees no reason to suspend the modification. Therefore, the rider TCR rates should reflect that modification.

Duke has filed proposed tariffs. The Commission has reviewed the proposed tariffs and finds that they should be approved with the exception that they be revised to reflect the modifications ordered by the Commission in this opinion and order. The standard service offer and tariffs approved herein shall be effective on a services-rendered basis, effective on January 1, 2009. Duke should be aware, however, that final copies of the approved tariffs must be filed before the tariffs can become effective. Duke shall notify its customers of the changes approved in this opinion and order, by means of a bill insert in the first billing after the effective date of the revised tariffs. Duke is directed to work with staff to develop appropriate language for that notice.

<u>FINDINGS OF FACT AND CONCLUSIONS OF LAW:</u>

(1) Duke is a public utility as defined in Section 4905.02, Revised Code, and, as such, is subject to the jurisdiction of this Commission.

(2) On July 31, 2008, Duke filed an application for approval of a standard service offer, pursuant to Section 4928.141, Revised Code.

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9 In order to reflect the Commission's determinations as to Duke's applications in Case No. 08-974-EL-UNC and 08-975-EL-UNC, the Commission will order its docketing division to file this opinion and order in each of those dockets.

(3) Motions to intervene were filed and granted, on various dates, allowing intervention by the OEG, OCC, Kroger, OEC, IEU, Cincinnati, OPAE, Constellation, Dominion, CUFA, Sierra, NRDC, NEMA, Integrys, DES, OMA, GCHC, PWC, OFB, Terrace Park, Wind, UC, Schools, MSCG, and the Commercial Group.

(4) On August 5, 2008, the attorney examiner assigned to the proceedings issued an entry, setting a procedural schedule, including a technical conference and an evidentiary hearing, set to commence on October 20, 2008. In addition, the examiner announced that local public hearings would be established by subsequent entry.

(5) On August 26, 2008, OCC, OEC, and OPAE jointly filed a motion for the establishment of local public hearings. Also on that same day, the same movants filed a separate motion asking the Commission to grant a sixty-day continuance of the hearing date and extension of the discovery deadline or, in the alternative, a 15-day continuance and extension. On September 5, 2008, the examiner ruled on the motion, agreeing to continue the hearing until November 3, 2008, and to extend the procedural schedule.

(6) On September 17, 2008, the examiner issued an entry scheduling two local public hearings. On September 22, 2008, OCC, Sierra, NRDC, and CUFA filed a joint interlocutory appeal and request for certification, asserting that the local public hearing schedule established by the examiner allowed for only 20 days' notice and that such notice was insufficient.

(7) On September 19, 2008, OCC filed another motion for a continuance and an extension of time. In this motion, OCC requested a 30-day continuance and extension or, alternatively, a motion to compel discovery.

(8) On October 1, 2008, the examiner denied the motion for the continuance, granted OCC's motion to compel discovery, denied the appellants' request for certification, and scheduled an additional local public hearing.

(9) On September 29, 2008, OCC, OPAE, CUFA, Sierra, and NRDC filed a motion to stay negotiations between Duke and the other parties to the proceedings. The examiner did not issue such a stay but did alter the schedule to allow additional time for negotiations, retaining November 3, 2008, as the date for commencement of the evidentiary hearing.

(10) On October 21, 2008, OCC requested an extension of time to file intervenor testimony, which request was granted on October 22, 2008. The procedural schedule was further modified, at the request of Duke, on October 31, 2008.

(11) On October 27, 2008, Duke filed a stipulation and recommendation and an addendum to that stipulation. The stipulation was signed by Duke, staff, PWC, GCHC, Integrys, NRDC, Sierra, CUFA, Constellation, OPAE, OEC, Kroger, OCC, OEG, OMA, and the Commercial Group. On November 10, 2008, Cincinnati filed a letter indicating that it joins the stipulation. On November 19, 2008, Terrace Park also advised the Commission that it joins the stipulation.

(12) Three local public hearings were held on October 7 and 15, 2008. At those meetings, 40 public witnesses testified.

(13) The evidentiary hearing was held on November 10, 2008.

(14) Section 4928.20(J), Revised Code, requires that all governmental aggregations be allowed to elect not to receive and pay for the services for which Duke is compensated through rider SRA-SRT but not the services for which Duke is compensated through rider SRA-CD.

(15) It is reasonable and appropriate for rider DR-SAW to limit the availability of an exemption to those customers whose capabilities meet or exceed the applicable benchmark in any given year but not to those customers who have a minimum monthly demand of three MW at a single site or aggregated at multiple sites within Duke's certified territory. With this modification, we find that the exemption would reasonably encourage mercantile customers to commit their energy efficiency and peak demand reduction capabilities for integration into Duke's programs.

(16) The Commission finds that the stipulation, as so modified, meets the three criteria for adoption of stipulations and should, therefore, be adopted.

(17) The Commission specifically finds that Duke's proposed electric security plan, as set forth in the application, modified through the stipulation, and further modified herein, including its pricing and all other terms and conditions, including any deferrals and any future recovery of deferrals, is more favorable in the aggregate as compared

to the expected results that would otherwise apply under Section 4928.142, Revised Code.

(18) The Commission finds that the proposed tariffs filed by Duke on December 10, 2008, are reasonable, subject to being revised to reflect the modifications ordered by the Commission in this opinion and order.

ORDER

It is, therefore,

ORDERED, That the stipulation filed in these proceedings be adopted, as modified herein. It is, further,

ORDERED, That the application of Duke for approval of a standard service offer, pursuant to Section 4928.141, Revised Code, be granted, to the extent set forth herein. It is, further,

ORDERED, That Duke be authorized to file in final form four complete, printed copies of tariffs consistent with this opinion and order, and to cancel and withdraw its superseded tariffs. Duke shall file one copy in this case docket and one copy in its TRF docket (or may make such filing electronically, as directed in Case No. 06-900-AU-WVR). The remaining two copies shall be designated for distribution to staff. It is, further,

ORDERED, That the effective date of the new tariffs shall be a date not earlier than both January 1, 2009, and the date upon which four complete, printed copies of final tariffs are filed with the Commission. The new tariffs shall be effective for services rendered on or after such effective date. It is, further,

ORDERED, That Duke shall notify its customers of the changes approved by this opinion and order, as described herein. It is, further,

ORDERED, That the Commission's docketing division shall file a copy of this order in Case Nos. 08-974-EL-UNC and 08-975-EL-UNC. It is, further,

ORDERED, That a copy of this opinion and order be served upon all parties of record.

THE PUBLIC UTILITIES COMMISSION OF OHIO

Alan R. Schriber, Chairman

Paul A. Centolella

Ronda Hartman Fergus

Valerie A. Lemmie

Cheryl L. Roberto

JWK/SEF;geb

Entered in the Journal
DEC 1 7 2008

Reneé J. Jenkins
Secretary

GCHC hospital member who may be impacted by DE-Ohio's work assignment;

b. Evaluate the business impact of service interruptions to GCHC member hospitals;

c. Reliability Plans to identify and establish work plan for improved feeder reliability. The Parties agree to meet routinely to discuss interruptions and plans to meet future load growth.

STATE OF INDIANA
BEFORE THE
INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF DUKE ENERGY INDIANA, INC. REQUESTING THE INDIANA UTILITY REGULATORY COMMISSION TO APPROVE AN ALTERNATIVE REGULATORY PLAN PURSUANT TO IND. CODE § 8-1-2.5-1, *ET SEQ.*, FOR THE OFFERING OF ENERGY EFFICIENCY CONSERVATION, DEMAND RESPONSE, AND DEMAND-SIDE MANAGEMENT PROGRAMS AND ASSOCIATED RATE TREATMENT INCLUDING INCENTIVES PURSUANT TO A REVISED STANDARD CONTRACT RIDER NO. 66 IN ACCORDANCE WITH IND. CODE §§ 8-1-2.5-1 *ET SEQ.* AND 8-1-2-42(a); AUTHORITY TO DEFER PROGRAM COSTS ASSOCIATED WITH ITS ENERGY EFFICIENCY PORTFOLIO OF PROGRAMS; AUTHORITY TO IMPLEMENT NEW AND ENHANCED ENERGY EFFICIENCY PROGRAMS, INCLUDING THE POWERSHARE® PROGRAM IN ITS ENERGY EFFICIENCY PORTFOLIO OF PROGRAMS; AND APPROVAL OF A MODIFICATION OF THE FUEL ADJUSTMENT CLAUSE EARNINGS AND EXPENSE TESTS	)	CAUSE NO. 43374

STIPULATION

AND

AGREEMENT

August 15, 2008

BDDB01 5370632v1

STIPULATION AND AGREEMENT

This Stipulation and Agreement ("Agreement") is entered into this 15th day of August, 2008, by and between Duke Energy Indiana, Inc. ("Duke Energy Indiana") and the Indiana Office of Utility Consumer Counselor ("OUCC") (together "the Parties").

WHEREAS, the Parties to this Agreement have engaged in extensive, arms'length settlement negotiations in an effort to constructively resolve their differences in this proceeding;

WHEREAS, the Parties believe that this Agreement is sound, it reasonably balances both Duke Energy Indiana's and ratepayers' interests; and is in the public interest;

WHEREAS, the Agreement retains many important features of Duke Energy Indiana's initial Save-a-Watt proposal, such as:

- Compensation to Duke Energy Indiana for successful implementation of energy efficiency programs on the basis of a discount to the "avoided costs" of a power plant, rather than on the basis of what the utility spends on energy efficiency programs;
- Pay for performance, in that the avoided cost compensation described above is based upon actual energy efficiency savings achieved, measured and verified by an independent third party;
- The potential for an incentive for Duke Energy Indiana if it effectively and efficiently implements and delivers energy efficiency programs to its customers; but,

- Duke Energy Indiana remains at risk, based upon its actual performance, for recovery of its energy efficiency program costs, as well as any management incentive;

WHEREAS, the Agreement also includes a number of provisions that are very important to the OUCC, on behalf on Indiana consumers, such as:

- Performance targets, with Duke Energy Indiana eligible for a higher level of incentive based on how well it performs in achieving energy efficiency results which lead to actual savings for its customers;

- Earnings caps – which vary by performance while limiting the amount of incentive for which Duke Energy Indiana is eligible;

- A rate impact cap – to ensure that during the 4-year term of this agreement, even residential customers who choose not to participate in energy efficiency programs will not experience a significant rate increase as a result of the Save-a-Watt program;

- A financial commitment to contract with Indiana businesses to assist in implementation of the energy efficiency programs; and

- A commitment to provide $250,000 in targeted grants to post-secondary institutions for specialized energy efficiency education programs.

NOW, THEREFORE, the Parties agree as follows:

1. Scope of Agreement. This Agreement comprehensively resolves all issues between the Parties associated with Duke Energy Indiana's save-a-watt program as filed in Cause No. 43374.

a). Agreement Framework. Attached hereto as Exhibit A is a Term Sheet setting forth specific provisions of the settlement ("Settlement Terms") that is intended by the Parties to resolve all pending issues relating to Cause No. 43374. The terms of the Agreement are effective upon approval by the Indiana Utility Regulatory Commission ("Commission"). Also attached hereto, as Exhibit B, is a chart summarizing (1) Duke Energy Indiana's initial save-a-watt proposal, (2) the major issues raised by the OUCC in their testimony filed in this Cause, and (3) how the Settlement Terms address those issues raised by the OUCC, resulting in a comprehensive compromise that forms the basis for this Agreement.

2. Integration. Approval of this Agreement constitutes approval of the Settlement Terms attached hereto as Exhibit A.

3. Presentation of the Agreement.

a). The Parties shall jointly move to have this Agreement presented to and approved by the Commission.

b). The Agreement, including the Settlement Terms in Exhibit A, is not severable and shall be accepted or rejected by the Commission in its entirety without modification or further condition that may be unacceptable to either Party.

4. Effect and Use of Stipulation and Agreement.

a). The terms of this Agreement, including the Settlement Terms in Exhibit A, represent a fair, just and reasonable resolution by negotiation and compromise. As set forth in the Order in *Re Petition of Richmond Power & Light*, Cause No. 40434 at page 10, as a term of this Agreement, the Commission must assure the Parties that it is not the Commission's intent to allow this Agreement, or the Order approving it, to be cited as precedent by any person or deemed an admission by any Party in any other proceeding except as necessary to enforce its terms before the Commission, or any court of competent jurisdiction on these particular issues. This Agreement, including the Settlement Terms in Exhibit A, is solely the result of compromise in the settlement process. Nothing contained herein is to be construed or deemed an admission, liability or wrongdoing on the part of either party to this Agreement. Both of the parties hereto have entered into this Agreement solely to avoid further disputes and litigation with the attendant inconvenience and expenses.

b). The evidence presented by the Parties in this Cause, including testimony offered in support of Settlement, constitutes substantial evidence sufficient to support this Agreement and provides an adequate evidentiary basis upon which the Commission can make any findings of fact and conclusions of law necessary for the approval of this Agreement, as filed.

c). The issuance of a Final Order by the Commission approving this Agreement, including the Settlement Terms specified in Exhibit A, without modification shall terminate all proceedings in regard to this Agreement.

d). The undersigned represent and agree that they are fully authorized to execute this Agreement on behalf of their designated clients who will be bound thereby.

e). The Parties shall not appeal the agreed final Order or any subsequent Commission order to the extent such order is specifically implementing, without modification, the provisions of this Agreement, including the Settlement Terms in Exhibit A, and the Parties shall not support any appeal of any such order by a person not a party to this Agreement.

f). The provisions of this Agreement, including the Settlement Terms in Exhibit A, shall be enforceable by any party at the Commission or any court of competent jurisdiction, whichever is applicable.

g). The communications and discussions during the negotiations and conferences which produced this Agreement, including the Settlement Terms in Exhibit A, have been conducted on the explicit understanding that they are or relate to offers of settlement and shall therefore be privileged.

ACCEPTED AND AGREED this 15th day of August, 2008.

By:________________________
Jim Stanley
President, Duke Energy Indiana,

By: [signature]
David Stippler
Indiana Office of Utility Consumer Counselor

By: [signature]
Peter L. Hatton
Attorney for Duke Energy Indiana

By: [signature]
Randall Helmen
Attorney for the Indiana Office of Utility Consumer Counselor

f). The provisions of this Agreement, including the Settlement Terms in Exhibit A, shall be enforceable by any party at the Commission or any court of competent jurisdiction, whichever is applicable.

g). The communications and discussions during the negotiations and conferences which produced this Agreement, including the Settlement Terms in Exhibit A, have been conducted on the explicit understanding that they are or relate to offers of settlement and shall therefore be privileged.

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Peter L. Hatton
Attorney for Duke Energy Indiana

By:__________________________
Randall Helmen
Attorney for the Indiana Office of Utility Consumer Counselor

Exhibit A

SETTLEMENT TERMS

A. **Initial Programs**

RESIDENTIAL CUSTOMER PROGRAMS
- Residential Energy Assessments
- Smart $aver® for Residential Customers
- Low-Income Services
- Energy Efficiency Education Program for Schools
- Power Manager

NON-RESIDENTIAL CUSTOMER PROGRAMS
- Non-Residential Energy Assessments
- Smart $aver® for Non-Residential Customers
- PowerShare® (subject to the conditions set forth in Section L. below)

In addition, research programs may be included to begin pilots with customers to determine the potential impacts of these new programs. However, Duke Energy Indiana agrees not to offer these programs or its the Efficiency Savings Plan in its initial portfolio of programs, but will present the programs to the Advisory Committee for consideration before Duke Energy Indiana offers them as pilot programs.

B. Term

1. The term of the settlement agreement shall be 4 years; however, cost recovery shall continue through year 6 as necessary to enforce its terms.

C. *Compensation for* Results

2. The Company will be compensated based on its ability to achieve verified MW and MWh reductions that create avoided cost savings on behalf of customers. The Company will retain a percentage of avoided cost savings, as set out below, in order to recover the cost of marketing, implementing and administering energy efficiency programs, impact evaluation studies and to provide the utility with an incentive for the successful

management of energy efficiency programs. Any incentive that may be due the Company will be funded by the avoided cost savings retained by the Company.

2. Total avoided cost savings shall be measured based on actual MW and MWh reductions achieved applicable to energy efficiency programs multiplied by MW and MWh avoided cost rates as described in Section H below. Reductions in MWs and MWhs shall be measured and verified by an independent-third party acceptable to the advisory committee. The percentage of avoided costs will differ for demand response and conservation programs in order to mitigate any bias that may exist between demand response and energy conservation programs from a profitability perspective and so that the Company will be indifferent to the percentage relationship of demand response and conservation programs when determining the optimal mix of programs during the term of the Settlement Agreement The Company assumes the risk that energy efficiency savings retained by the Company will not cover the costs of marketing, implementing or administering the energy efficiency programs or provide an incentive for the successful management of energy efficiency programs during the period of the Settlement Agreement. The percentage of avoided costs retained by the Company will vary, depending upon the success with which the Company manages its energy efficiency programs as set forth below:

Demand Response % of Avoided Costs	Conservation % of NPV of Avoided Costs
75%	60%

Revenue = Demand Response: 75% of avoided capacity costs +
Energy Conservation: 60% of NPV of avoided energy costs +
60% of NPV of avoided capacity costs

Costs = Program costs in year incurred

3. The Company shall use the same value for avoided costs when determining targeted cost savings and actual cost savings.

D. Performance Targets and Earnings Cap

1. The Company shall have the opportunity to earn an incentive for the successful management of energy efficiency programs which shall be tied to performance relative to energy efficiency plan targets. The energy efficiency plan is forecasted to produce total avoided cost savings of $260 MM (nominal dollars) due to programs implemented during the 4-year term of the agreement. The performance targets are set as a percentage of actual achievement relative to the $260 MM in targeted cost savings. The performance targets and earnings caps are as follows:

% Target Achievement	Capped Rate of Return on Program Costs
90% to 100%	15%
80% to 89%	12%
60% to 79%	9%
<60%	5%

It should be noted that program cost recovery is not guaranteed. With save-a-watt, the Company assumes the risk that the avoided cost revenues will cover program costs.

2. The total avoided cost savings used to determine compensation levels shall not exceed the targeted total avoided cost level of $260 MM. In addition, the Company agrees to limit rate impact to the RS rate class to a maximum of 3.0% for the Rider EE (see Table F-2). This rate limit applies to the combined revenue requirement for EE programs under save-a-watt and all associated lost revenues.

Should the Company decide to pursue innovative new program ideas that seem unattainable today to further reduce carbon emissions in the state of Indiana which may cause the Company to exceed the agreed upon limits, it will first seek input from the Advisory Committee and request authority from the IURC to pursue those programs. Based upon recent experience in other energy efficiency initiatives and collaboratives, the OUCC believes the Commission should retain its authority to establish all regulated retail rates, which in this case, may be accomplished by establishing a firm cap.

3. The management incentive, which shall be calculated as an after-tax return on actual program costs incurred, shall not exceed (i.e., shall be capped) at the rates set forth in Section D.1. above. To the extent Company earnings, at the end of the four-year settlement period exceed the capped earnings, such excess earnings shall be refunded to customers. The after-tax return on actual program costs shall be grossed-up for applicable taxes when determining amounts to be returned or recovered from customers.

4. The target achievement of $260MM (nominal dollars) due to programs implemented during the 4-year term of the agreement is tied to the following targeted MW and cumulative MWh savings:

	Portfolio Impacts at 100% Participation				
	Indiana				
Year	1	2	3	4	Beyond Yr 4
MWh	69,269	146,592	215,334	296,466	1,585,571
MW	317	403	451	496	96

5. The targets submitted in the Company's plan assume 100% participation. Final target discussions should remain open as opt-out provisions and other key issues are discussed with other intervening parties.

6. The estimated relative profitability outcome of various combinations of demand response and conservation programs is shown below for illustrative purposes only. Any incentive ultimately earned by the Company will depend on the Company's ability to achieve actual savings on behalf of customers.

Portfolio ROI Matrix Based on Participation

Indiana		Conservation Participation Levels					
		100%	90%	80%	70%	60%	50%
Demand Response Participation Levels	100%	15.0%	15.0%	12.0%	9.0%	9.0%	5.0%
	90%	15.0%	15.0%	12.0%	9.0%	9.0%	5.0%
	80%	12.0%	12.0%	12.0%	9.0%	8.0%	5.0%
	70%	9.0%	9.0%	9.0%	9.0%	6.0%	3.0%
	60%	9.0%	9.0%	9.0%	7.0%	4.0%	1.0%
	50%	5.0%	5.0%	5.0%	5.0%	2.0%	(2.0%)

7. The carbon offsets generated by the Company's proposal are estimated to be slightly more than 2 million tons

Carbon Tons Offset
Estimated based on 100% Participation Level

Indiana	
Sum of MWh Impacts Over Life of Measures	2,313,233
Carbon Tons Avoided Per MWh	0.97
Total Carbon Offset (tons)	2,243,836

8. The Company agrees that future revenues from carbon emission allowances resulting from save-a-watt programs will be credited to those jurisdictional ratepayers that funded related expenses.

E. Lost Revenues

1. The Company shall recover 100% of the lost revenues via Rider EE. The Company will terminate the recovery of lost revenues for each vintage year of EE installations 3 years following the end of such vintage year to reflect the effect of opportunity sales. The recovery of lost revenues will end in the event that decoupling or an alternative recovery mechanism is implemented or a general rate case is implemented.

Estimated Lost Revenues:

Lost Margins By Vintage								
Estimated based on 85% Achievement and Lost Margins, 3-year term, 4 vintages								
Indiana								
Projected Revenue Requirement Billed	1	2	3	4	5	6	7	Sum Total
First Year Vintage	$2,076,681	$2,076,681	$2,076,681					$6,230,044
Second Year Vintage		$2,419,912	$2,419,912	$2,419,912				$7,259,736
Third Year Vintage			$2,272,914	$2,272,914	$2,272,914			$6,818,743
Fouth Year Vintage				$2,768,034	$2,768,034	$2,768,034		$8,304,101
Total	$2,076,681	$4,496,593	$6,769,508	$7,460,860	$5,040,948	$2,768,034	$0	$28,612,624

F. Revenue Requirements

1. The intent of this design is to recover the full revenue requirements during the 4-year term of this agreement. The Company agrees to forego any "revenue reshaping" and, instead, base cost recovery on avoided costs applicable to the energy efficiency programs. Revenues collected from customers during the term of the agreement will be based on the expected avoided costs to be achieved during the term of this period and an 85% level of achievement. These forecasts and assumptions produce revenue requirements, which shall then be trued up to actual results at the end of the agreement. If the Company over-collects revenues from customers, the amount of over-collection shall be refunded at an annual rate of 6%; if the company under-collects revenues from customer, the amount of under-collections shall be collected with no (0%) annual carrying charge.

2. The initial revenue requirements and estimated percentage increase in overall customer rates calculated based on 85% achievement levels are listed below:

Revenue Requirements:

Total Revenue Requirements							
Estimated based on 85% Achievement							
Indiana	1	2	3	4	5	6	Sum Total
Incremental Energy Savings (MWh)	58,879	65,725	58,431	68,962	0	0	
Incremental Energy as % of 2009 Sales	0.20%	0.22%	0.20%	0.24%	0.00%	0.00%	
Cumulative Energy as % of 2009 Sales	0.20%	0.43%	0.62%	0.86%	0.86%	0.86%	
Retail Sales Forecast (MWh)	29,291,294	29,549,786	29,932,999	30,021,739	30,007,518	30,061,389	
Cumulative Energy Savings (MWh)	58,879	124,603	183,034	251,996	248,946	215,340	
Retail Sales Forecast after EE savings (MWh)	29,232,415	29,425,183	29,749,965	29,769,743	29,758,572	29,846,049	
Estimated Energy Efficiency Revenues	$28,414,809	$30,132,063	$30,324,422	$33,619,740	$0	$0	$122,491,033
Rate $/kWh	$0.00097	$0.00102	$0.00102	$0.00113	$0.00000	$0.00000	
Rate Change (based on June 2007 rev)	1.58%	1.68%	1.69%	1.87%	0.00%	0.00%	
Estimated Lost Margins	$2,076,681	$4,496,593	$6,769,508	$7,460,860	$5,040,948	$2,768,034	$28,612,624
EE Rate $/kWh	$0.00007	$0.00015	$0.00023	$0.00025	$0.00017	$0.00009	
Rate Change (based on June 2007 rev)	0.12%	0.25%	0.38%	0.42%	0.28%	0.15%	
Total Revenue Requirement	$30,491,490	$34,628,656	$37,093,929	$41,080,600	$5,040,948	$2,768,034	$151,103,657
Rate $/kWh	$0.00104	$0.00118	$0.00125	$0.00138	$0.00017	$0.00009	
Rate Change (based on 2007 rev)	1.70%	1.93%	2.07%	2.29%	0.28%	0.15%	

3. It is not Duke Energy's intention to charge customers twice for the same demand response equipment. Because the save-a-watt model indirectly compensates the Company for demand response equipment, Duke Energy shall credit the full installed cost of existing demand response equipment back to customers. Such credit will be equally spread out over the term of the agreement. The Company estimates that a total credit shall be in the amount $6,229,115, of which $1,557,279 would be credited back to customers in each year.

G. True-Up Process

1. Annual amounts billed customers during the term of the four-year pilot program will be fixed based on the values for each year set forth in Section F above. Any difference between amounts billed customers or amounts due the Company based on the terms of the Settlement Agreement, as determined at the end of the settlement period, shall be returned to customers or recovered from customers via Rider EE. Duke Energy Indiana shall not file updates or change the annual jurisdictional revenue requirement levels billed customers during the settlement period, as set out in Section F.2., unless it

becomes apparent that estimated amounts owed customers or amounts owed the Company at the end of the settlement period will be greater than a 1.5% change in the total customer rates in a single year.

2. The true-up process will incorporate the following provisions:
   a. Actual avoided cost savings will be compared to targeted avoided cost savings at the end of year 4 as follows:

      Actual cost savings/target cost savings = % Target Achievement

   b. The percentage of actual target achievement is used in conjunction with the table in Section D. above to determine the appropriate earnings cap.
   c. The net income based on actual savings is calculated and compared to the applicable earnings cap.
   d. Any difference between the Company's net income and the amount collected from customers based on the initial revenue requirement during the 4-year term will be reconciled between customers and the Company.
   e. If the Company over-collects revenues from customers, the amount of over-collection shall be refunded at an annual rate of 6%; if the company under-collects revenues from customer, the amount of under-collections shall be collected with no (0%) annual carrying charge.

3. Any difference between lost revenues billed customers and lost revenue due the Company based on results of the Measurement and Verification (M&V) study completed at the end of the settlement period will be reconciled and either returned to customers or recovered from customers. Such amount will be refunded or recovered over two years from the date of any such reconciliation with interest accrued on any over or under collected balance as set forth in Section G.2.e. above.

H. Controlling Avoided Costs

1. The settling parties agree to utilize the Company's QF rate as the avoided cost for the cost/benefit analysis of the initial save-a-watt programs during the term of this agreement. However, the parties recognize the need to incorporate a market-based component to the value of avoided costs in the future to more accurately reflect Company business decisions in activities such as purchasing capacity or constructing generation units such as a gas fired combustion turbine.

The settling parties anticipate discussions related to avoided cost values to be a key agenda item in expected technical workshops planned by the IURC in Phase II of its generic DSM proceeding, IURC Cause No. 42693. In the meantime, the settling parties agree to develop a methodology that may serve as a proxy to blend the build and buy options to initiate stakeholder discussions within 90 days of the issuance of a final order in this proceeding. The value derived from such methodology may be used to establish the avoided costs for program cost/benefit analysis and cost recovery for any additional programs offered during term of the settlement agreement and for programs that continue beyond the settlement term.

Given the absence of a capacity market in the MISO footprint and no imminent plans to establish such a market, the methodology will weight the 2008 approved QF rate and a market-based value of capacity based upon data such as, but not limited to, capacity purchases, the value of demand response resources in MISO through its Emergency Demand Response tariff, and the value of Demand Response Resources (DRRs) in the Ancillary Services Market (ASM) which is scheduled to begin in September 2008.

2. If the approved capacity credit of the QF rate changes by more than 25%, the avoided cost will be adjusted to enable modification of the portfolio of programs. Upon modification, the energy efficiency avoided cost percentages will be changed to maintain the relationship between the target achievement and the target management incentives.

I. Program Portfolio Management and Advisory Committee

1. In order to achieve maximum results, the portfolio of energy efficiency programs will be constantly monitored by Duke Energy's program managers and may need to be modified periodically in order to make the programs more successful, more cost-effective, and/or react to market conditions.
2. An Advisory Committee shall be established to collaborate with Duke Energy on its program development and modification.
3. The Advisory Committee shall exist throughout the term of this agreement and shall consist of representatives of Duke Energy and the OUCC with each organization having one vote. Upon approval of the settlement agreement, the Commission shall have the opportunity to have a voting representative if it so chooses. There may be other non-specified non-voting members, such as other settling parties, the Lieutenant Governor's Indiana Energy Group, the Energy Center at Discovery Park, Purdue University and members associated with other Indiana-based universities and national energy efficiency advocates.
4. During the implementation of the programs outlined herein, Duke Energy will work with the Advisory Committee on the design of an appropriate methodology to be used to evaluate the performance of the energy efficiency programs. Additional roles of the

Advisory Committee are to collaborate on new program ideas, review and approve modifications to existing programs, and review the M&V process.

5. Independent measurement and verification of programs, conducted by an independent third-party will be performed according to the schedule agreed to herein to ensure programs remain cost effective. The overall program portfolio must always be cost-effective when evaluated using the total resource cost test and including management incentives as a component of direct costs.
6. The Advisory Committee will review results of all programs and interim M&V reports on an annual basis. This group may request a mid-point review of programs and rates by the Commission should the need arise.
7. Free ridership and MW and MWh savings will be updated as part of the M&V process in evaluating the continued cost-effectiveness of existing programs.
8. The Advisory Committee shall have the ability to approve program modifications as long as the changes do not go outside the guidelines set out in this settlement or result in spending above previously approved levels.
9. Should the Advisory Committee vote and approve modifications to the existing programs, no IURC approval would be needed to implement such modifications.
10. It is anticipated that the IURC will need to approve all new programs and any proposal that results in an increase in rates.
11. Duke Energy Indiana retains the right to raise any program approval concerns with the Commission.
12. The Advisory Committee will meet at least two times a year.

J. Measurement & Verification

1. Reports of actual energy efficiency participation including any measurement, verification and evaluation shall be completed and provided to the IURC and parties to this proceeding annually.

2. The results of the M&V process at the end of the settlement term will be used to determine the actual MW and MWh achieved. The M&V study shall be submitted to the Commission as part of such true-up proceedings set forth in Section G. above.

3. The OUCC retains the right, if necessary, to formally contest the results of the Company's M&V activities in a hearing before the Indiana Utility Regulatory Commission.

4. Duke Energy Indiana will provide the OUCC with $100,000 to acquire an independent third-party consultant to assist in evaluating the results of the Company's M&V studies. Company shareholders shall provide such funding and the amounts of such funding shall not be considered when determining either program costs or management incentives provided under this agreement.

K. Throughput –

1. Company shall propose, in an alternate proceeding, a cost recovery mechanism that addresses both (1) the financial incentive to increase between rate cases retail sales under the existing regulatory framework, and (2) the financial disincentive under the existing regulatory framework to invest in energy efficiency or otherwise decrease the retail sales of electricity between rate cases. Upon a final order approving this settlement, Duke Energy Indiana agrees to meet with the OUCC and other parties to the settlement agreement to discuss a framework for resolving the throughput issue. No

later than sixty days after the issuance of a final order approving the settlement agreement, either (1) the settling parties shall submit a petition seeking Commission approval of a throughput mechanism, or (2) Duke Energy Indiana shall file its Petition proposing a mechanism to address the throughput issue.

L. MISO Demand Response Resources

1. Duke Energy Indiana is supportive of the Midwest ISO's demand response initiatives and wishes to encourage demand response program participation in this market. As the new rules are developed by Midwest ISO regarding resource adequacy, ancillary services market, and economic value, Duke Energy Indiana commits to offer demand response programs that will be compatible with the various Midwest ISO demand response tariff provisions. Duke Energy Indiana believes it is in a unique position to coordinate customer participation in Midwest ISO demand response initiatives. Duke Energy Indiana believes that a key variable in determining how the Company should be paid for demand response programs by retail customers is whether those programs will count toward the Company's Midwest ISO resource adequacy requirements. Planning resources that qualify under Midwest ISO Module E resource adequacy requirements will be eligible for Save-A-Watt (SAW) recovery.[1] SAW recovery for PowerShare CallOption will not be requested until this program qualifies as a Planning Resource under Midwest ISO Module E requirements or IURC approval if obtained to use this program as a Planning Resource.
2. Economic customer demand response programs could be designed for use in the energy markets including the ancillary service market, participation as emergency demand response resources, or be used by Duke Energy Indiana to reduce load requirements or

[1] The settling parties understand that as proposed, Module E will include provisions for state commissions to approve additional programs to be considered planning resources that reach beyond MISO's minimum requirements. If the IURC approves specific demand response programs under these conditions, the Company may seek IURC authority to recover costs for such programs through Rider EE using the SAW model.

to avoid expected high locational marginal prices. These programs may or may not meet requirements to be Planning Resources. Duke Energy Indiana will recover all program costs for Economic Programs, including the PowerShare Quote Option program, through Rider 70 proceedings. Revenues and charges received from or allocated to Duke Energy Indiana by the Midwest ISO related to such programs would be allocated in FAC, RTO, and Rider 70 proceedings.

3. The Company may develop future custom demand response programs to flexibly respond to the needs of large customers and will evaluate such programs to determine whether they qualify as Midwest ISO Planning Resources or are Economic in nature. The Company may seek cost recovery under SAW or under Rider 70 proceedings as described above. Before presenting such custom demand response programs to the Commission for approval, the Company will first seek input from the Advisory Committee, subject to duly executed confidentiality agreements, and then request authority from the IURC to extend such offerings, which is consistent with the agreement in section D.2. above.

No later that 60 days after (1) FERC final approval of Module E, and (2) after the approval of this settlement agreement, Duke Energy Indiana commits to begin meeting with the OUCC to ensure that its demand response programs receiving Rider EE recovery can be utilized as Midwest ISO Planning Resources. In addition, Duke Energy commits to discuss with the OUCC new demand response programs designed for Midwest ISO ASM participation.

If the Company includes the PowerShare programs in Rider EE (as part of save-a-watt), it will extract the PowerShare program costs from Rider 70, and reduce its requested recovery of any capacity purchases in future Rider 70 proceedings by the amount of the

PowerShare resources to avoid double-recovery. This commitment will continue until both the Midwest ISO and the IURC support the inclusion of price-responsive demand as an adequate resource for planning purposes, or until the end of the settlement term, whichever is sooner.

M. Engagement of Indiana-based firms

Duke Energy Indiana commits to expend no less than 25% of its total program costs during the term of this agreement for the implementation of save-a-watt through contracts with Indiana-based businesses. In like manner, Duke Energy Indiana shall make every effort to employ local vendors where feasible in the marketing, implementing and administering of such energy efficiency programs.

The parties acknowledge reports of a shortage of skilled labor resources in Indiana to promote energy efficiency. The shortage of skilled persons necessary to complete energy efficiency audits, install demand response equipment and effectuate measures promoting energy efficiency has delayed full participation in important programs. The parties believe that focused skills training for energy efficiency technicians and contractors may facilitate increased program participation and overall effectiveness in the future.

In order to address this situation, the Company agrees to provide the sum of $250,000 to be paid in the form of targeted grants toward the funding and development of specialized post-secondary education programs with various Indiana institutes of higher education. This payment will be due within 90 days of the issuance of a final order in this proceeding.

EXHIBIT B

Duke Energy Indiana / OUCC Save-A-Watt Settlement

Provision	Exhibit A Reference	Save-a-Watt as proposed by Duke Indiana in Case-in-Chief	OUCC Concerns/Recommendations	Resulting Compromise / Save-a-Watt Settlement Agreement Provisions
Term	B	No definitive term, but proposal included a 4-year term of programs.	The Commission should grant Petitioner the authority to implement the save-a-watt regulatory model only as a term pilot program with a firm expiration date.	4 year pilot program (with true-up, etc. extending beyond as necessary).
Initial EE Programs to be Implemented	A	Residential: • Energy Assessments • Smart $aver • Low-income • K-12 Education • Power Manager Non-Residential • Energy Assessments • Smart $aver • PowerShare Research • Advanced Power Manager • Efficiency Savings Plan	The Commission should not authorize the proposed Advanced Power Manager in this Cause since it is not yet fully developed. The Company should exclude from the save-a-watt regulatory model its proposed Advanced Power Manager program.	Residential: • Energy Assessments • Smart $aver • Low-Income • K-12 Education • Power Manager Non-Residential • Energy Assessments • Smart $aver • PowerShare Potential Research • Efficiency Savings Plan (not in initial portfolio of programs, will be discussed by Advisory Committee)
Avoided Cost-Based Compensation to Duke for Results	C	Energy conservation : 90% of actual (independently measured & verified) avoided costs achieved.	Duke must present evidence of actual savings in terms of demand (MWs) and energy (MWhs) that are measured, verified and audited by third party vendors. Results of such studies should form the foundation of cost recovery. Noted that demand response programs are subsidizing energy conservation based on portfolio mix. DSM savings and related decreases in program costs must be shared equitably between Duke's ratepayers and its shareholders. Duke should limit the proposal to a factor no greater than 66% by which to weight avoided cost savings.	Separate avoided cost percentages for demand response and energy conservation programs to make the company indifferent relative to profitability. 60% of actual (independently measured & verified) NPV avoided capacity and energy costs achieved, subject to an earnings cap (described on page 2 below).
	C	Demand response: 90% of actual (independently measured & verified) avoided costs achieved.		75% of actual (independently measured & verified) avoided capacity costs achieved, subject to an earnings cap (described on page 2 below).

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EXHIBIT B

Duke Energy Indiana / OUCC Save-A-Watt Settlement

Provision	Exhibit A Reference	Save a Watt as proposed by Duke Indiana in Case-in-Chief	OUCC Concerns/Recommendations	Resulting Compromise / Save a Watt Settlement Agreement Provisions
Included Elements in Avoided Cost-Based Compensation	C,E	Program costs, "lost revenues," and management incentive – all at risk, based upon achievement of actual, verified results	See discussion of "lost revenues" and "throughput incentive" on page 3 below.	Program costs and management incentive – both at risk, based upon achievement of actual, independently verified results. "Lost revenues" (for energy conservation programs only) broken out and dealt with separately, (as described on page 3 below).
Avoided Cost Calculation	H	Demand: Based on annual QF rate filed with IURC (i.e., "peaker methodology")	The Company's proposal inextricably links the cost to ratepayers of energy efficiency and utility supply-side costs. This exposes consumers to a risk not previously associated with energy efficiency investments. The Company must provide a method of shielding ratepayers from such risk. Cost recovery of any shareholder incentives based upon avoided costs should be closely linked to actual Midwest ISO market based savings.	Based on current annual QF rate filed with IURC, but set for 4 years with inflation factor. May be modified during term if changes by more than 25%. Agreement to work towards inclusion of market component in avoided cost calculation.
	H	Energy: Based on actual avoided energy costs, per IRP	None.	Based on actual avoided energy costs, per IRP
Performance Targets and Earnings Caps	D	No explicit performance targets; implicit within "pay for performance" nature of avoided cost revenue stream. No earnings caps	Duke's proposal provides the utility with an opportunity for unregulated profit. This profit derives from shareholder incentives that exceed outcomes that may prevail in competitive markets and the magnitude of which shield the Company from the risk of non-performance. Duke shareholder incentives should be tiered based upon actual results. Duke should limit the proposal to a return	Based on targeted plan savings, earnings cap varies based upon performance level achieved as percent of target (see below) % Target CAP 90-100% 15% cap on return on program costs 80-89% 12% cap on return on program costs 60-79% 9% cap on return on program costs <60% 5% cap on return on program costs *Energy conservation – Savings considered over life of measure, e.g., HVAC has 15 yrs of savings *Demand response – Savings are annual

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EXHIBIT B

Duke Energy Indiana / OUCC Save-A-Watt Settlement

			on program costs of no greater than 10.5%.	
Provision	Exhibit A Reference	Save a Watt as proposed by Duke Indiana in Case-in-Chief	OUCC Concerns/Recommendations	Resulting Compromise / Save a Watt Settlement Agreement Provisions
Initial Revenue Requirements Calculation	F	Based on 90% of estimated avoided costs at 100% achievement, "shaped" to resemble power plant investment and recovery.	The Company's proposal to reshape revenues is unnecessarily complex. The Company should base revenues on contemporaneous estimates of avoided costs.	Based on 4-year plan to create $260 MM in (nominal) avoided costs at 85% achievement level; no "reshaping" of revenue requirements.
EE Savings Cap, i.e. limitations on amount of kWh and kW Duke Energy can achieve	D	None; Energy Efficiency is a valuable resource that benefits all customers compared to alternative resources and lowers bills for participants through their reduction in usage.	The Commission should consider a reasonable rate impact for Duke ratepayers based on a holistic review of other pending or active regulatory ratemaking treatments. The Company's proposal exposes ratepayers to an indeterminable rate impact.	Limited to targeted plan savings over the 4-year term and a 3.0% maximum rate increase for residential customers during the 4-year term.
True Up	G	Annual, with adjustment to revenue requirements based on actual compared to targeted avoided cost savings. Over collections refunded to customers with 0% interest.	The utility should shield ratepayers from both the risk and costs of utility over-collection and should return to ratepayers any excess revenues collected plus an additional amount that compensates ratepayers for the time value of their money.	At conclusion of 4-year period, based on actual compared to targeted avoided cost savings, in conjunction with performance targets and earnings caps. Over-collections refunded to customers with 6% interest.
Cost Recovery Period	E	20 years based on life of measure with recovery of and on avoided cost	See discussion of limited term above.	6 years: (4 + true up in year 5) for recovery of avoided cost and full 6 years for recovery of lost revenues.
"Lost Revenue" Recovery Mechanism (loss attributable to fixed cost recovery, for energy conservation	E,K	No explicit lost revenue recovery or decoupling mechanism proposed.	The Company's save-a-watt regulatory model fails to remove the throughput incentive whereby the Company continues to profit from increasing electricity sales.	Direct recovery of 100% of lost revenues resulting from energy conservation programs for 3 (vintage) years. Duke Indiana to propose mechanism to deal with "throughput incentive" in alternate proceeding. Lost revenue recovery mechanism terminated prior to 3 years if/when new base rate case or throughput incentive mechanism implemented.

EXHIBIT B

Duke Energy Indiana / OUCC Save-A-Watt Settlement

Provision	Exhibit A Reference	Save a Watt as proposed by Duke Indiana in Case-in-Chief	OUCC Concerns/Recommendations	Resulting Compromise / Save a Watt Settlement Agreement Provisions
programs only)				
Measurement and Verification	I,J	By independent third party with defined program schedule.	The Company should commit to funding with shareholder dollars all evaluation, measurement and verification activities, including both costs incurred by the Company and by the OUCC on behalf of ratepayers.	Same; plus $100,000 funding for OUCC independent M&V consultant. Overall program portfolio must always be cost-effective when evaluated using the total resource cost test and including management incentives as a component of direct costs.
Opt Out Option for Large Customers	N/A	Customers having an aggregate load of 5 MW or more may opt out of participating in save-a-watt conservation programs, provided they self-certify re EE actions taken. Large customers who opt in and participate in conservation programs must stay in save-a-watt for 11 years which represents the useful life of save-a-watt measures installed.	None	Proposed opt-out provisions were not changed in this agreement; however, there are implicit changes due to introduction of the 4 year pilot term applicable to all Duke Indiana customers.
Program Portfolio Management and Advisory Committee	I	Collaborative process with Energy Efficiency stakeholders to provide input to program development and review measurement and verification	An Oversight Board comprised of DSM stakeholder representatives should actively and regularly review specific utility programs, results and, forecasted DSM expenditures.	Potential for three voting members (DEI, OUCC and IURC, if the IURC so chooses to participate) plus non-voting members to shape program modifications.

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EXHIBIT B

Duke Energy Indiana / OUCC Save-A-Watt Settlement

MISO DR Compatibility	L	Consistent with current resource planning. Discussed demand response opportunities in MISO, but did not link them to save-a-watt.	The Company's proposal does not follow the intent of the FERC and creates barriers to DR participation in competitive wholesale energy markets. Duke should fully utilize all Midwest ISO market-based options and related revenue sources for DR.	Duke Indiana commits to work to make SAW programs compatible with MISO requirements. DR programs that meet MISO requirements are eligible for SAW; if DR programs do not meet MISO DR requirements (or are otherwise not deemed qualifying resources by IURC), approved programs receive cost recovery treatment under Rider 70. Company may request custom DR programs that meet MISO requirements be placed under SAW or Rider 70.
Provision	**Exhibit A Reference**	**Save a Watt as proposed by Duke Indiana in Case-in-Chief**	**OUCC Concerns/Recommendations**	**Resulting Compromise / Save a Watt Settlement Agreement Provisions**
Other Provisions	D, F, M	Not applicable	No specific recommendations in testimony	Future revenues from carbon emission allowances resulting from save-a-watt programs will be credited to customers Duke Indiana commits to expend no less than 25% of total program costs through contracts with Indiana-based businesses. Duke Indiana agrees to provide $250,000 in targeted grants for specialized post-secondary education programs to assist in the training of a skilled labor force in Indiana to promote energy efficiency. Duke will credit customers with $6.2 MM previously collected to fund Power Manager program spilt evenly over 4 years to avoid double-recovery.

Peter L. Hatton

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CERTIFICATE OF SERVICE

The undersigned hereby certifies that copies of the foregoing Stipulation and Agreement was delivered or mailed, postage prepaid, in the United States Mail, this 15th day of August 2008, to:

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Office of Utility Consumer Counselor
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115 W. Washington Street
Indianapolis, IN 46204

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PETITIONER'S SETTLEMENT SUPPORTING
TESTIMONY EXHIBIT DD-1

STATE OF INDIANA
BEFORE THE
INDIANA UTILITY REGULATORY COMMISSION

VERIFIED PETITION OF DUKE ENERGY INDIANA, INC. REQUESTING THE INDIANA UTILITY REGULATORY COMMISSION TO APPROVE AN ALTERNATIVE REGULATORY PLAN PURSUANT TO IND. CODE § 8-1-2.5-1, *ET SEQ.*, FOR THE OFFERING OF ENERGY EFFICIENCY CONSERVATION, DEMAND RESPONSE, AND DEMAND-SIDE MANAGEMENT PROGRAMS AND ASSOCIATED RATE TREATMENT INCLUDING INCENTIVES PURSUANT TO A REVISED STANDARD CONTRACT RIDER NO. 66 IN ACCORDANCE WITH IND. CODE §§ 8-1-2.5-1 *ET SEQ.* AND 8-1-2-42(a); AUTHORITY TO DEFER PROGRAM COSTS ASSOCIATED WITH ITS ENERGY EFFICIENCY PORTFOLIO OF PROGRAMS; AUTHORITY TO IMPLEMENT NEW AND ENHANCED ENERGY EFFICIENCY PROGRAMS, INCLUDING THE POWERSHARE® PROGRAM IN ITS ENERGY EFFICIENCY PORTFOLIO OF PROGRAMS; AND APPROVAL OF A MODIFICATION OF THE FUEL ADJUSTMENT CLAUSE EARNINGS AND EXPENSE TESTS	)	CAUSE NO. 43374

STIPULATION

AND

AGREEMENT

October 31, 2008

STIPULATION AND AGREEMENT

This Stipulation and Agreement ("Agreement") is entered into this 31st day of October, 2008, by and between Duke Energy Indiana, Inc. ("Duke Energy Indiana"), Nucor Steel, a division of Nucor Corporation ("Nucor"), Steel Dynamics, Inc.-Engineered Bar Products Division. ("SDI"), Kroger Company ("Kroger"), and the Indiana Office of Utility Consumer Counselor (the "OUCC") (together "the Parties").

NOW, THEREFORE, the Parties agree as follows:

1. Scope of Agreement. This Agreement, along with the August 15, 2008 Stipulation and Agreement entered into between Duke Energy Indiana and the OUCC ("the August 15 Settlement") (collectively, "the Settlements"), comprehensively resolves all issues between the Parties associated with Duke Energy Indiana's save-a-watt program as filed in Cause No. 43374.

a). Agreement Framework. Attached hereto as Exhibit A is a Term Sheet setting forth specific provisions of the settlement ("Settlement Terms") that, along with the August 15 Settlement, is intended by the Parties to resolve all pending issues relating to Cause No. 43374. The terms of the Agreement are effective upon approval by the Indiana Utility Regulatory Commission ("Commission").

2. Integration. Approval of this Agreement constitutes approval of the Settlement Terms attached hereto as Exhibit A.

3. Presentation of the Agreement.

a). The Parties will jointly move the Commission for approval of both the August 15 Settlement and this Agreement in their entirety. The Agreement, including the Settlement Terms in Exhibit A, is not severable from the August 15 Settlement and the

Settlements shall be accepted or rejected by the Commission in their entirety without modification or further condition that is unacceptable to any Party, consistent with section 3(c) below.

b). The Parties agree to support or not oppose the approval in its entirety of the August 15 Settlement. The Parties agree that Duke Energy Indiana's case-in-chief filing, as modified by both the August 15 Settlement and this Agreement shall be taken together as whole and shall constitute the Company's alternative regulatory plan. Nucor, SDI and Kroger agree not to offer for admission into the record their respective testimonies and exhibits filed October 27, 2008. The Parties may, if they choose, file additional testimony in support of this Agreement.

c). If the Order of the Commission in this proceeding modifies or conditions the August 15 Settlement, only the parties to the August 15 Settlement may decide to accept or reject such modification or condition. If the Order of the Commission in this proceeding modifies or conditions approval of this Agreement, only the Parties to this Agreement may decide to accept or reject such modification or condition.

4. Effect and Use of Stipulation and Agreement.

a). The terms of this Agreement, including the Settlement Terms in Exhibit A, represent a fair, just and reasonable resolution by negotiation and compromise. As set forth in the Order in *Re Petition of Richmond Power & Light*, Cause No. 40434 at page 10, as a term of this Agreement, the Commission must assure the Parties that it is not the Commission's intent to allow this Agreement, or the Order approving it, to be cited as precedent by any person or deemed an admission by any Party in any other proceeding except as necessary to enforce its terms before the Commission, or any court of competent jurisdiction on these particular issues. This Agreement, including the Settlement Terms in Exhibit A, is solely the result of compromise in the settlement process. Nothing contained herein is to be construed or deemed an admission, liability or wrongdoing on the part of Duke Energy Indiana. Each of the parties hereto has entered into this Agreement solely to avoid further disputes and litigation with the attendant inconvenience and expenses.

b). The evidence presented by the Parties in this Cause constitutes substantial evidence sufficient to support both the August 15 Settlement and this Agreement and provides an adequate evidentiary basis upon which the Commission can make any findings of fact and conclusions of law necessary for the approval of both the August 15 Settlement and this Agreement, as filed.

c). The issuance of a final Order by the Commission approving both the August 15 Settlement and this Agreement, including the Settlement Terms in Exhibit A, without modification shall terminate all proceedings in regard to this Agreement.

d). The undersigned represent and agree that they are fully authorized to execute this Agreement on behalf of their designated clients who will be bound thereby.

e). The Parties shall not appeal the agreed final Order or any subsequent Commission order to the extent such order is specifically implementing, without modification, the provisions of both the August 15 Settlement and this Agreement, including the Settlement Terms in Exhibit A, and the Parties shall not support any appeal of any such order by a person not a party to this Agreement.

f). The provisions of this Agreement, including the Settlement Terms in Exhibit A, shall be enforceable by any party at the Commission or any court of competent jurisdiction, whichever is applicable.

g). The communications and discussions during the negotiations and conferences which produced this Agreement, including the Settlement Terms in Exhibit A, have been conducted on the explicit understanding that they are or relate to offers of settlement and shall therefore be privileged.

ACCEPTED AND AGREED this 31st day of October, 2008.

By: ______________________
Melanie Price
Attorney for Duke Energy Indiana

By: ______________________
Peter Matheis
Attorney for Nucor

By: ______________________
Kurt Boehm
Attorney for Kroger

By: ______________________
Damon Xenopoulos
Attorney for SDI

By: ______________________
David Stippler
Indiana Office of the Utility
Consumer Counselor

g). The communications and discussions during the negotiations and conferences which produced this Agreement, including the Settlement Terms in Exhibit A, have been conducted on the explicit understanding that they are or relate to offers of settlement and shall therefore be privileged.

ACCEPTED AND AGREED this 31st day of October, 2008.

By:______________________
Melanie Price
Attorney for Duke Energy Indiana

By:______________________
Peter Matheis
Attorney for Nucor

By: K Boehm
Kurt Boehm
Attorney for Kroger

By:______________________
Damon Xenopoulos
Attorney for SDI

By:______________________
David Stippler
Indiana Office of the Utility
Consumer Counselor

g). The communications and discussions during the negotiations and conferences which produced this Agreement, including the Settlement Terms in Exhibit A, have been conducted on the explicit understanding that they are or relate to offers of settlement and shall therefore be privileged.

ACCEPTED AND AGREED this 31st day of October, 2008.

By:________________________
Melanie Price
Attorney for Duke Energy Indiana

By:________________________
Peter Matheis
Attorney for Nucor

By:________________________
Kurt Boehm
Attorney for Kroger

By:________________________
Damon Xenopoulos
Attorney for SDI

By:________________________
David Stippler
Indiana Office of the Utility
Consumer Counselor

Exhibit A

SETTLEMENT TERMS

The Stipulation and Agreement entered into with the Indiana Office of Utility Consumer Counselor ("OUCC") and filed with the Indiana Utility Regulatory Commission on August 15, 2008 in Cause No. 43374 contemplated that there would be further discussions, specifically around opt-out provisions, with other parties. Specifically, Paragraph D5 states that "[f]inal target discussions should remain open as opt-out provisions and other key issues are discussed with other intervening parties." In furtherance of the spirit of the August 15 Settlement, Duke Energy Indiana, Inc. ("Duke Energy Indiana" or "Company"), the OUCC, Nucor Steel, a Division of Nucor Corporation ("Nucor"), Steel Dynamics, Inc.-Engineered Bar Products Division ("SDI") and Kroger Company ("Kroger") (collectively referred to as "the Parties") agree as follows:

A. Opt Out for Large Customers

1. The Parties agree that a large industrial and commercial customer in Indiana may opt out of the energy conservation and/or demand response components of the Company's proposed Standard Contract Rider No. 66 ("Rider EE") if the customer's aggregated annual maximum peak demand is greater than 25,000 kW.
   a. A customer may aggregate the load of the Duke Energy Indiana accounts of its affiliates to meet this opt out threshold. For purposes of this provision, an "affiliate" shall be defined as any business entity of which 50% or more is owned or controlled, directly or indirectly, by the customer.
   b. If a customer qualifies to opt out of the Company's Rider EE, the customer may choose to opt out for select accounts/locations or all accounts, at its sole election. However, the customer cannot opt out of individual programs.

2. Demand Response Programs.
   a. A customer may opt out of the demand response component of Rider EE for the term of the Company's proposed Rider EE. The demand response component of Rider EE will not be charged to customer accounts or locations that opt out of demand response during said term.
   b. A customer must opt out of demand response within 60-days following the approval of the order in this proceeding. If the customer does not opt out of the demand response component of Rider EE within this 60 day period, the customer will be billed Rider EE charges for the term of this Agreement.
   c. There is no customer certification required to opt out of the demand response component of Rider EE.

3. Energy Conservation Programs.
   a. At the time of the election to opt out of the energy conservation component of Rider EE, the customer must self-certify or attest that, as to each facility for which the customer seeks to opt out, within the last three years it has performed or had performed an energy audit or analysis and has implemented or has plans for implementing the cost effective measures identified for installation in that audit or

analysis. Duke Energy Indiana will collect and maintain the self-certifications for the term of the program and make them available to the Commission and the OUCC at their request.

b. A customer may opt out of the energy conservation component of Rider EE for each vintage year. Energy conservation programs are fully paid for in the vintage year in which they occur. Lost margin recovery will occur for two additional years. For example, a large customer who participates in vintage year 1, could opt-out of vintage years 2, 3 and 4. The customer would pay the energy conservation component of Rider EE in vintage year 1 and lost margins associated with year 1 in the first year. The customer would continue to see EE Rider charges in years 2 and 3 to collect vintage year 1 lost margin recovery for years 2 and 3. The customer would not incur any charges for the energy conservation component or lost margins associated with vintage years 2 or 3.
c. The vintage year approach provides customers with greater flexibility to opt out and back in to Duke Energy Indiana's energy conservation component of Rider EE. For example, a customer who opts out of vintage year 1 and 2 may opt in for vintage year 3. The vintage year approach should make it easier for large customers to participate in energy conservation programs.
d. Once a customer opts out, they will be out until they elect to opt back in.
e. A customer must elect to opt-out, or back in, no later than 60-days prior to the beginning of a vintage year.
f. If a customer elects to opt out of energy conservation component, they forego participation in the true up process at the end of year four. In other words, a customer must participate all four years to be included in the true up process.

4. Customer Equipment. If equipment is required on the customer side of the meter for demand response or energy conservation programs covered by the August 15 Agreement, and the customer provides such equipment, the Company agrees to waive any charges for the equipment. If the Company installs such equipment on the customer's behalf, the Company will charge the cost of installation to the customer. The equipment requirements, and determination of customer equipment meeting those requirements will be determined by the Company at its sole discretion.

B. Treatment of Future Custom Demand Response Special Contracts for Large Customers

1. Duke Energy Indiana commits at this time it shall not seek recovery of any demand response costs associated with future custom demand response special contracts (*i.e.*, non-tariff contracts) under Rider EE (for example, contracts currently being negotiated with SDI and Nucor). In other words, the demand response impacts of these contracts will be omitted from the save-a-watt model and shall have no effect on Rider EE. The Company reserves the right to request recovery of any demand response associated costs under such contracts in its Rider 70 or other proceedings.

2. Duke Energy Indiana further agrees that if any future custom demand response special contract for large customers (*i.e.*, a non-tariff contract) does not meet the Midwest ISO's

Module E Resource Adequacy requirements or approval by the Commission as a planning resource, then the Company will not seek recovery of any capacity payments associated with demand response under such contracts (in Rider 70 or elsewhere).

Indiana Proposal Comparison - Total

$ In Millions, At 85% Participation, Excludes Power Manager Equipment Credit

OUCC Settlement Proposal: Original Settlement with the OUCC on the Modified Save a Watt Proposal (special contracts included)

Opt Out Settlement (Conservation Scaled Up): Special contracts removed from Demand Response and load forecast, non residential Conservation scaled up to reach $260M in nominal avoided costs

Opt Out Settlement (Demand Response Scaled Up) Special contracts removed from Demand Response and load Forecast, non residential Demand Response scaled up to reach $260M in nominal avoided costs

Total

Impacts

Cumulative Energy Impacts	1	2	3	4	5	6	SUM
OUCC Settlement Proposal	58,879	124,603	183,034	251,996	0	0	618,512
Opt Out Settlement (Conservation Scaled Up)	68,609	144,989	213,928	294,435	0	0	721,961
Opt Out Settlement (Demand Response Scaled Up)	58,879	124,603	183,034	251,996	0	0	618,512
Cumulative Capacity Impacts							
OUCC Settlement Proposal	317	403	451	496	0	0	
Opt Out Settlement (Conservation Scaled Up)	170	259	310	358	0	0	
Opt Out Settlement (Demand Response Scaled Up)	281	347	410	458	0	0	

Revenues

Estimated Energy Efficiency Revenues	1	2	3	4	5	6	SUM
OUCC Settlement Proposal	$28.4	$30.1	$30.3	$33.6	$0.0	$0.0	$122.5
Opt Out Settlement (Conservation Scaled Up)	$23.8	$25.7	$26.1	$29.7	$0.0	$0.0	$105.2
Opt Out Settlement (Demand Response Scaled Up)	$27.1	$28.2	$28.3	$31.5	$0.0	$0.0	$115.1
Estimated Lost Margins							
OUCC Settlement Proposal	$2.1	$4.5	$6.8	$7.5	$5.0	$2.8	$28.6
Opt Out Settlement (Conservation Scaled Up)	$2.5	$5.3	$8.0	$8.8	$6.0	$3.3	$33.9
Opt Out Settlement (Demand Response Scaled Up)	$2.1	$4.5	$6.8	$7.5	$5.0	$2.8	$28.6
Total Revenue Requirement							
OUCC Settlement Proposal	$30.5	$34.6	$37.1	$41.1	$5.0	$2.8	$151.1
Opt Out Settlement (Conservation Scaled Up)	$26.2	$31.0	$34.1	$38.5	$6.0	$3.3	$139.1
Opt Out Settlement (Demand Response Scaled Up)	$29.2	$32.7	$35.1	$38.9	$5.0	$2.8	$143.7

Petitioner's Settlement Supporting Exhibit DD-2
(Page 2 of 5)

Indiana Proposal Comparison - Residential

$ in Millions, At 85% Participation, Excludes Power Manager Equipment Credit

OUCC Settlement Proposal: Original Settlement with the OUCC on the Modified Save a Watt Proposal (special contracts included)
Opt Out Settlement (Conservation Scaled Up): Special contracts removed from Demand Response and load forecast, non residential Conservation scaled up to reach $260M in nominal avoided costs
Opt Out Settlement (Demand Response Scaled Up) Special contracts removed from Demand Response and load Forecast, non residential Demand Response scaled up to reach $260M in nominal avoided costs

Residential
Impacts

Cumulative Energy Impacts	1	2	3	4	5	6	SUM
OUCC Settlement Proposal	38,179	81,240	117,317	161,722			398,458
Opt Out Settlement (Conservation Scaled Up)	38,179	81,240	117,317	161,722			398,458
Opt Out Settlement (Demand Response Scaled Up)	38,179	81,240	117,317	161,722			398,458
Cumulative Capacity Impacts							
OUCC Settlement Proposal	81	108	130	156			
Opt Out Settlement (Conservation Scaled Up)	81	108	130	156			
Opt Out Settlement (Demand Response Scaled Up)	81	108	130	156			

Revenues

Estimated Energy Efficiency Revenues	1	2	3	4	5	6	SUM
OUCC Settlement Proposal	$11.7	$12.5	$11.9	$14.5	$0.0	$0.0	$50.6
Opt Out Settlement (Conservation Scaled Up)	$11.6	$12.3	$11.8	$14.4	$0.0	$0.0	$50.2
Opt Out Settlement (Demand Response Scaled Up)	$11.7	$12.4	$11.9	$14.5	$0.0	$0.0	$50.6
Estimated Lost Margins							
OUCC Settlement Proposal	$1.3	$2.8	$4.1	$4.5	$3.0	$1.7	$17.4
Opt Out Settlement (Conservation Scaled Up)	$1.3	$2.8	$4.1	$4.5	$3.0	$1.7	$17.4
Opt Out Settlement (Demand Response Scaled Up)	$1.3	$2.8	$4.1	$4.5	$3.0	$1.7	$17.4
Total Revenue Requirement							
OUCC Settlement Proposal	$13.0	$15.2	$16.0	$19.1	$3.0	$1.7	$68.0
Opt Out Settlement (Conservation Scaled Up)	$12.9	$15.1	$15.9	$18.9	$3.0	$1.7	$67.5
Opt Out Settlement (Demand Response Scaled Up)	$13.0	$15.2	$16.0	$19.0	$3.0	$1.7	$68.0

Indiana Proposal Comparison - Non Residential

$ in Millions, At 85% Participation, Excludes Power Manager Equipment Credit

OUCC Settlement Proposal: Original Settlement with the OUCC on the Modified Save a Watt Proposal (special contracts included)
Opt Out Settlement (Conservation Scaled Up): Special contracts removed from Demand Response and load forecast, non residential Conservation scaled up to reach $260M in nominal avoided costs
Opt Out Settlement (Demand Response Scaled Up) Special contracts removed from Demand Response and load Forecast, non residential Demand Response scaled up to reach $260M in nominal avoided costs

Non Residential	1	2	3	4	5	6	SUM
Impacts							
Cumulative Energy Impacts							
OUCC Settlement Proposal	20,699	43,364	65,717	90,275			220,054
Opt Out Settlement (Conservation Scaled Up)	30,430	63,749	96,611	132,714			323,503
Opt Out Settlement (Demand Response Scaled Up)	20,699	43,364	65,717	90,275			220,054
Cumulative Capacity Impacts							
OUCC Settlement Proposal	235	295	321	340			
Opt Out Settlement (Conservation Scaled Up)	88	151	180	202			
Opt Out Settlement (Demand Response Scaled Up)	199	240	280	302			

Revenues							
Estimated Energy Efficiency Revenues	1	2	3	4	5	6	SUM
OUCC Settlement Proposal	$16.7	$17.7	$18.4	$19.1	$0.0	$0.0	$71.8
Opt Out Settlement (Conservation Scaled Up)	$12.1	$13.3	$14.3	$15.3	$0.0	$0.0	$55.0
Opt Out Settlement (Demand Response Scaled Up)	$15.4	$15.8	$16.4	$16.9	$0.0	$0.0	$64.5
Estimated Lost Margins							
OUCC Settlement Proposal	$0.8	$1.7	$2.7	$2.9	$2.0	$1.1	$11.3
Opt Out Settlement (Conservation Scaled Up)	$1.2	$2.5	$3.9	$4.3	$3.0	$1.6	$16.5
Opt Out Settlement (Demand Response Scaled Up)	$0.8	$1.7	$2.7	$2.9	$2.0	$1.1	$11.3
Total Revenue Requirement							
OUCC Settlement Proposal	$17.5	$19.4	$21.0	$22.0	$2.0	$1.1	$83.1
Opt Out Settlement (Conservation Scaled Up)	$13.3	$15.9	$18.2	$19.6	$3.0	$1.6	$71.6
Opt Out Settlement (Demand Response Scaled Up)	$16.2	$17.5	$19.0	$19.9	$2.0	$1.1	$75.7

Indiana Proposal Comparison - Net Benefit

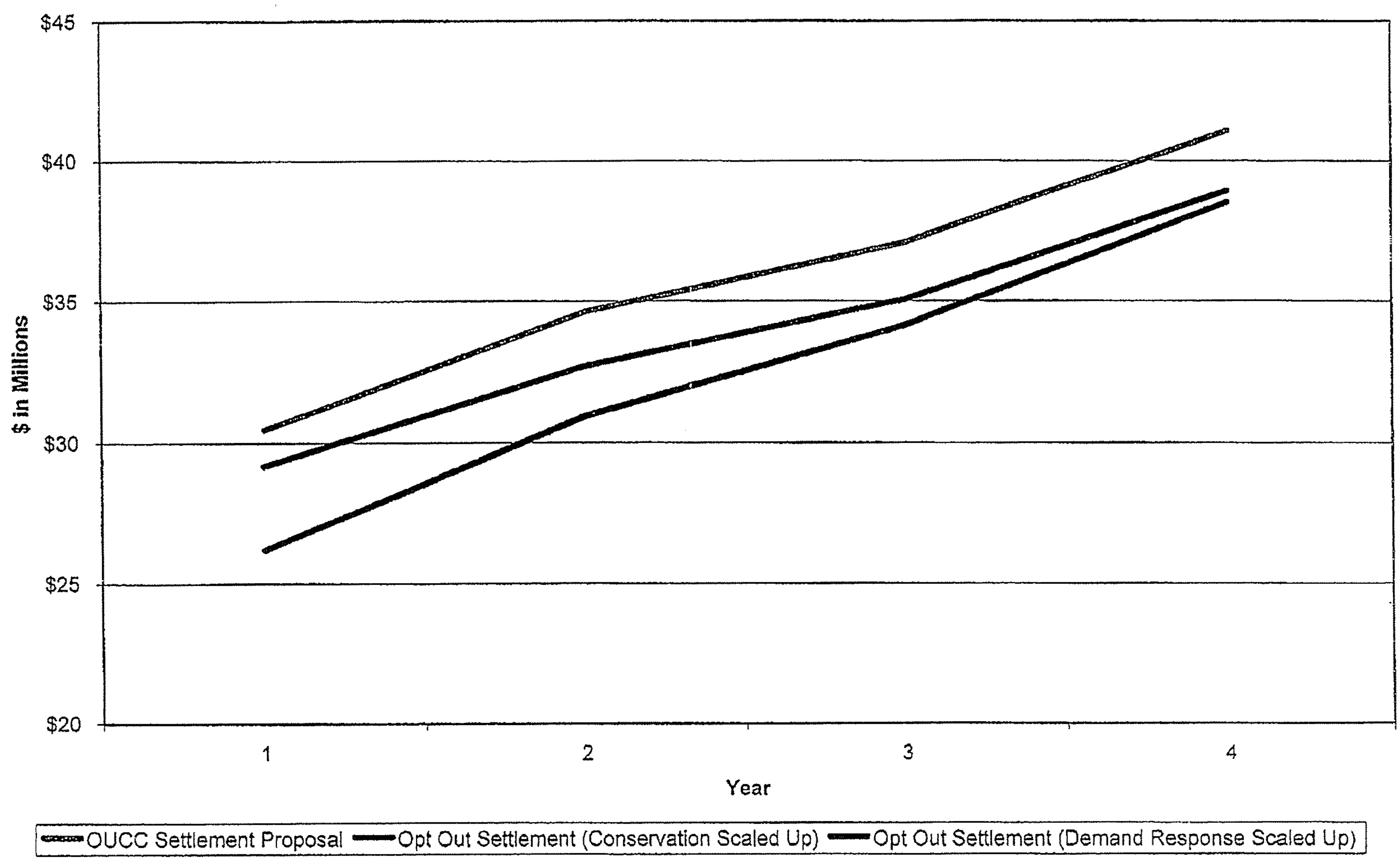
$ In Millions, Nominal, includes ROI true up to 15% of program costs, at 100% Participation, Excludes Power Manager Equipment Credit

OUCC Settlement Proposal: Original Settlement with the OUCC on the Modified Save a Watt Proposal (special contracts included)
Opt Out Settlement (Conservation Scaled Up): Special contracts removed from Demand Response and load forecast, non residential Conservation scaled up to reach $260M in nominal avoided costs
Opt Out Settlement (Demand Response Scaled Up) Special contracts removed from Demand Response and load Forecast, non residential Demand Response scaled up to reach $260M in nominal avoided costs

Costs at 100% Participation	OUCC Settlement Proposal	Opt Out Settlement Conservation Scaled Up	Opt Out Settlement Demand Response Scaled Up
Total Avoided Costs	$260	$260	$260
Total Program Costs	$107	$91	$96
Net Benefit	$152	$169	$164
Benefit to Customers	$122 : 80%	$144 : 85%	$138 : 84%
Taxes	$14 : 9%	$12 : 7%	$12 : 8%
Benefit to Company	$16 : 11%	$14 : 8%	$14 : 9%

Petitioner's Exhibit DD-2 (5 of 5)

Total Incremental Revenue Requirements



Duke Energy Indiana, Inc.

PETITIONER'S EXHIBIT CC-1
PAGE 2 OF 3

Calculation of Estimated Net Operating Income
And Percentages Return On Program Costs

Line No.		Conservation Program								Line No.
		NPV	Sum	1	2	3	4	5	6	
1	Program Revenue	$ 86,096,015	$ 97,919,582	$ 17,719,380	$ 21,397,780	$ 23,826,409	$ 27,167,031	$ 5,040,948	$ 2,768,034	1
2	Less: Lost Margin Recovery	23,935,453	28,612,624	2,076,681	4,496,593	6,769,508	7,460,860	5,040,948	2,768,034	2
3	Program Revenue Excluding Loss Margin Recovery	62,160,562	69,306,958	15,642,699	16,901,187	17,056,901	19,706,171	-	-	3
4	Less: Utility Receipts Tax	870,248	970,298	218,998	236,617	238,797	275,886	-	-	4
5	Less: Public Utility Fee + Uncollectibles	361,775	403,367	91,041	98,365	99,271	114,690	-	-	5
6	Less: Program Costs	47,045,462	52,454,124	11,838,985	12,791,457	12,909,307	14,914,375	-	-	6
7	Net Cash Flows Before Income Taxes	13,883,077	15,479,169	3,493,675	3,774,748	3,809,526	4,401,220	-	-	7
8	State Taxable Income	14,753,326	16,449,467	3,712,673	4,011,365	4,048,323	4,677,106	-	-	8
9	Net Cash Flows Before Income Taxes	13,883,077	15,479,169	3,493,675	3,774,748	3,809,526	4,401,220	-	-	9
10	State Income Tax at 8.5%	1,254,032	1,398,204	315,577	340,966	344,107	397,554	-	-	10
11	Federal Taxable Income	12,629,045	14,080,965	3,178,098	3,433,782	3,465,419	4,003,666	-	-	11
12	Federal Income Tax @35%	4,420,166	4,928,338	1,112,334	1,201,824	1,212,897	1,401,283	-	-	12
13	Net Operating Income	$ 8,208,879	$ 9,152,627	$ 2,065,764	$ 2,231,958	$ 2,252,522	$ 2,602,383	$ -	$ -	13
14	Percentage Return on Program Costs	17.45%	17.45%	17.45%	17.45%	17.45%	17.45%			14

NOTE: Calculations have been prepared assuming customer participation rates and avoided cost savings for both demand response and conservation programs at 85% of plan and no opt out.

Duke Energy Indiana, Inc.

PETITIONER'S EXHIBIT CC-1
PAGE 3 OF 3

Calculation of Estimated Net Operating Income
And Percentages Return On Program Costs

Line No.				Demand Response Program						Line No.
		NPV	Sum	1	2	3	4	5	6	
1	Program Revenue	42,267,344	46,954,959	11,214,831	11,673,597	11,710,242	12,356,289	-	-	1
2	Less: Utility Receipts Tax	591,742	657,369	157,008	163,430	163,943	172,988	-	-	2
3	Less: Public Utility Fee + Uncollectibles	245,996	273,278	65,270	67,940	68,154	71,914	-	-	3
4	Less: Program Costs	40,071,103	44,501,646	10,687,032	11,070,904	11,101,565	11,642,145	-	-	4
5	Net Cash Flows Before Income Taxes	1,358,502	1,522,666	305,521	371,323	376,580	469,242	-	-	5
6	State Taxable Income	1,950,244	2,180,035	462,529	534,753	540,523	642,230	-	-	6
7	Net Cash Flows Before Income Taxes	1,358,502	1,522,666	305,521	371,323	376,580	469,242	-	-	7
8	State Income Tax at 8.5%	165,771	185,303	39,315	45,454	45,944	54,590	-	-	8
9	Federal Taxable Income	1,192,731	1,337,363	266,206	325,869	330,636	414,652	-	-	9
10	Federal Income Tax @35%	417,456	468,077	93,172	114,054	115,723	145,128	-	-	10
11	Net Operating Income	$ 775,275	$ 869,286	$ 173,034	$ 211,815	$ 214,913	$ 269,524	$ -	$ -	11
12	Percentage Return on Program Costs	1.93%	1.95%	1.62%	1.91%	1.94%	2.32%			12

NOTE: Calculations have been prepared assuming customer participation rates and avoided cost savings for both demand response and conservation programs at 85% of plan and no opt out.

DUKE ENERGY INDIANA, INC.

**Projection Of Estimated Net Customer Benefits And Earnings Impacts
At Assumed Achievement Levels Based On The Save-A-Watt Proposal
As Modified By The August 15, 2008 Stipulation And Agreement
Between The Company And The Office Of Utility Consumer Counselor
(Dollars in Millions)**

Line No.	Assumed Attainment Level	Estimated Lifetime Avoided Costs	Estimated Program Costs	Estimated Net Operating Income Realized By The Company (1)	Incentive Cap	Net Operating Income Allowed Reflecting Cap	Lesser Of NOI Actually Realized Or Cap	Line No.
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	
1	40%	$104.0	$65.5	-$9.1	5%	$3.3	-$9.1	1
2	50%	129.90	72.50	- 4.80	5%	3.60	- 4.80	2
3	60%	155.90	79.50	- 0.60	9%	7.20	- 0.60	3
4	70%	181.90	86.50	3.70	9%	7.80	3.70	4
5	80%	207.90	93.50	7.90	12%	11.20	7.90	5
6	85%	220.90	97.00	10.00	12%	11.60	10.00	6
7	90%	233.90	100.40	12.10	15%	15.10	12.10	7
8	100%	$259.9	$107.4	$16.4	15%	$16.1	$16.1	8

(1) Reflects revenues billed customers, based on applicable percentages of avoided costs at assumed attainment levels, less program costs and taxes.

DUKE ENERGY INDIANA, INC.

Projection Of Estimated Net Customer Benefits And Earnings Impacts
At Assumed Achievement Levels Based On The Save-A-Watt Proposal
As Modified By The August 15, 2008 Stipulation And Agreement
Between The Company And The Office Of Utility Consumer Counselor
(Dollars in Millions)

Line No.	Assumed Attainment Level	Revenues Ultimately Realized By The Company / Paid By Customers To Cover						After-Tax Shareholder Incentive As A Percent Of Total Revenue	Line No.
		Program Costs	Taxes	Incentive	Sub-Total	Lost Margins	Total		
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	
1	40%	$65.5	-$5.0	-$9.1	$51.4	$13.5	$64.9	0.0%	1
2	50%	72.50	- 1.90	- 4.80	65.80	16.80	82.60	0.0%	2
3	60%	79.50	1.30	- 0.60	80.20	20.20	100.40	0.0%	3
4	70%	86.50	4.40	3.70	94.60	23.60	118.20	3.1%	4
5	80%	93.50	7.70	7.90	109.10	26.90	136.00	5.8%	5
6	85%	97.00	9.30	10.00	116.30	28.60	144.90	6.9%	6
7	90%	100.40	11.00	12.10	123.50	30.30	153.80	7.9%	7
8	100%	$107.4	$13.9	$16.1	$137.4	$33.7	$171.1	9.4%	8

DUKE ENERGY INDIANA, INC.

Projection Of Estimated Net Customer Benefits And Earnings Impacts
At Assumed Achievement Levels Based On The Save-A-Watt Proposal
As Modified By The August 15, 2008 Stipulation And Agreement
Between The Company And The Office Of Utility Consumer Counselor
(Dollars in Millions)

		Avoided Cost Savings Realized By Customers		Percentage Of Avoided Cost Savings Retained By The Company To Cover:				
Line No.	Assumed Attainment Level	Amount	% Of Total Avoided Cost Savings	Program Costs	Taxes	Incentive	Total	Line No.
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	
1	40%	$52.6	50.6%	63.0%	-4.8%	-8.8%	49.4%	1
2	50%	64.10	49.3%	55.8%	-1.5%	-3.7%	50.6%	2
3	60%	75.70	48.6%	51.0%	0.8%	-0.4%	51.4%	3
4	70%	87.30	48.0%	47.6%	2.4%	2.0%	52.0%	4
5	80%	98.80	47.5%	45.0%	3.7%	3.8%	52.5%	5
6	85%	104.60	47.4%	43.9%	4.2%	4.5%	52.6%	6
7	90%	110.40	47.2%	42.9%	4.7%	5.2%	52.8%	7
8	100%	$122.5	47.1%	41.3%	5.3%	6.2%	52.8%	8

**PETITIONER'S AMENDED OPT-OUT
SETTLEMENT EXHIBIT EE-1**

**STATE OF INDIANA
BEFORE THE
INDIANA UTILITY REGULATORY COMMISSION**

VERIFIED PETITION OF DUKE ENERGY INDIANA, INC. REQUESTING THE INDIANA UTILITY REGULATORY COMMISSION TO APPROVE AN ALTERNATIVE REGULATORY PLAN PURSUANT TO IND. CODE § 8-1-2.5-1, *ET SEQ.*, FOR THE OFFERING OF ENERGY EFFICIENCY CONSERVATION, DEMAND RESPONSE, AND DEMAND-SIDE MANAGEMENT PROGRAMS AND ASSOCIATED RATE TREATMENT INCLUDING INCENTIVES PURSUANT TO A REVISED STANDARD CONTRACT RIDER NO. 66 IN ACCORDANCE WITH IND. CODE §§ 8-1-2.5-1 *ET SEQ.* AND 8-1-2-42(a); AUTHORITY TO DEFER PROGRAM COSTS ASSOCIATED WITH ITS ENERGY EFFICIENCY PORTFOLIO OF PROGRAMS; AUTHORITY TO IMPLEMENT NEW AND ENHANCED ENERGY EFFICIENCY PROGRAMS, INCLUDING THE POWERSHARE® PROGRAM IN ITS ENERGY EFFICIENCY PORTFOLIO OF PROGRAMS; AND APPROVAL OF A MODIFICATION OF THE FUEL ADJUSTMENT CLAUSE EARNINGS AND EXPENSE TESTS	)	CAUSE NO. 43374

AMENDED AND RESTATED

STIPULATION

AND

AGREEMENT

January 15, 2009

252886

AMENDED AND RESTATED STIPULATION AND AGREEMENT

This Amended and Restated Stipulation and Agreement ("Amended Agreement") is entered into this 15th day of January, 2009, by and between Duke Energy Indiana, Inc. ("Duke Energy Indiana"), Duke Energy Indiana – Industrial Group ("Industrial Group"), Wal-Mart Stores East, LLP ("Wal-Mart"), Nucor Steel, a division of Nucor Corporation ("Nucor"), Steel Dynamics, Inc.-Engineered Bar Products Division ("SDI"), Kroger Company ("Kroger"), and the Indiana Office of Utility Consumer Counselor (the "OUCC") (together "the Parties").

NOW, THEREFORE, the Parties agree as follows:

1. Scope of Agreement. This Amended Agreement, along with the August 15, 2008 Stipulation and Agreement entered into between Duke Energy Indiana and the OUCC ("the August 15 Settlement") and the Stipulation and Agreement entered into between Nucor, SDI, Kroger and the OUCC and filed with the Commission on November 3, 2008 ("Opt-Out Settlement") (collectively, "the Settlements"), comprehensively resolves all issues between the Parties associated with Duke Energy Indiana's alternative regulatory plan as filed in Cause No. 43374.

a). Agreement Framework. Attached hereto as Exhibit A is a Term Sheet setting forth specific provisions of the settlement ("Amended and Restated Settlement Terms") that, along with the August 15 Settlement and the Opt-Out Settlement, is intended by the Parties to resolve all pending issues relating to Cause No. 43374 relative to the Parties. The terms of the Amended Agreement are effective upon approval by the Indiana Utility Regulatory Commission ("Commission").

2. Integration. Approval of this Agreement constitutes approval of the Settlement Terms attached hereto as Exhibit A.

3. Presentation of the Agreement.

a). The Parties will jointly move the Commission for approval of the Settlements in their entirety. This Amended Agreement, including the Amended and Restated Settlement Terms in Exhibit A, is not severable from either the August 15 Settlement or the Opt-Out Settlement and the Settlements shall be accepted or rejected by the Commission in their entirety without modification or further condition that is unacceptable to any Party, consistent with section 3(c) below.

b). The Parties agree to support or not oppose the approval in their entirety of the August 15 Settlement or Opt-Out Settlement. The Parties agree that Duke Energy Indiana's case-in-chief filing, as modified by the August 15 Settlement, the Opt-Out Settlement, and this Amended Agreement shall be taken together as whole and shall constitute the Company's alternative regulatory plan. Nucor, SDI, Kroger, the Industrial Group, and Wal-Mart agree not to offer for admission into the record their respective testimonies and exhibits previously filed in this proceeding regarding the Settlements (*i.e.* testimony filed on October 27, 2008 and December 19, 2008). The Parties may, if they choose, file additional testimony in support of this Agreement.

c). If the Order of the Commission in this proceeding modifies or conditions the August 15 Settlement, only the parties to the August 15 Settlement may decide to accept or reject such modification or condition. If the Order of the Commission modifies or conditions of the Opt-Out Settlement, only the parties to the Opt-Out Settlement may decide to accept or reject such modification or condition. If the Order of the Commission in this proceeding modifies or conditions approval of this Amended Agreement, only the Parties to this Amended Agreement may decide to accept or reject such modification or condition.

4. Effect and Use of Stipulation and Agreement.

a). The terms of this Amended Agreement, including the Amended and Restated Settlement Terms in Exhibit A, represent a fair, just, and reasonable resolution by negotiation and compromise. As set forth in the Order in *Re Petition of Richmond Power & Light*, Cause No. 40434 at page 10, as a term of this Amended Agreement, the Commission must assure the Parties that it is not the Commission's intent to allow this Amended Agreement, or the Order approving it, to be cited as precedent by any person or deemed an admission by any Party in any other proceeding except as necessary to enforce its terms before the Commission, or any court of competent jurisdiction on these particular issues. This Amended Agreement, including the Amended and Restated Settlement Terms in Exhibit A, is solely the result of compromise in the settlement process. Nothing contained herein is to be construed or deemed an admission, liability, or wrongdoing on the part of Duke Energy Indiana. Each of the parties hereto has entered into this Amended Agreement solely to avoid further disputes and litigation with the attendant inconvenience and expenses.

b). The evidence presented by the Parties in this Cause constitutes substantial evidence sufficient to support the August 15 Settlement, the Opt-Out Settlement and this Amended Agreement and provides an adequate evidentiary basis upon which the Commission can make any findings of fact and conclusions of law necessary for the approval of both the August 15 Settlement, the Opt-Out Settlement and this Amended Agreement, as filed.

c). The issuance of a final Order by the Commission approving the August 15 Settlement, the Opt-Out Settlement, and this Amended Agreement, including the Amended and Restated Settlement Terms in Exhibit A, without modification shall terminate all proceedings in regard to these Agreements.

d). The undersigned represent and agree that they are fully authorized to execute this Amended Agreement on behalf of their designated clients who will be bound thereby.

e). The Parties shall not appeal the agreed final Order or any subsequent Commission order to the extent such order is specifically implementing, without modification, the provisions of the August 15 Settlement, the Opt-Out Settlement, and this Amended Agreement, including the Amended and Restated Settlement Terms in Exhibit A, and the Parties shall not support any appeal of any such order by a person not a party to this Amended Agreement.

f). The provisions of this Amended Agreement, including the Amended and Restated Settlement Terms in Exhibit A, shall be enforceable by any party at the Commission or any court of competent jurisdiction, whichever is applicable.

g). The communications and discussions during the negotiations and conferences that produced this Amended Agreement, including the Amended and Restated Settlement Terms in Exhibit A, have been conducted on the explicit understanding that they are or relate to offers of settlement and shall therefore be privileged.

ACCEPTED AND AGREED this 15th day of January, 2009.

By:________________________
Melanie Price
Attorney for Duke Energy Indiana

By:____________________
Kurt Boehm
Attorney for Kroger

This sheet is a signature page to the Amended Settlement in Cause No. 43374.

By: ______________________
David Stippler
Indiana Office of Utility Consumer Counselor

This sheet is a signature page to the Amended Settlement in Cause No. 43374.

By: ______________________
Peter Matheis
Attorney for Nucor

This sheet is a signature page to the Amended Settlement in Cause No. 43374.

By: [signature]
Damon Xenopoulos
Attorney for SDI

This sheet is a signature page to the Amended Settlement in Cause No. 43374.

By: ______________________
Jennifer Wheeler-Terry
Attorney for Duke Energy Indiana Industrial Group

This sheet is a signature page to the Amended Settlement in Cause No. 43374.

By:__________________________
David Hanselman
Grace Wung
Attorneys for Wal-Mart Stores of the East, LP

This sheet is a signature page to the Amended Settlement in Cause No. 43374.

Exhibit A

Redline to the Opt-Out Settlement Agreement filed on November 3, 2008

AMENDED AND RESTATED SETTLEMENT TERMS

These settlement terms reflect an amendment to the Stipulation and Agreement filed with the Indiana Utility Regulatory Commission on November 6, 2008 among Duke Energy Indiana, Inc. ("Duke Energy Indiana" or "Company"), the Indiana Office of Utility Consumer Counselor ("OUCC"), Nucor Steel, a Division of Nucor Corporation ("Nucor"), Steel Dynamics, Inc.-Engineered Bar Products Division ("SDI"), and Kroger Company ("Kroger") (the "Initial Parties"). The Initial Parties consent to the Amended and Restated Stipulation and Agreement, including these Amended and Restated Settlement Terms.
(collectively referred to as "the Parties") agree as follows:

The Stipulation and Agreement entered into with the Indiana Office of Utility Consumer Counselor ("OUCC") and filed with the Indiana Utility Regulatory Commission on August 15, 2008 in Cause No. 43374 contemplated that there would be further discussions, specifically around opt-out provisions, with other parties. Specifically, Paragraph D5 states that "[f]inal target discussions should remain open as opt-out provisions and other key issues are discussed with other intervening parties." In furtherance of the spirit of the August 15 Settlement, ~~Duke Energy Indiana, Inc. ("Duke Energy Indiana" or "Company"), the OUCC, Nucor Steel, a Division of Nucor Corporation ("Nucor"), Steel Dynamics, Inc. Engineered Bar Products Division ("SDI") and Kroger Company ("Kroger")~~ the Initial Parties and the Industrial Group and Wal-Mart Stores East, LP (collectively referred to as "the Parties") agree as follows:

A. Opt Out for Large Customers

1. Eligibility. The Parties agree that a large industrial and commercial customer in Indiana may opt out of the energy conservation and/or demand response components of the Company's proposed Standard Contract Rider No. 66 ("Rider EE") if the customer's aggregated annual maximum peak demand is greater than ~~25,000~~5,000 kW.
   a. A customer may aggregate the load of the Duke Energy Indiana accounts of its affiliates to meet this opt out threshold. For purposes of this provision, an "affiliate" shall be defined as any business entity of which 50% or more is owned or controlled, directly or indirectly, by the customer.
   b. If a customer qualifies to opt out of the Company's Rider EE, the customer may choose to opt out for select accounts/locations or all accounts, at its sole election. However, the customer cannot opt out of individual programs.
   c. In order to ensure a manageable administrative process, opt-out decision-making will be limited for demand response and conservation as detailed in sections A.2 and A.3, respectively.

2. Demand Response Programs.
   a. A customer may opt out of the demand response component of Rider EE for the term of the Company's proposed Rider EE. The demand response component of Rider EE

Exhibit A

will not be charged to customer accounts or locations that opt out of demand response during said term. A customer must opt out of demand response within 60-days following the approval of the order in this proceeding. Once an eligible customer has opted-out of the demand response component of Rider EE, they will not be permitted to opt-back-in for the initial term of Rider EE. If the customer does not opt out of the demand response component of Rider EE within this 60 day period, the customer will be billed Rider EE charges for the term of this Agreement.

b. There is no customer certification required to opt out of the demand response component of Rider EE.

3. Energy Conservation Programs.

a. In order to ensure a manageable administrative process, opt-out decision-making will occur only once per year during an enrollment period for the conservation component of Rider EE. A customer must choose to opt out of the conservation component during the first sixty days following approval of the final order in this proceeding. Thereafter, there will be an annual enrollment/ opt-out period that ends 60 days prior to the beginning of the subsequent vintage year for the conservation component. During the enrollment/ opt-out period, qualifying customers may designate which of their accounts will opt-out (or opt back-in) of energy conservation programs. Once a customer has chosen to opt-out of the conservation component, they will not be entitled to (re)enroll unless they notify the Company of their intention in writing to opt-in during the annual enrollment period.

a.b At the time of the election to opt out of the energy conservation component of Rider EE, the customer must self-certify or attest that, as to each facility for which the customer seeks to opt out, within the last three years it has performed or had performed an energy audit or analysis or within the next six months will perform an energy audit or analysis and has implemented or has plans for implementing the energy efficiency cost-effective measures-. identified for installation in that audit or analysis. Duke Energy Indiana will collect and maintain the self-certifications for the term of the program and treat such certifications as confidential customer information. Duke Energy Indiana will make the self-certifications and make them available to the Commission and the OUCC at their request for informational purposes and subject to confidentiality restrictions. The affected customer will also be notified.

cb. A customer may opt out of the energy conservation component of Rider EE for each vintage year. Energy conservation programs are fully paid for in the vintage year in which they occur. Lost margin recovery will occur for two additional years. For example, a large customer who participates in vintage year 1, could opt-out of vintage years 2, 3 and 4. The customer would pay the energy conservation component of Rider EE in vintage year 1 and lost margins associated with year 1 in the first year. The customer would continue to see EE Rider charges in years 2 and 3 to collect vintage year 1 lost margin recovery for years 2 and 3. The customer would not incur any charges for the energy conservation component or lost margins associated with vintage years 2 or 3.

de. The vintage year approach provides customers with greater flexibility to opt out and back in to Duke Energy Indiana's energy conservation component of Rider EE. For

Exhibit A

example, a customer who opts out of vintage year 1 and 2 may opt in for vintage year 3. The vintage year approach should make it easier for large customers to participate in energy conservation programs.

ed. Once a customer opts out, they will be out until they elect to opt back in.

fe. A customer must elect to opt-out, or back in, no later than 60-days prior to the beginning of a vintage year.

gf. If a customer elects to opt out of energy conservation component, they forego participation in the true up process at the end of year four. In other words, a customer must participate all four years to be included in the true up process.

4. Customer Equipment. If equipment is required on the customer side of the meter for demand response or energy conservation programs covered by the August 15 Agreement, and the customer provides such equipment, the Company agrees to waive any charges for the equipment. If the Company installs such equipment on the customer's behalf, the Company will charge the cost of installation to the customer. The equipment requirements, and determination of customer equipment meeting those requirements will be determined by the Company at its sole discretion.

B. Treatment of Future Custom Demand Response Special Contracts for Large Customers

1. Duke Energy Indiana commits at this time it shall not seek recovery of any demand response costs associated with future custom demand response special contracts (*i.e.*, non-tariff contracts) under Rider EE (for example, contracts currently being negotiated with SDI and Nucor). In other words, the demand response impacts of these contracts will be omitted from the save-a-watt model and shall have no effect on Rider EE. The Company reserves the right to request recovery of any demand response associated costs under such contracts in its Rider 70 or other proceedings.
2. Duke Energy Indiana further agrees that if any future custom demand response special contract for large customers (*i.e.*, a non-tariff contract) does not meet the Midwest ISO's Module E Resource Adequacy requirements or approval by the Commission as a planning resource, then the Company will not seek recovery of any capacity payments associated with demand response under such contracts (in Rider 70 or elsewhere).

C. Grandfathering PowerShare CallOption

1. Existing customers, 5MW and above who have the option to opt out of Rider EE, shall be grandfathered at their existing level of participation in PowerShare CallOption to continue under the existing cost recovery structure (*i.e.*, Rider 70) subject to the existing PowerShare CallOption being modified to comply with Midwest ISO's resource adequacy requirements. See Confidential Attachment No. 1 for the grandfathered customers and MW amounts. Any MW of PowerShare CallOption beyond the specific customer and MWs grandfathered and any conversion of existing PowerShare Call Option to a new PowerShare product offering will be treated as part of Rider EE, as long as the program meets the Midwest ISO's resource adequacy requirements.
2. Rate recovery associated with the grandfathered demand response load will continue under Rider 70 as it does today. Additionally, the amount of PowerShare expense

Exhibit A

included in base rates today will remain in base rates and continue to be annually reconciled (trued-up) with the amount of PowerShare expense that continues to be recovered under Rider 70 (*i.e.*, expenses associated with PowerShare QuoteOption and grandfathered PowerShare CallOption).

3. The grandfathered PowerShare CallOption MWs will still produce avoided cost savings up to $9.3 million, and therefore, together with Rider EE programs may allow Duke Energy Indiana to achieve its avoided cost goal of $260 million. The net effect is that the Rider EE targeted avoided cost savings target may be adjusted to no less than $250.7 million to reflect these Rider 70 grandfathered MWs described above for purposes of determining the application of the capped rate of return on program costs contained in the Settlement Agreement filed on August 15, 2008.

D. Other Provisions

1. The Parties acknowledge that issues regarding participation in RTO demand response programs are pending in Cause No. 43566, and the parties do not intend anything in the settlement agreement filed in this proceeding to limit what may be determined in Cause No. 43566. Likewise, none of the Parties, by entering into the settlement agreement in this proceeding, has acquiesced in or waived any position with respect to any other proceeding, including such proceedings that Duke Energy Indiana has committed to initiate as part of settlement agreements in this proceeding.

2. Duke Energy Indiana shall label save-a-watt as a trial program.

3. The revenues and expenses associated with the save-a-watt program (Rider EE) shall be included in the FAC earnings and expense tests.

Exhibit A

AMENDED AND RESTATED SETTLEMENT TERMS

These settlement terms reflect an amendment to the Stipulation and Agreement filed with the Indiana Utility Regulatory Commission on November 6, 2008 among Duke Energy Indiana, Inc. ("Duke Energy Indiana" or "Company"), the Indiana Office of Utility Consumer Counselor ("OUCC"), Nucor Steel, a Division of Nucor Corporation ("Nucor"), Steel Dynamics, Inc.-Engineered Bar Products Division ("SDI"), and Kroger Company ("Kroger") (the "Initial Parties"). The Initial Parties consent to the Amended and Restated Stipulation and Agreement, including these Amended and Restated Settlement Terms.
(collectively referred to as "the Parties") agree as follows:

The Stipulation and Agreement entered into with the Indiana Office of Utility Consumer Counselor ("OUCC") and filed with the Indiana Utility Regulatory Commission on August 15, 2008 in Cause No. 43374 contemplated that there would be further discussions, specifically around opt-out provisions, with other parties. Specifically, Paragraph D5 states that "[f]inal target discussions should remain open as opt-out provisions and other key issues are discussed with other intervening parties." In furtherance of the spirit of the August 15 Settlement, the Initial Parties and the Industrial Group and Wal-Mart Stores East, LP (collectively referred to as "the Parties") agree as follows:

A. Opt Out for Large Customers

1. Eligibility. The Parties agree that a large industrial and commercial customer in Indiana may opt out of the energy conservation and/or demand response components of the Company's proposed Standard Contract Rider No. 66 ("Rider EE") if the customer's aggregated annual maximum peak demand is greater than 5,000 kW.
   a. A customer may aggregate the load of the Duke Energy Indiana accounts of its affiliates to meet this opt out threshold. For purposes of this provision, an "affiliate" shall be defined as any business entity of which 50% or more is owned or controlled, directly or indirectly, by the customer.
   b. If a customer qualifies to opt out of the Company's Rider EE, the customer may choose to opt out for select accounts/locations or all accounts, at its sole election. However, the customer cannot opt out of individual programs.
   c. In order to ensure a manageable administrative process, opt-out decision-making will be limited for demand response and conservation as detailed in sections A.2 and A.3, respectively.

2. Demand Response Programs.
   a. A customer may opt out of the demand response component of Rider EE for the term of the Company's proposed Rider EE. The demand response component of Rider EE will not be charged to customer accounts or locations that opt out of demand response during said term. A customer must opt out of demand response within 60-days

Exhibit A

following the approval of the order in this proceeding. Once an eligible customer has opted-out of the demand response component of Rider EE, they will not be permitted to opt-back-in for the initial term of Rider EE. If the customer does not opt out of the demand response component of Rider EE within this 60 day period, the customer will be billed Rider EE charges for the term of this Agreement.

b. There is no customer certification required to opt out of the demand response component of Rider EE.

3. Energy Conservation Programs.
   a. In order to ensure a manageable administrative process, opt-out decision-making will occur only once per year during an enrollment period for the conservation component of Rider EE. A customer must choose to opt out of the conservation component during the first sixty days following approval of the final order in this proceeding. Thereafter, there will be an annual enrollment/ opt-out period that ends 60 days prior to the beginning of the subsequent vintage year for the conservation component. During the enrollment/ opt-out period, qualifying customers may designate which of their accounts will opt-out (or opt back-in) of energy conservation programs. Once a customer has chosen to opt-out of the conservation component, they will not be entitled to (re)enroll unless they notify the Company of their intention in writing to opt-in during the annual enrollment period.
   b At the time of the election to opt out of the energy conservation component of Rider EE, the customer must self-certify that, within the last three years it has performed or had performed an energy audit or analysis or within the next six months will perform an energy audit or analysis and has implemented or has plans for implementing energy efficiency measures. Duke Energy Indiana will collect and maintain the self-certifications for the term of the program and treat such certifications as confidential customer information. Duke Energy Indiana will make the self-certifications available to the Commission and the OUCC at their request for informational purposes and subject to confidentiality restrictions. The affected customer will also be notified. c. A customer may opt out of the energy conservation component of Rider EE for each vintage year. Energy conservation programs are fully paid for in the vintage year in which they occur. Lost margin recovery will occur for two additional years. For example, a large customer who participates in vintage year 1, could opt-out of vintage years 2, 3 and 4. The customer would pay the energy conservation component of Rider EE in vintage year 1 and lost margins associated with year 1 in the first year. The customer would continue to see EE Rider charges in years 2 and 3 to collect vintage year 1 lost margin recovery for years 2 and 3. The customer would not incur any charges for the energy conservation component or lost margins associated with vintage years 2 or 3.
   d. The vintage year approach provides customers with greater flexibility to opt out and back in to Duke Energy Indiana's energy conservation component of Rider EE. For example, a customer who opts out of vintage year 1 and 2 may opt in for vintage year 3. The vintage year approach should make it easier for large customers to participate in energy conservation programs.
   e. Once a customer opts out, they will be out until they elect to opt back in.

Exhibit A

f. A customer must elect to opt-out, or back in, no later than 60-days prior to the beginning of a vintage year.
g. If a customer elects to opt out of energy conservation component, they forego participation in the true up process at the end of year four. In other words, a customer must participate all four years to be included in the true up process.

4. Customer Equipment. If equipment is required on the customer side of the meter for demand response or energy conservation programs covered by the August 15 Agreement, and the customer provides such equipment, the Company agrees to waive any charges for the equipment. If the Company installs such equipment on the customer's behalf, the Company will charge the cost of installation to the customer. The equipment requirements, and determination of customer equipment meeting those requirements will be determined by the Company at its sole discretion.

B. Treatment of Future Custom Demand Response Special Contracts for Large Customers

1. Duke Energy Indiana commits at this time it shall not seek recovery of any demand response costs associated with future custom demand response special contracts (*i.e.*, non-tariff contracts) under Rider EE (for example, contracts currently being negotiated with SDI and Nucor). In other words, the demand response impacts of these contracts will be omitted from the save-a-watt model and shall have no effect on Rider EE. The Company reserves the right to request recovery of any demand response associated costs under such contracts in its Rider 70 or other proceedings.
2. Duke Energy Indiana further agrees that if any future custom demand response special contract for large customers (*i.e.*, a non-tariff contract) does not meet the Midwest ISO's Module E Resource Adequacy requirements or approval by the Commission as a planning resource, then the Company will not seek recovery of any capacity payments associated with demand response under such contracts (in Rider 70 or elsewhere).

C. Grandfathering PowerShare CallOption

1. Existing customers, 5MW and above who have the option to opt out of Rider EE, shall be grandfathered at their existing level of participation in PowerShare CallOption to continue under the existing cost recovery structure (*i.e.*, Rider 70) subject to the existing PowerShare CallOption being modified to comply with Midwest ISO's resource adequacy requirements. See Confidential Attachment No. 1 for the grandfathered customers and MW amounts. Any MW of PowerShare CallOption beyond the specific customer and MWs grandfathered and any conversion of existing PowerShare Call Option to a new PowerShare product offering will be treated as part of Rider EE, as long as the program meets the Midwest ISO's resource adequacy requirements.
2. Rate recovery associated with the grandfathered demand response load will continue under Rider 70 as it does today. Additionally, the amount of PowerShare expense included in base rates today will remain in base rates and continue to be annually reconciled (trued-up) with the amount of PowerShare expense that continues to be recovered under Rider 70 (*i.e.*, expenses associated with PowerShare QuoteOption and grandfathered PowerShare CallOption).

Exhibit A

3. The grandfathered PowerShare CallOption MWs will still produce avoided cost savings up to $9.3 million, and therefore, together with Rider EE programs may allow Duke Energy Indiana to achieve its avoided cost goal of $260 million. The net effect is that the Rider EE targeted avoided cost savings target may be adjusted to no less than $250.7 million to reflect these Rider 70 grandfathered MWs described above for purposes of determining the application of the capped rate of return on program costs contained in the Settlement Agreement filed on August 15, 2008.

D. Other Provisions

1. The Parties acknowledge that issues regarding participation in RTO demand response programs are pending in Cause No. 43566, and the parties do not intend anything in the settlement agreement filed in this proceeding to limit what may be determined in Cause No. 43566. Likewise, none of the Parties, by entering into the settlement agreement in this proceeding, has acquiesced in or waived any position with respect to any other proceeding, including such proceedings that Duke Energy Indiana has committed to initiate as part of settlement agreements in this proceeding.

2. Duke Energy Indiana shall label save-a-watt as a trial program.

3. The revenues and expenses associated with the save-a-watt program (Rider EE) shall be included in the FAC earnings and expense tests.

ATTACHMENT 1

DUKE ENERGY INDIANA, INC.
CUSTOMERS ABOVE 5MW WHO CURRENTLY PARTICIPATE IN
POWERSHARE® CALLOPTION

Customer	PowerShare® CallOption KW
ELI LILLY INC	1,000
INDIANA UNIVERSITY	500
CUMMINS ENGINE	915
LONE STAR INDUSTRIES	4,913
ESSROC MATERIALS	4,500
ROCHESTER METAL PRODUCTS	12,136
MARSH SUPERMARKETS	2,597
LEHIGH CEMENT	2,600
IMPACT FORGE	2,000
KOBELCO METAL POWDER	3,600
FORD METER BOX	250
Total	**35,011**

STAFF-DR-01-014

REQUEST:

Given that Duke Energy Ohio, Inc. is the parent company and owner of Duke Kentucky, explain the relevance of the discussion of investors' interest in the save-a-watt plan on pages 10-11 of the Stevie Testimony.

RESPONSE:

Duke Energy has taken the initiative to pursue the consistent implementation of energy efficiency programs in all of the jurisdictions in which it operates. While Duke Energy Kentucky may be a subsidiary of Duke Energy Ohio, the regulatory treatment of energy efficiency programs for any part of Duke Energy will be of interest to current and potential investors in Duke Energy because of the effects energy efficiency can have on current and future earnings.

PERSON RESPONSIBLE: Richard G. Stevie

STAFF-DR-01-015

REQUEST:

Provide an update of the status of the Market Potential Study discussed on pages 13-14 of the Stevie Testimony.

RESPONSE:

A copy of the completed market potential study is provided in Attachment Staff-DR-01-015.

PERSON RESPONSIBLE: Richard G. Stevie

Kentucky Market Potential Study for Demand Side Management Programs Final Report

Prepared for:
Duke Energy Kentucky
Cincinnati, Ohio

Prepared by:
Forefront Economics Inc.
H. Gil Peach & Associates LLC

with contributions from:
Mark E. Thompson
H. Gil Peach
Howard Reichmuth
John Mitchell

February 9, 2009

Forefront Economics Inc. and H. Gil Peach & Associates. Kentucky Market Potential Study for Demand Side Management Programs Final Report. Report prepared for Duke Energy Kentucky, Cincinnati, Ohio, February 2009.

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EXECUTIVE OVERVIEW

This document presents a long-term Demand Side Management (DSM) Market Potential Study (MPS) for residential and non-residential electric and gas customers in the Duke Energy Kentucky (DEK) service area. The MPS was prepared by Forefront Economics Inc and H. Gil Peach and Associates and includes an assessment of the long-term market potential for DSM savings and a five-year DSM action plan. Long-term DSM savings potential is assessed from both the technical and economic perspectives. The design, implementation, oversight and cost effectiveness of specific DSM programs are addressed in the five-year action plan.

Overview of Findings

Key findings from the MPS are summarized in Table 1.

Table 1. Annual Electric and Gas Usage and DSM Potential 20-Year Planning Horizon

	kWh (millions)	Percent of Total	MMCF	Percent of Total
Total Usage	4,181	100%	11,552	100%
Technical Potential Savings	1,276	31%	3,360	29%
Economic Potential (@ $0.06/kWh, $0.90/therm)*	622	15%	2,358	20%
Recommended DSM Programs (after 5 years) **	136	3.4%	113	1.0%

* Refers to the energy savings that can be acquired with DSM for less cost than the cost of serving the load with traditional supply side resources.
** DSM savings shown as percent of Year 5 usage.

The technical potential shows that if the energy saving technologies, identified in this report, were applied across all applicable customers, without regard to market or economic constraints, weather normalized annual electricity usage could be reduced by 31 percent and weather normalized gas usage could be reduced by 29 percent. A recent meta-analysis of potential studies found a median technical potential of 33 percent for electric measures and 40 percent for gas measures across all customer segments.[1] While our estimate of electric technical potential is well within the range found in the meta-analysis, our estimate of gas technical potential is somewhat lower because our energy modeling reflects the interdependencies between gas and electricity. In other words, the increase in gas space heating due to electric efficiency improvements offsets the savings from the broad application of gas energy efficiency technologies thereby lowering the overall gas technical potential.

Economic potential reflects the subset of technical potential that can be acquired for less than the avoided cost of supply. Avoided costs vary significantly depending on the nature of the served load, fuel costs, distribution charges and other costs. Economic potential is presented in the body of this report in the form of a DSM supply curve showing the economic potential depending on the level of avoided cost. We show economic potential in Table 1 at $0.06 per kWh and $0.90 per therm. These avoided cost points are based on the observed range of electric avoided cost for various types of loads analyzed with DSMore but are ultimately somewhat arbitrary selections on our part.

[1] Nadel, Steven, Anna Shipley and R. Neal Elliott. The Technical, Economic and Achievable Potential for Energy-Efficiency in the U.S. – A Meta-Analysis of Recent Studies. 2004 ACEEE Summer Study in Energy Efficiency in Buildings.

Using these levels for avoided cost, we estimate that nearly half of the electric technical potential and 70 percent of the gas technical potential is cost effective. We have included incremental measure costs and a rough estimate of DSM program delivery and administration expenses in our calculation of economic potential. More precise estimates of DSM acquisition costs are reflected in the five-year DSM action plan.

Savings from DSM programs included in the five-year action plan are also shown in Table 1. After five years of operation, these programs are expected to lower electric usage by over 3 percent and decrease gas usage by 1.0 percent. The percentage is lower for gas due to the offsetting increase in gas space heating demand from electrical efficiency improvements, primarily lighting. The approach used to develop the set of recommended DSM programs consisted of the following steps:

(1) conduct a market assessment for determining electric and gas usage and characteristics across customer groups,
(2) review a comprehensive list of DSM technologies and estimate the energy savings potential,
(3) consider the appropriateness of selected technologies for the DEK service area in terms of markets, cost effectiveness and accessibility to products,
(4) group the highest potential technologies into logical sets for marketing and outreach,
(5) design program strategies to promote the technologies based on industry best practices,
(6) consider the cost effectiveness of the designed program, including costs to the utility and to participating customers, and
(7) describe a final set of recommended program designs that make the most sense for the utility and have a strong potential for delivering cost effective energy savings.

The process resulted in the following set of recommended programs. DEK will, of course, make the final selection of programs to be submitted for regulatory approval.

Reference	Program Name	Cost Effective (TRC Test)	Recommended
1	Commercial and Industrial Peak Reduction	Yes	Yes
2	Residential Peak Reduction	Yes	Yes
3	Renewables and Demonstrations	No	Yes
4	Commercial and Industrial Incentives	Yes	Yes
5	Commercial and Industrial Rebates	Yes	Yes
6	Commercial and Industrial Retro-Commissioning Lite	Yes	Yes
7	Commercial and Industrial HVAC Optimization	Yes	Yes
8	Commercial and Industrial Audit	Yes	Yes
9	Commercial and Industrial New Construction	Yes	Yes
10	Residential Whole House	Yes	Yes
11	Residential Rebates	Yes	Yes
12	Residential Appliance Recycling	Yes	Yes
13	Residential New Construction	Yes	Yes
14	Residential Solar Siting	Yes	Yes
15	Residential Low and Moderate Income Weatherization	No	Yes

Expected savings and program budgets are presented annually in Table 2. Program budgets are also presented on a cost per utility customer and percent of retail revenue.

Table 2. Energy Savings and Annual Budget for Recommended Programs

Year	Cumulative kWh Savings (millions)	Cumulative MMCF Savings	Program Budget (millions $)	Cost per Customer	Percent of Revenue
1	12.9	7.0	$ 4.60	$ 30.87	1.0%
2	35.1	20.8	$ 5.71	$ 37.92	1.3%
3	63.3	43.3	$ 7.66	$ 50.42	1.7%
4	97.9	73.4	$ 8.01	$ 52.17	1.8%
5	136.2	113.1	$ 9.46	$ 60.99	2.1%

Annual program budgets are estimated at $9.5 million in Year 5 for all recommended programs. This amounts to approximately 2.1 percent of the revenues from customers included in this study and equates to spending of $61 per customer for program delivery cost and incentives. Based on recent data from the US Department of Energy on DSM program spending, $61 per customer is higher than average of comparably sized utilities but still well within the range of spending. Spending per customer by the comparable utilities ranged from less than one dollar to nearly $90, averaging $23. Spending as a percent of revenue averaged 1.1 percent with a wide range.

Our five-year program plan provides an estimate of realistically achievable potential in the near term. As such, it reflects an overall level of effort that, in our judgment, is an aggressive but realistic ramp up of DSM programs. Although the five-year plan reflects a significant increase in DSM, it is not meant to provide an estimate of maximum achievable potential. In considering what are realistic program participation rates and incentive levels through the five-year plan, we rely on the experience of other utilities, best practices and our own professional judgment. Accordingly, our plan implicitly reflects assumptions regarding the availability of capital and overall economic conditions consistent with DSM investment. The macro economic climate and availability of capital that will prevail over the next five years is unfolding as this report is written and may negatively influence actual program participation rates.

On the other hand, the incoming administration has set as a priority "green" jobs and energy efficiency. To the extent these policy objectives are translated into actual programs and incentives that benefit DSM efforts, program participation rates will be benefited. How the current unfavorable economic climate, policy shifts in favor of DSM and other macro level forces influence program adoption rates and overall DSM acquisition levels will be determined in the years ahead. Whatever the outcome, these counter currents amplify the need to adapt DSM strategy as lessons are learned from implementation.

Overview of Approach

The purpose of this section is to provide an overview of the approach used in the preparation of this DSM Action Plan. Our approach is perhaps best described as three components, each building off of the last. These components are Market Assessment, DSM Potential and DSM Programs.

Market Assessment

Market Assessment provides the foundation layer of the analysis and supports the work of the other two components. The objective of the market assessment component is to describe customers and loads in sufficient detail to provide an understanding of energy usage by market segment. An important aspect of this project is that the market assessment was completed using a blend of internal DEK data, service territory specific secondary data, and detailed energy modeling. By blending internal utility data with secondary data sources, a much richer market assessment is possible. Key to the market assessment layer is a rigorous analysis of actual customer billing and hourly load data to construct electric and gas usage models for each residential and non-residential segment.

DSM Potential

The DSM potential component of the analysis builds off of the market assessment and provides an estimate of technical potential and DSM supply curves showing the amount of DSM potential available at various costs per unit of energy. At this stage of the analysis the savings potential of several Energy Efficiency Measures (EEM) is assessed. EEM savings potential is constructed from the use of secondary information documenting the industry's experience with the technology adjusted for the market assessment and load modeling results specific to DEK. The process of blending internal and secondary information along with energy modeling to develop the market assessment and DSM potential estimates is shown in the figure below.

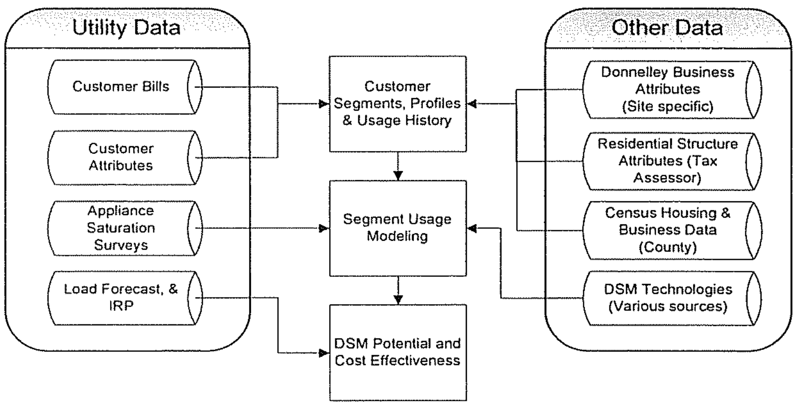


Figure 1. Overview of Market Assessment and DSM Potential Estimates

A significant benefit from this approach is that it results in end-use load profiles and DSM potential estimates by market segment that are based on customer characteristics and energy usage specific to DEK. DEK service territory specific data used to construct the analysis include:

- Monthly energy bills for 23,000 electric and 19,000 gas customer sites sampled from 16 market segments.[2]
- Hourly (8,760) load data for residential and 4 non-residential DEK rate classes. Hourly load data are not typically available for these types of projects and proved extremely valuable in our modeling efforts.
- Residential Appliance Survey conducted in 2007 providing recent information on equipment and end-uses. DEK respondents were selected and analyzed separately from the broader survey.
- Size of home (square feet) and vintage of construction (year built) were obtained from tax-assessor records for residential properties within the DEK service territory.
- Site-specific business attributes for business locations within the DEK service territory. These records provided the information necessary to estimate non-residential floor space and energy utilization per square foot by non-residential segment.
- Long-term load forecast for DEK.

[2] See Appendix E for details on the segmentation and sampling strategy used in this analysis.

DSM Programs

DSM program design represents the final layer of the core analysis of this Action Plan. The program design process builds off of the prior two layers by mapping measures to programs through an analysis of the best practices from other leading electricity and gas utilities. This approach balances engineering and economic characteristics of specific end-use technologies with public policy and corporate objectives. The goals in this effort are, to the extent possible, to incorporate the specific environmental and market characteristics of the service territory, and to orient the programs toward both a technology optimum and a participation optimum. To be effective, these goals in program design and practical implementation will be implemented and optimized within a seasoned marketing framework. Strategic change comes from working closely with customers and suppliers to jointly create program success. The result is a set of recommended programs that are optimized to fit DEK.

Organization of Report

The first five sections following this Executive Overview present the findings of each of the three components or "layers" of analysis discussed above: Market Assessment, DSM Potential (Technical and Economic) and DSM Programs. The final two sections of the main report present program cost effectiveness results and evaluation plans. Several appendices following the main report provide additional documentation on various aspects of the analysis.

In this report the term Demand Side Management (DSM) refers to the planning and implementation of utility programs that influence customer uses of energy in ways that will produce desired changes in the utility's load shape. As such, DSM includes traditional energy efficiency, conservation and demand reduction. All energy usage numbers are 2007 weather normalized unless otherwise stated.

MARKET ASSESSMENT

Energy efficiency planning needs to be based on a sound understanding of customer characteristics. The purpose of this section is to provide a foundation for the DSM planning and analysis presented in subsequent sections. We begin with an overview of energy usage in the DEK service area. A description of the customer base using internal and secondary data precedes the presentation of energy usage models. These models are used to estimate the electric and gas sales by end-uses; such as, space heat, water heat, lighting, cooking, dryers, process energy, and miscellaneous plug loads. The detailed energy usage models also provide a basis for estimating existing efficiency levels, the technical potential, energy savings and cost effectiveness of a wide variety of demand side measures and programs.

Energy use estimates presented in this report are normalized to long-term weather conditions by using the energy usage models applied to a typical or normal year. All energy use and end-use estimates in the report have been normalized to 30-year monthly temperature normals. Though the energy use estimates are for a normal weather year, the models were developed using actual usage and weather data from January 2007 through December 2007.

Overview of Market Sectors

The focus of this study is on the nearly 129,000 electric customers and 93,000 gas customers in the DEK service territory. These customers account for nearly 4 billion kWh annually, as shown in Table 3, and over 11 million MCF annually, as shown in Table 4.

Table 3. DEK Customers and Weather Normalized Annual Electric Usage by Sector

Sector	Customers	Annual Usage (million kWh)	Percent of Total	Use per Customer (kWh/year)
Residential	116,879	1,398	36.2%	11,965
Non-Residential	12,034	2,463	63.8%	204,629
Total	128,913	3,861	100.0%	29,950

Source: Unique premise counts and billing data from CIS extract (Jan 2007 – Dec 2007).

Table 4. DEK Customers and Weather Normalized Annual Gas Usage by Sector

Sector	Customers	Annual Usage (MCF)	Percent of Total	Use per Customer (MCF/year)
Residential	86,048	6,324,652	55.0%	73.5
Non-Residential	6,833	5,182,670	45.0%	758.5
Total	92,881	11,507,322	100.0%	123.9

Source: Unique premise counts and billing data from CIS extract (Jan 2007 – Dec 2007).

The residential sector is far larger in terms of customer count than the non-residential sector. Although there are far fewer non-residential customers than residential, the average non-residential electric customer uses 17 times more electricity than the average residential customer. Similarly, the average non-residential gas customer uses 10 times more gas than the average residential customer. The non-residential sector accounts for 64 percent of the electric consumption and 45 percent of the gas consumption considered in this study.

Monthly electric loads by sector are shown in Figure 2 for electric and Figure 3 for gas with non-residential broken down between commercial and manufacturing (based on SIC code). Residential electric loads are by far the most seasonal with comparable summer and winter peaks. Although not as seasonal as residential, commercial loads peak in the summer and have a less pronounced winter peak. By contrast, manufacturing loads are nearly constant across the months except for a small summer peak in July and August, coincident with the residential and commercial peak.

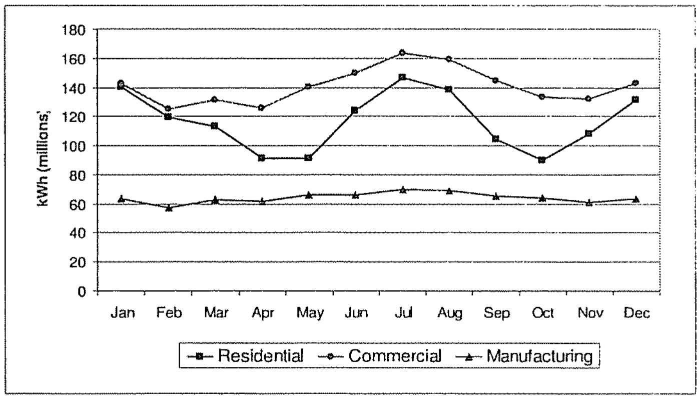


Figure 2. Total Electric Sales by Rate Class

As shown in Figure 3, monthly gas loads are highly seasonal with strong winter demand relative to summer months. Residential gas loads are the most seasonal with sharply higher winter demand relative to summer months. Commercial and manufacturing sectors follow a similar pattern but with progressively less pronounced seasonal variation in consumption.

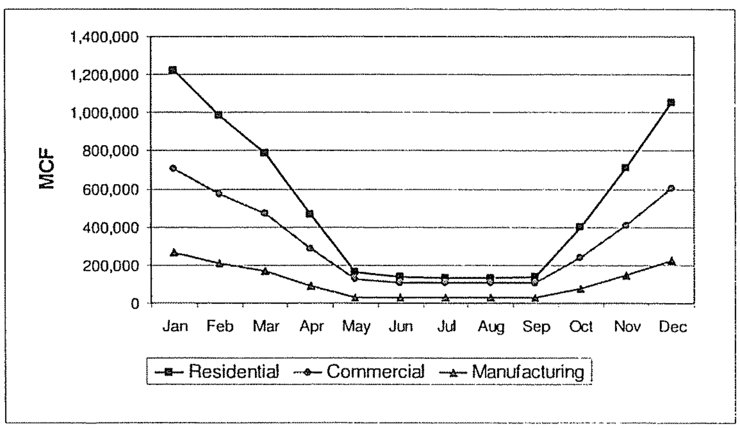


Figure 3. Total Gas Sales by Rate Class

Detailed energy usage analysis by sector and end-use will be presented later in this section. End-use models were estimated for each sector allowing loads to be disaggregated by major end-use. Energy and demand are both important considerations when planning DSM programs. A map of MW demand by month and time of day is shown in Figure 4 for electric and Figure 5 for gas.

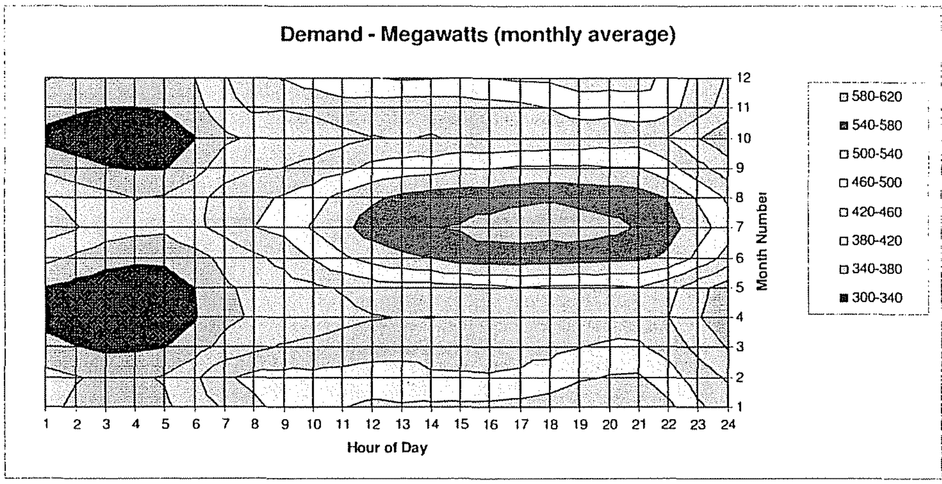


Figure 4. Electric Hourly Average Demand Map

Demand was modeled using several sources of information, including hourly electric load data provided from DEK. A detailed discussion of the methodology is presented in Appendix A. Electric demand is at its highest in July between 3 PM and 7 PM with high loads throughout the afternoon and early evening of the summer months. Gas demand is at its highest in January and February with a morning and evening peak occurring around 8 AM and 6 PM, respectively. DSM technologies and programs which impact loads during these periods will save peak and energy.

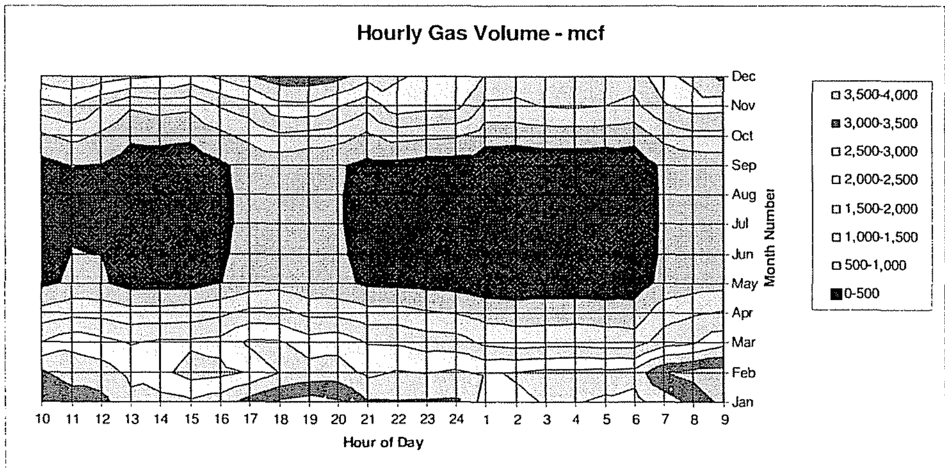


Figure 5. Gas Hourly Average Demand Map

Residential

The market assessment presented in this section begins with a high-level view of residential housing in the DEK service area, followed by a detailed analysis of residential electric loads. We used the following sources of information for the analysis presented in this section:

- CIS Extract obtained from DEK, including monthly billing data.
- The Duke Energy Residential Appliance Saturation Survey (RASS), completed in early 2007.
- Residential assessor records.
- Hourly load data for the DEK residential customer class.

DEK serves 117,000 residential electric customers and 86,000 gas customers in Kentucky. About 60 percent of the electric customers are also DEK gas customers. About 80 percent of gas customers are also DEK electric customers. A simple segmentation strategy based on type of structure and vintage of construction was used to describe and model residential energy usage. This segmentation approach captures the major differences in residential housing stock that impact energy usage and DSM opportunities. The segments were also selected to better describe cost effective DSM opportunities which can vary significantly by type of housing and vintage of construction. Customer counts in each of the four segments are shown in the table below.

Table 5. Residential Customers by Segment and Fuel

	Electric				Gas		
	Single Family	**Multifamily**	**Total**		**Single Family**	**Multifamily**	**Total**
Existing Construction	82,168	33,098	115,266		70,851	13,099	83,950
New Construction	1,517	96	1,613		2,085	13	2,098
Total	83,685	33,194	116,879		72,936	13,112	86,048
Percent	72%	28%	100%		85%	15%	100%
Source: DEK CIS Data							

Single family construction accounts for nearly three-fourths of all residential electric customers and 85 percent of residential gas customers. The remainder is multifamily housing units including duplexes, condominiums and apartment buildings. Single family and multifamily units exhibit many differences that impact energy consumption and energy efficiency potential. These differences include size of unit, appliance penetration, building shell integrity and lifestyle attributes.

There are typically many important differences between older and newer homes that have large impacts on energy use and energy efficiency potential. Differences in the thermal integrity of the building shell and appliance penetration rates, for example, can lead to large differences in annual usage between older and newer homes. Existing construction is defined as all homes with meters installed prior to 2004. Current building practices are reflected in the new construction segment, defined as all customers connected in 2004, 2005 and 2006. Using 2004 as a cutoff is somewhat arbitrary and less important than having a group of homes to model and contrast the differences between existing and new housing stock.

New Construction Levels

Residential construction estimated from housing permit data for the DEK service area is shown in Figure 6. Data shown in Figure 6 are based on monthly permit data lagged to approximate the timing of construction and better align temporally with actual service installations. Single family construction has fallen significantly since 2004. Multifamily construction also dropped since 2005. There were approximately 2,000 total housing units constructed in 2007, about two-thirds the historic average of the last 10 years. Although the mix of construction varies from year to year, over 80 percent of new housing stock is single family units.

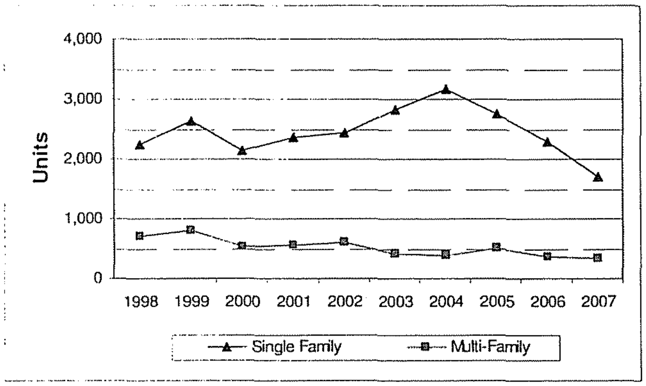


Figure 6. Residential Housing Units Permitted for Construction, DEK Service Area

In addition to the "site built" construction reflected in the permit data, an average of 300 manufactured homes are placed in the DEK service territory annually.[3] Site built homes are constructed on-site without the use of pre-built walls and other major structural components. Manufactured homes are homes built or primarily built off-site and then installed on the building site.

Housing Stock Characteristics

Figure 7 through Figure 9 was derived from real estate data provided by DEK. Housing attribute details are useful for understanding the nature of the housing stock and, therefore, the DSM opportunities.

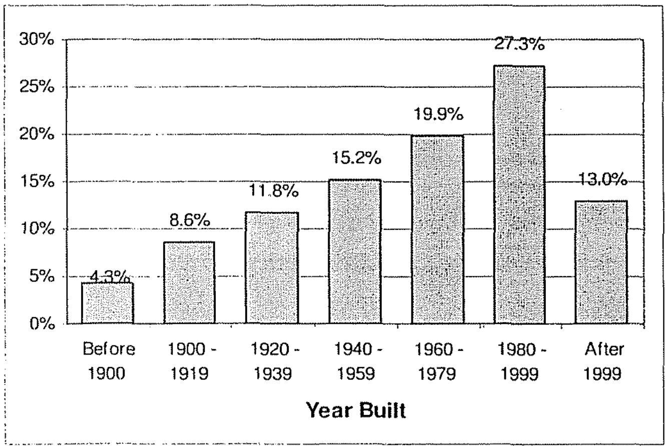


Figure 7. Percent of Single Family Dwellings by Year Built

[3] Based on US Census data for statewide placements of manufactured homes (2005-2007) and the percentage of statewide population living within the service territory.

Sixty percent of the single family housing stock was constructed prior to 1980. These homes represent the largest retrofit opportunity both in terms of the number of homes and the most gains to be acquired from improved shell efficiencies. About 13 percent of the housing stock is less than 10 years old.

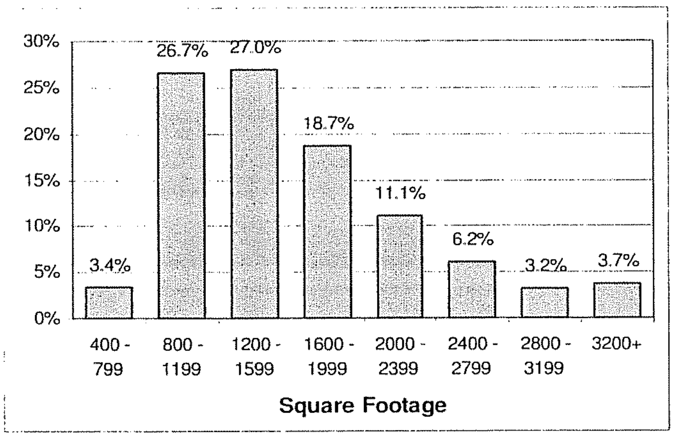


Figure 8. Percent of Single Family Dwellings by Square Feet

Nearly 60 percent of the single family housing stock is smaller than 1,600 square feet, while three-fourths is smaller than 2,000 square feet.

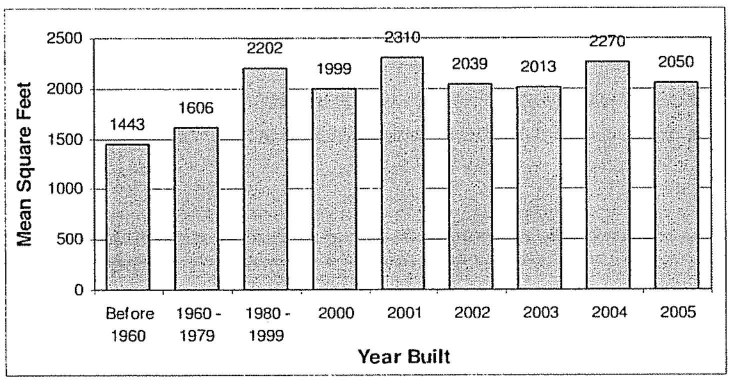


Figure 9. Single Family Mean Square Feet by Year Built

Although square footage has varied between 2000 and 2300 since 1999, single family homes over this period have averaged 2100 square feet.

Appliance Saturation Rates

Appliance saturation rates are important inputs to the segment usage models discussed later in this section. Duke Energy's Residential Appliance Saturation Survey (RASS) was used to estimate the prevalence of heating fuels and appliances. Survey results are reported in Table 6 by segment and fuel for major end-uses and appliances. Segments with insufficient coverage for reporting are listed as "NA".

Table 6. Appliance and End-Use Installation Rates from Residential Survey

	Electric Customers				Gas Customers			
	Single Family		Multifamily		Single Family		Multifamily	
	Existing	New	Existing	New	Existing	New	Existing	New
	n=154	n=12	n=33	n=1	n=123	n=9	n=16	n=1
Main Heat Fuel - Electric:	18%	NA	53%	NA	3%	NA	NA	NA
Standalone FA Furnace	5%	NA	25%	NA	3%	NA	NA	NA
Heat Pump with FA Furnace	9%	NA	19%	NA	0%	NA	NA	NA
Standalone Heat Pump	4%	NA	0%	NA	0%	NA	NA	NA
Other	1%	NA	9%	NA	0%	NA	NA	NA
Main Heat Fuel - Gas/Other:	82%	NA	47%	NA	97%	NA	NA	NA
Standalone FA Furnace	71%	NA	34%	NA	85%	NA	NA	NA
Heat Pump with FA Furnace	3%	NA	0%	NA	3%	NA	NA	NA
Standalone Heat Pump	0%	NA	3%	NA	0%	NA	NA	NA
Other	7%	NA	9%	NA	8%	NA	NA	NA
Used for Cooling:								
Central Air Conditioner	76%	NA	61%	NA	88%	NA	NA	NA
Heat Pump	13%	NA	12%	NA	2%	NA	NA	NA
Window Unit	9%	NA	24%	NA	10%	NA	NA	NA
None	1%	NA	3%	NA	1%	NA	NA	NA
Electric Water Heat	27%	NA	52%	NA	8%	NA	NA	NA
Gas Water Heat	73%	NA	45%	NA	91%	NA	NA	NA
Electric Oven	74%	NA	82%	NA	69%	NA	NA	NA
Electric Range	71%	NA	76%	NA	67%	NA	NA	NA
Electric Clothes Dryer	72%	NA	61%	NA	66%	NA	NA	NA
Dishwasher	77%	NA	55%	NA	77%	NA	NA	NA
Clothes Washer	97%	NA	73%	NA	97%	NA	NA	NA

Source: Duke Energy Appliance Saturation Survey (2007)

The RASS survey was not stratified by vintage of construction so in order to provide a sufficiently large number of new construction respondents, homes built in 2000 and after were classified as new construction. Still, this designation did not provide for a sufficient number of completed surveys in the new multifamily segment. Because of the variance and potential inaccuracies associated with customer reported fuel and equipment information, survey results are used as a guide in calibrating energy usage models rather than absolute model inputs.

Energy Usage Analysis

Monthly billing data at the premise level was aggregated by the four residential customer segments used in this report. An end-use energy (electric and gas) and electric demand model was then estimated using the aggregated billing data, residential survey results, detailed hourly load profiles and weather data. Model assumptions were refined to provide the best empirical fit to the actual customer billing data. The annual usage for each residential segment is shown in Table 7 for electric and gas customers.

Table 7. Annual Usage by Residential Segment and Fuel

	Electric				Gas		
Segment	**Premises**	**Average Annual kWh per Premise**	**Total Usage (millions of kWh)**		**Premises**	**Average Annual CCF per Premise**	**Total Usage (MCF)**
Single Family Existing	82,168	13,510	1,110.1		70,851	751	5,321,223
Multi Family Existing	33,098	8,017	265.3		13,099	657	860,874
Single Family New	1,517	14,414	21.9		2,085	681	141,962
Multi Family New	96	11,775	1.1		13	456	593
Total Residential	**116,879**	**11,965**	**1,398.4**		**86,048**	**735**	**6,324,652**
Source: Energy model results using monthly billing data from DEK.							

The monthly load profiles resulting from the energy models are shown by segment in Table 8.

Table 8. Residential Usage by Housing Type and Fuel

	Electric (thousands kWh)					Gas (MCF)			
Month	**SF Existing**	**MF Existing**	**SF New**	**MF New**		**SF Existing**	**MF Existing**	**SF New**	**MF New**
Jan	110,669	27,705	2,124	139.3		1,033,183	161,100	27,155	119.7
Feb	93,883	23,531	1,816	116.4		833,357	130,526	21,894	95.4
Mar	89,099	22,221	1,758	104.8		665,138	106,347	17,486	73.5
Apr	71,965	17,778	1,460	78.0		390,851	65,630	10,307	39.7
May	72,544	17,128	1,449	66.8		133,490	27,997	3,792	13.9
Jun	99,072	22,641	1,951	79.6		115,229	18,981	3,421	12.6
Jul	117,815	26,437	2,318	92.7		109,781	18,026	3,258	12.2
Aug	111,044	25,003	2,184	87.6		111,191	18,278	3,297	12.3
Sep	83,382	19,088	1,639	66.8		114,375	18,882	3,383	12.5
Oct	71,220	17,155	1,467	73.5		331,239	57,643	8,780	32.7
Nov	85,574	20,927	1,691	98.0		595,738	97,041	15,769	66.3
Dec	103,797	25,733	2,010	126.9		887,650	140,422	23,421	102.2
Total	**1,110,062**	**265,346**	**21,866**	**1,130.4**		**5,321,223**	**860,874**	**141,962**	**593.0**

Because of the large number of homes, the existing stock of single family homes is by far the largest segment, accounting for about 80 percent of the residential sector's electric and gas energy usage. All segments follow a similar monthly load pattern, as expected.

Monthly residential electricity usage by major end-use is shown in Figure 10 and Table 9. *Appliances and* electronics is the largest single end-use, accounting for nearly 40 percent of all annual residential usage. Taken together with the other baseload end-uses (laundry, water heating and lighting), baseloads account for about three-fourths of all residential usage. Space cooling and heating account for 13 percent and 12 percent, respectively, of annual electricity usage but contribute significantly to the seasonal peak.

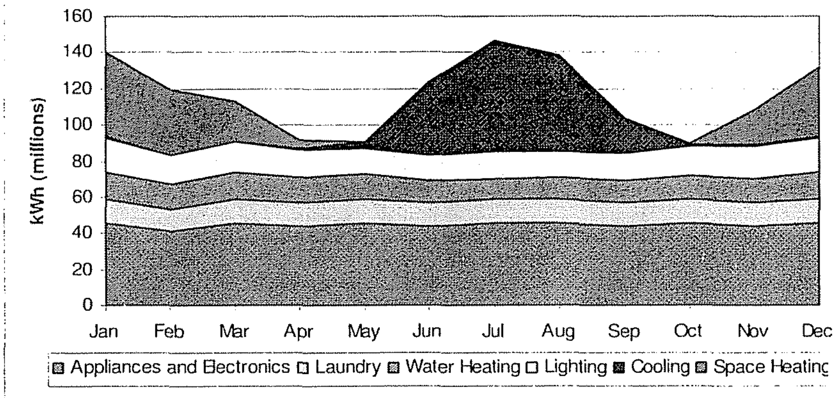


Figure 10. Monthly Residential Electric Loads by End-Use

Table 9. Residential Sector Monthly Electric Usage by End-Use

Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Cooling	Space Heating	Total
	(millions of kWh)						
Jan	45.6	13.8	14.9	18.1	0.7	47.4	140.6
Feb	41.2	12.5	13.6	15.7	0.6	35.8	119.3
Mar	45.6	13.8	14.6	16.3	0.7	22.2	113.2
Apr	44.1	13.4	13.7	15.0	0.6	4.5	91.3
May	45.6	13.8	13.2	14.8	3.7	0.0	91.2
Jun	44.1	13.4	12.0	14.1	40.2	0.0	123.7
Jul	45.6	13.8	11.2	14.8	61.3	0.0	146.7
Aug	45.6	13.8	11.3	14.6	53.0	0.0	138.3
Sep	44.1	13.4	11.6	15.0	20.0	0.0	104.2
Oct	45.6	13.8	12.6	16.3	0.7	1.0	89.9
Nov	44.1	13.4	12.9	17.5	0.7	19.8	108.3
Dec	45.6	13.8	14.2	18.8	0.8	38.5	131.7
Annual	**536.5**	**162.9**	**155.9**	**191.0**	**182.9**	**169.2**	**1,398.4**
Percent	38%	12%	11%	14%	13%	12%	100%

Table 9 shows the end-uses derived from the utility energy model on a utility wide basis, including the melded effects of the less than full saturation of electric space and water heat. However, these aggregate utility wide end-uses bear no clear intuitive relationship to the end usage at a single premise. In Table 10 these aggregated end-uses have been disaggregated using appliance saturations from the appliance saturation survey to give end-use estimates for a single average premise.

Table 10. Residential Average Use per Premise by Electric-Served End-Use

End-Use	kWh/Yr	Effective Market Share
Space Heating	6,033	19%
Furnace Fan (gas heat)	402	81%
Space Cooling	1,832	85%
Water Heater	3,901	34%
Light	1,634	100%
All other	5,984	100%
Effective market share includes heating by secondary heaters in gas-heated residences, and partial cooling by window units.		

Note in Table 10 that the stated appliance energy use applies only to premises that use that type of appliance. For example the stated electric space heat end-use of 6,033 kWh per year applies only to electrically heated premises, and the 3,901 kWh per year applies only to premises with electric water heat.

Monthly residential gas loads by major end-use are shown in Figure 11 and Table 11. The shape of residential gas demand is driven primarily by residential space heating. Space heating accounts for 70 percent of total annual residential gas usage. Water heating is the other major gas end-use accounting for 25 percent of annual usage but over 80 percent of total summer usage.

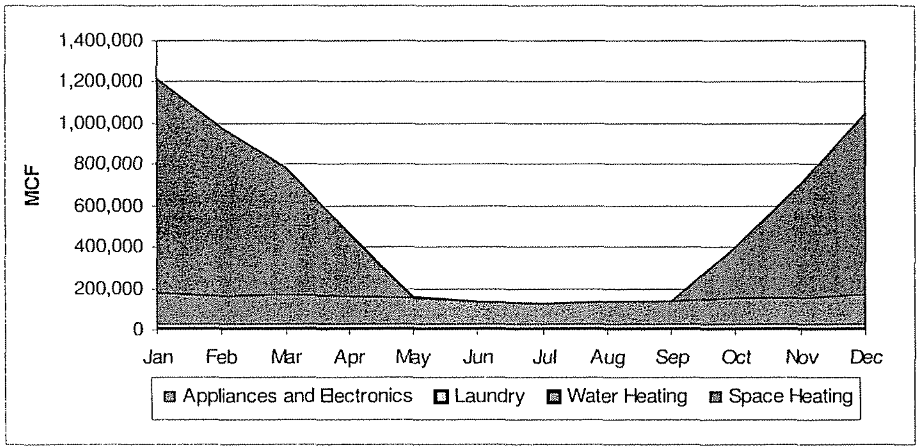


Figure 11. Monthly Residential Gas Loads by End-Use

Table 11. Residential Sector Monthly Gas Usage by End-Use

Month	Cooking & Miscellaneous	Laundry	Water Heating	Space Heating	Total
	(MCF)				
Jan	11,205	13,423	156,741	1,040,188	1,221,557
Feb	10,121	12,124	140,581	823,047	985,873
Mar	11,205	13,423	148,318	616,099	789,044
Apr	10,844	12,990	135,356	307,639	466,828
May	11,205	13,423	128,367	12,297	165,292
Jun	10,844	12,990	113,811	0	137,645
Jul	11,205	13,423	106,449	0	131,077
Aug	11,205	13,423	108,151	0	132,778
Sep	10,844	12,990	112,819	0	136,652
Oct	11,205	13,423	126,794	246,273	397,695
Nov	10,844	12,990	132,487	552,294	708,614
Dec	11,205	13,423	148,579	878,389	1,051,596
Annual	**131,932**	**158,041**	**1,558,452**	**4,476,226**	**6,324,652**
Percent	2.1%	2.5%	24.6%	70.8%	100.0%

Table 11 shows the end-uses derived from the utility energy model on a utility wide basis, including the melded effects of the less than full saturation of gas space and water heat. However, these aggregate utility wide end-uses bear no clear intuitive relationship to the end usage at a single premise. In Table 12 these aggregated end-uses have been disaggregated using appliance saturations from the appliance saturation survey to give end-use estimates for a single average premise, and the end-uses have been expressed in the common sales units of therms.

Table 12. Residential Average Use per Premise by Gas-Served End-Use

End-Use	Therms/Yr	Effective Market Share
Space Heat	553	97%
Water Heat	220	85%
Other	105	33%

Note in Table 12 that the stated appliance energy use applies only to premises that use that type of appliance. For example the stated gas water heat end-use of 220 therms per year applies only to the premises with gas water heat. The end-use "other" comprises gas cooking and clothes drying together. The appliance survey lists these appliances with a melded market share of about 33 percent.

Electric Demand Analysis

The residential peak day demand at system coincident peak is shown in Figure 12 for winter and summer. Residential contributes more demand to system peak in the summer than the winter. Space cooling is the largest contributor to peak accounting for nearly two-thirds of the residential peak. Appliances and electronics also contribute significantly to winter and summer peak. Space heating demand is the largest contributor to winter residential demand.

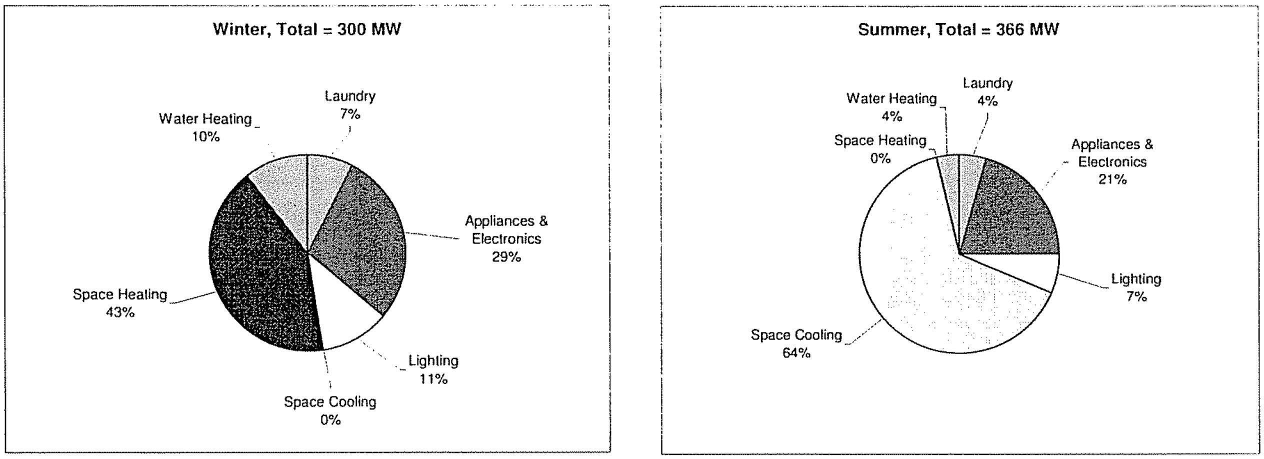


Figure 12. Residential Peak Day Demand by End-Use at System Coincident Peak

Non-Residential

The non-residential market is far less homogenous than residential. There are a greater number of basic customer types (segments) and the variation in size of building is much larger in commercial. For these reasons it is useful to describe the non-residential sector not only in terms of number of businesses but also in terms of square footage. Analysis of DSM opportunities in the non-residential segment also benefits from an understanding of the square footage of commercial and industrial space in the service territory.

Square footage estimates were developed using site-specific business data provided by DEK. Business attributes included SIC code and estimated employment. These two pieces of information were used along with estimates of employment density (employees per square foot) by type of business to estimate the square footage of each business record in the secondary data. The results of this analysis, summarized by segment, are shown in Table 13.

Table 13. Business Counts and Estimated Square Footage by Segment

Segment	Total Businesses	Percent	Employment	Percent	Total SqFootage	SqFootage Distribution	SqFt per Business
Grocery	265	2.9%	12,012	4.3%	5,645,640	2.2%	21,304
Hospitals	12	0.1%	5,470	1.9%	1,914,500	0.7%	159,542
Hotels	88	1.0%	3,188	1.1%	2,454,760	0.9%	27,895
Office	3,938	43.3%	93,204	33.0%	138,370,090	53.1%	35,137
Other	166	1.8%	1,846	0.7%	978,380	0.4%	5,894
Health Srv	626	6.9%	12,224	4.3%	4,278,400	1.6%	6,835
Eating/Drinking	762	8.4%	21,670	7.7%	10,184,900	3.9%	13,366
Retail	1,348	14.8%	34,465	12.2%	16,198,550	6.2%	12,017
Schools	314	3.4%	28,405	10.1%	21,019,700	8.1%	66,942
Warehouse	539	5.9%	17,885	6.3%	27,864,050	10.7%	51,696
Total Commercial	**8,058**	**88.5%**	**230,369**	**81.6%**	**228,908,970**	**87.8%**	
Ag,Mining,Construction	503	5.5%	11,321	4.0%	6,679,390	2.6%	13,279
Manufacturing	541	5.9%	40,653	14.4%	24,981,690	9.6%	46,177
Total Other Non-Residential	**1,044**	**11.5%**	**51,974**	**18.4%**	**31,661,080**	**12.2%**	
Total Non-Residential	**9,102**	**100.0%**	**282,343**	**100.0%**	**260,570,050**	**100.0%**	

Source: Forefront Economics estimate of square footage based on employment and employment density by SIC.
Source: Donnelly Business data covering DEOK-KY service territory

The last column in the table above shows the average square footage per business. Square feet per business is calculated using site-specific business information for businesses in the DEK service territory. The total number of employees is calculated by segment from these business records. Square footage by segment is then calculated by multiplying employment density estimates (e.g. 470 square feet per employee in retail) by the employment in that segment. Finally, average square feet per business is calculated by dividing the segment square footage by the number of businesses in the segment. The result of these calculations will be combined with the number of business sites from DEK's customer records to estimate the non-residential floor space and energy intensity by segment. Although informative, these calculations serve only a descriptive purpose and are not used in the energy modeling or estimates of DSM potential.

Electric Customer Segments

Non-residential customer data were segmented using the same SIC code classification scheme used to describe the business data acquired for the service territory. Number of premises and annual usage is shown by segment in Table 14 along with other descriptive information about the commercial sector. The number of premises was found to include many non-building types of electrical services (e.g. billboards and railroad controls). An alternative measure was developed to better approximate the number of actual buildings. The data in Table 14 only include premises with at least 3,000 kWh of annual usage.[4]

Square feet shown in Table 14 is the total square footage found for that segment in the service area. The energy utilization index (EUI) is calculated using the estimate of total square footage. Energy utilization index results from the 2003 Commercial Building Energy Consumption Survey (CBECS) published by the US DOE are also shown for comparison purposes. Although they follow the same general pattern, there are a few notable differences in EUI estimates.

Table 14. Number of Premises and Annual Electric Usage by Segment

Segment	CIS Premises	Average Annual kWh per Premise	Total Usage (millions of kWh)	Percent of C&I Loads	Square Feet per Business (a)	Estimated Total Square Feet (millions)	Square Feet Distribution	EUI (kWh per Sq Ft)	EUI from CBECS
Grocery	233	374,422	87	3.5%	21,304	5.0	2%	17.6	52.5
Hospitals	21	3,185,719	67	2.7%	159,542	3.4	1%	20.0	27.9
Hotels	91	530,187	48	2.0%	27,895	2.5	1%	19.0	14.7
Office	5,083	146,697	746	30.3%	35,137	178.6	61%	4.2	18.9
Other	755	155,255	117	4.8%	5,894	4.4	2%	26.3	16.7
Health	436	100,879	44	1.8%	6,835	3.0	1%	14.8	19.2
Restaurant	654	159,513	104	4.2%	13,366	8.7	3%	11.9	38.5
Retail	1,042	150,764	157	6.4%	12,017	12.5	4%	12.5	15.6
Schools	266	588,820	157	6.4%	66,942	17.8	6%	8.8	7.9
Warehouse	438	300,412	132	5.3%	51,696	22.6	8%	5.8	10.8
Total Commercial	**9,019**	**183,931**	**1,659**	**67%**		**258.6**	**89%**	**6.4**	NA
Ag, Mining, Util. & Constr	415	72,577	30	1.2%	13,279	5.5	2%	5.5	NA
Manufacturing	573	1,346,169	771	31.4%	46,177	26.5	9%	29.2	NA
Total Other Non-Residential	**988**	**811,209**	**801**	**33%**		**32.0**	**11%**	**25.1**	NA
Total Non-Residential	**10,007**	**245,862**	**2,460**	**100%**		**290.6**	**100%**	**8.5**	NA

Source: Energy model results using monthly billing data from CIS. CBECS is the Commercial Building Energy Consumption Survey results for the Midwest Census Region, East North Central Census Division (2003, US DOE)
(a) From Table 13.
Loads and customer counts exclude "small load" premises (about 2,000 accounts with less than 3,000 kWh per year)
NA - Not available due to nonsensical or unavailable data.

Energy utilization indices, plotted in Figure 13, serve a descriptive purpose in this report and are not used for the energy savings estimates. Except for manufacturing, the other sector is the most energy intensive but contains a small amount of square feet. Health, hospitals, hotels and grocery stores are also energy intensive with only a small amount of floor space. Offices have a large amount of square footage along with a low EUI.

[4] Although arbitrary, this level of usage was thought to effectively screen non-building premises such as billboards and switching equipment.

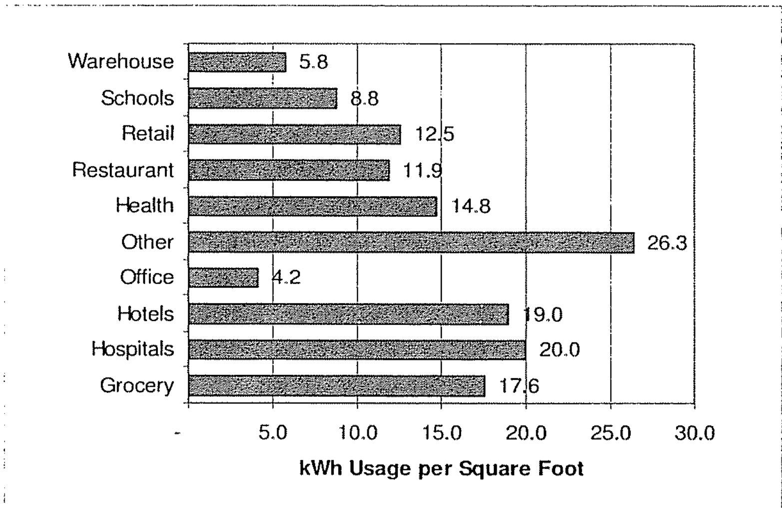


Figure 13. Commercial Electric EUI Distribution

The estimated distribution of commercial square footage is shown in Figure 12. Together the square footage and EUI information are useful for understanding the nature of energy consumption in the commercial segment. Offices account for nearly 70 percent of all commercial floor space. Although similar in the amount of floor space, the EUI estimates of warehouses and schools show that these two segments have somewhat different energy requirements.

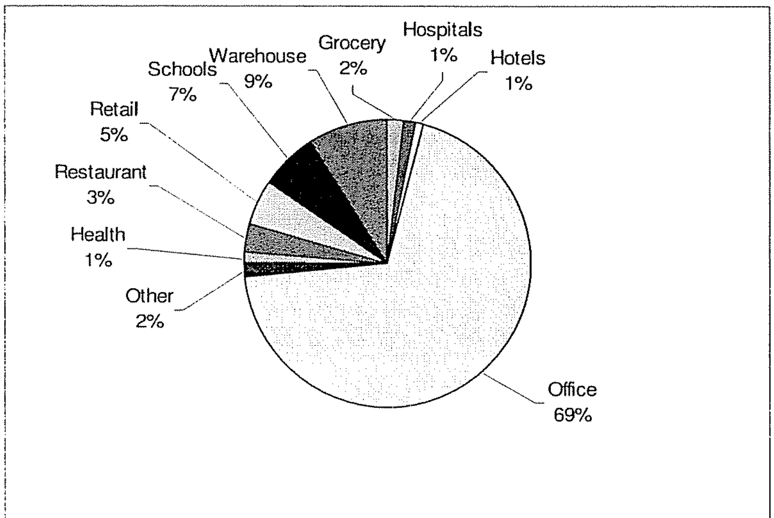


Figure 14. Square Footage Distribution of Electric Commercial Customers

Gas Customer Segments

The segmentation approach used for non-residential electric customers was also applied to gas customers. Gas non-residential segments are shown in Table 15. Manufacturing customers account for 26 percent of all non-residential usage. Commercial segments make up 72 percent of non-residential usage with offices accounting for the largest amount of commercial gas consumption.

Table 15. Number of Premises and Annual Gas Usage by Segment

Segment	CIS Premises	Average Annual Therms per Premise	Total Usage (MCF)	Percent of C&I Loads	Square Feet per Business (a)	Estimated Total Square Feet (millions)	Square Feet Distribution	EUI (therms per Sq Ft)	EUI from CBECS
Grocery	173	3,800	54,376	1.0%	21,304	3.7	2%	0.15	0.50
Hospitals	18	155,828	232,002	4.5%	159,542	2.9	1%	0.83	1.31
Hotels	79	22,347	146,021	2.8%	27,895	2.2	1%	0.68	0.78
Office	3,155	4,751	1,239,880	23.9%	35,137	110.9	57%	0.12	0.44
Other	513	14,290	606,367	11.7%	5,894	3.0	2%	2.06	0.68
Health	289	4,464	106,700	2.1%	6,835	2.0	1%	0.56	0.52
Restaurant	578	7,369	352,285	6.8%	13,366	7.7	4%	0.47	1.53
Retail	884	2,944	215,277	4.2%	12,017	10.6	5%	0.21	0.52
Schools	197	29,048	473,329	9.1%	66,942	13.2	7%	0.37	0.55
Warehouse	335	10,206	282,799	5.5%	51,696	17.3	9%	0.17	0.27
Total Commercial	**6,221**	**7,208**	**3,709,034**	**72%**		**173.5**	**89%**	**0.22**	NA
Ag, Mining, Util. & Constr	238	7,144	140,625	2.7%	13,279	3.2	2%	0.46	NA
Manufacturing	374	43,091	1,333,010	25.7%	46,177	17.3	9%	0.79	NA
Total Other Non-Residential	**612**	**29,112**	**1,473,635**	**28%**		**20.4**	**11%**	**0.74**	NA
Total Non-Residential	**6,833**	**758,476,456**	**5,182,670**	**100%**		**193.9**	**100%**	**0.28**	NA

Source: Energy model results using monthly billing data from CIS. CBECS is the Commercial Building Energy Consumption Survey for the Midwest Census Region, East North Central Census Division (2003, US DOE)
(a) From Table 13.
NA - Not avalilable due to nonsensical or unavailable data.

Figure 15 and Figure 16 show the gas energy intensities by segment and the square footage distribution of gas commercial customers, respectively. Taken together, these figures provide insights into which segments have higher than average usage and account for significant square footage. The energy intensity of Schools, for example, is on the moderate-to-high side and Schools account for a relatively large amount of square feet. While energy intensive, hospitals only account for a small amount commercial square footage.

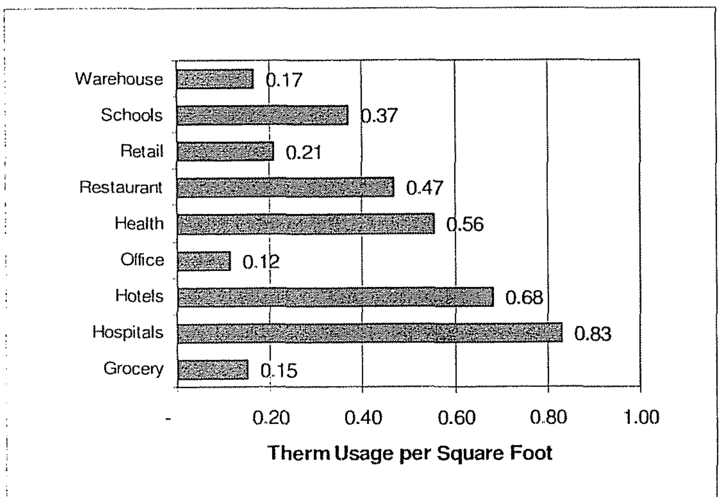


Figure 15. Commercial Gas EUI Distribution

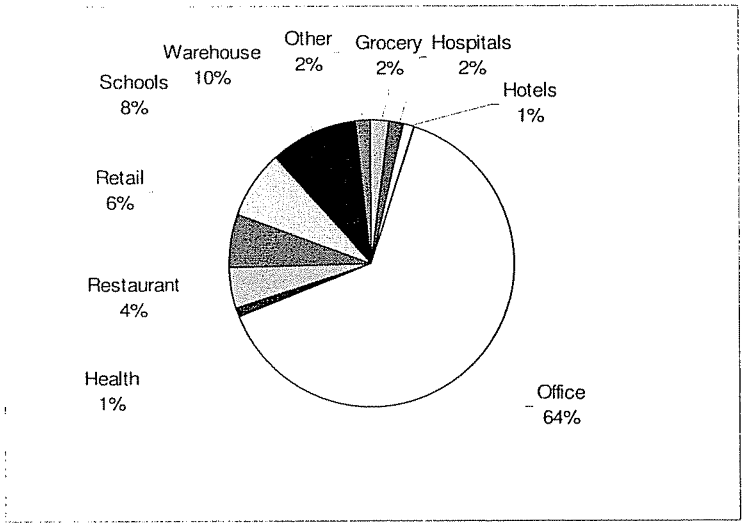


Figure 16. Square Footage Distribution of Gas Commercial Customers

Commercial Energy Usage and Demand

Annual energy usage by segment has already been presented in Table 14. Commercial energy usage by end-use is shown in Figure 17. Commercial load is characterized by a large percentage of baseload with a prominent summer cooling peak.

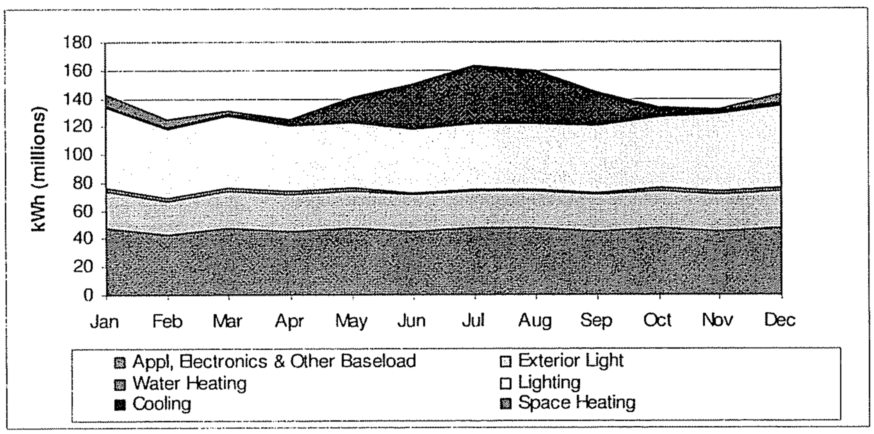


Figure 17. Monthly Commercial Electric Usage by End-Use

The large amount of baseload in commercial customer energy usage is apparent in Figure 17. Seasonally high usage associated for summer space cooling is also apparent in the monthly usage. As shown in Figure 18, the summer peak for commercial customers comes primarily from space cooling but there is also significant contributions to peak from appliances and electronics (plug loads) and lighting. The winter peak is driven by lighting, plug loads and exterior lighting by nearly equal amounts. Space heating is a significant contributor to the winter peak of commercial customers but not as large as the other three end-uses mentioned.

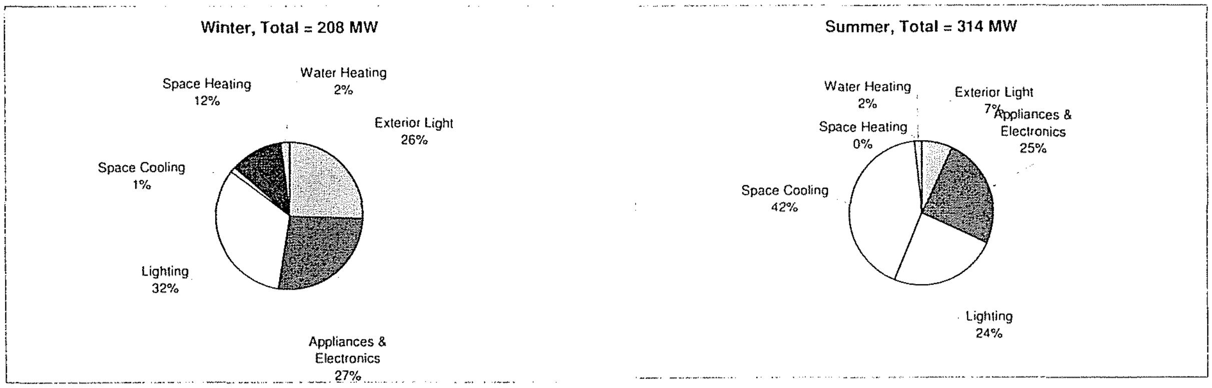


Figure 18. Commercial Peak Day Demand by End-Use at System Coincident Peak

As shown in Figure 19 the commercial gas usage is highly seasonal and dominated by space heating. A significant baseload is also present in the form of water heat. Other baseloads are small and insignificant relative to space and water heating.

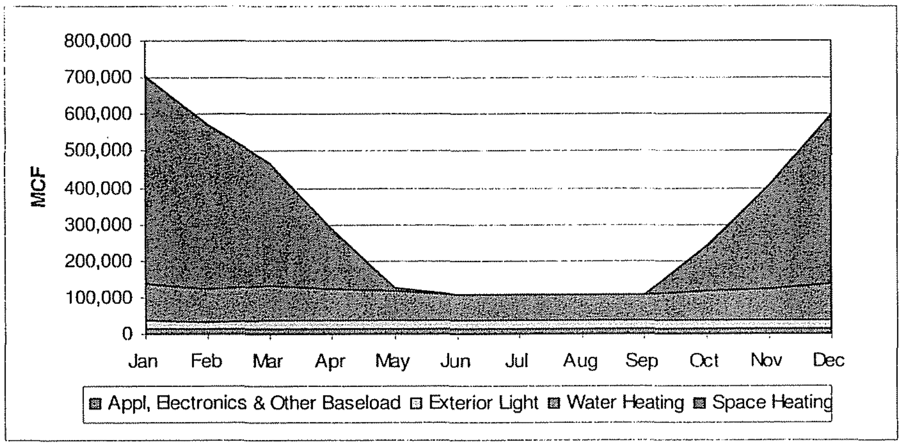


Figure 19. Monthly Commercial Gas Usage by End-Use

Manufacturing Energy Usage

Electric sales to manufacturing customers came to 780 million kWh in 2007, about one-fifth of total retail sales. As shown in Table 16, manufacturing customers cover a wide range of industries.

Table 16. Manufacturing Customers and Actual Electric 2007 Loads

SIC - Industry Name	Customers	Use Per Customer (MWh)	Total Usage (MWh)	Percent	Average Peak (kW)
20 - Food and Kindred Products	37	4,404	162,951	21%	1,106
22 - Textile Mill Products	6	2,560	15,362	2%	454
23 - Apparel and Other Textile Products	14	373	5,216	1%	95
24 - Lumber and Wood Products	19	44	839	0%	31
25 - Furniture and Fixtures	9	377	3,392	0%	155
26 - Paper and Allied Products	11	1,482	16,306	2%	340
27 - Printing and Publishing	69	894	61,699	8%	220
28 - Chemicals and Allied Products	27	2,357	63,634	8%	466
29 - Petroleum and Coal Products	11	441	4,854	1%	231
30 - Rubber and Miscellaneous Plastics Products	20	7,249	144,985	19%	1,160
32 - Stone, Clay, Glass, and Concrete Products	21	1,483	31,142	4%	709
33 - Primary Metal Industries	11	2,797	30,771	4%	858
34 - Fabricated Metal Products	53	1,197	63,462	8%	266
35 - Industrial Machinery and Equipment	95	768	72,997	9%	223
36 - Electrical and Electronic Equipment	71	68	4,839	1%	24
37 - Transportation Equipment	20	4,157	83,147	11%	954
38 - Instruments and Related Products	12	222	2,660	0%	69
39 - Miscellaneous Manufacturing Industries	67	147	9,846	1%	51
Total Manufacturing	573	1,358	778,102	100%	335

Sales to gas customers account for nearly 1.3 million MCF in 2007, about one-tenth of total gas sales.

Table 17. Manufacturing Customers and Actual Gas 2007 Loads

SIC - Industry Name	Customers	Use Per Customer (MCF)	Total Usage (MCF)	Percent
20 - Food and Kindred Products	28	14,548	407,336	32%
22 - Textile Mill Products	4	161	642	0%
23 - Apparel and Other Textile Products	8	227	1,819	0%
24 - Lumber and Wood Products	12	179	2,148	0%
25 - Furniture and Fixtures	10	1,761	17,608	1%
26 - Paper and Allied Products	7	1,564	10,946	1%
27 - Printing and Publishing	64	635	40,611	3%
28 - Chemicals and Allied Products	17	19,045	323,766	25%
29 - Petroleum and Coal Products	13	10,038	130,492	10%
30 - Rubber and Miscellaneous Plastics Products	19	2,151	40,877	3%
32 - Stone, Clay, Glass, and Concrete Products	9	693	6,237	0%
33 - Primary Metal Industries	7	866	6,065	0%
34 - Fabricated Metal Products	42	1,394	58,549	5%
35 - Industrial Machinery and Equipment	64	1,620	103,701	8%
36 - Electrical and Electronic Equipment	15	1,216	18,242	1%
37 - Transportation Equipment	11	1,875	20,622	2%
38 - Instruments and Related Products	10	451	4,506	0%
39 - Miscellaneous Manufacturing Industries	33	1,555	51,325	4%
Missing	1	33,816	33,816	3%
Total Manufacturing	374	3,421	1,279,306	100%

Food and Chemicals are by far the largest manufacturing sectors, accounting for 32 and 25 percent of gas sales to manufacturing customers, respectively.

Total manufacturing loads are shown by month in Figure 20. Manufacturing loads are characterized by large process-related and motor consumption that is not highly correlated with weather. Still, there is a noticeable summer cooling load that adds to the coincident July peak.

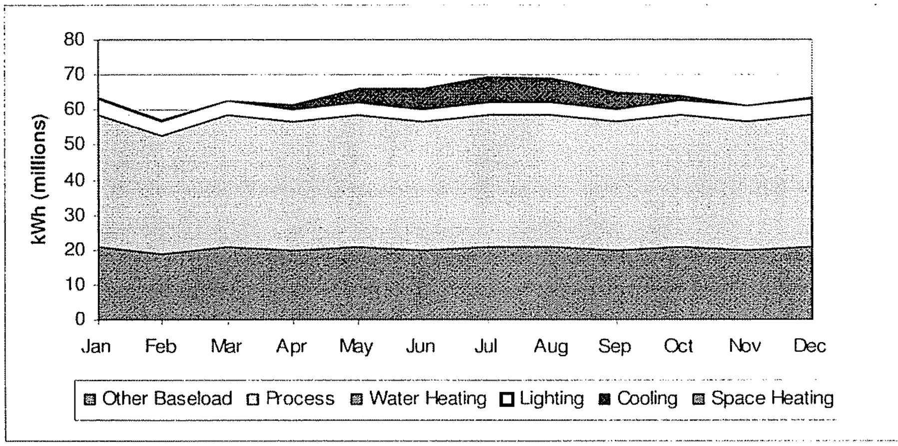


Figure 20. Monthly Manufacturing Electric Usage by End-Use

Total manufacturing gas usage is shown by month in Figure 21. Nearly all gas usage in manufacturing is for heating space and water. Process and other baseloads are insignificant relative to heating loads.

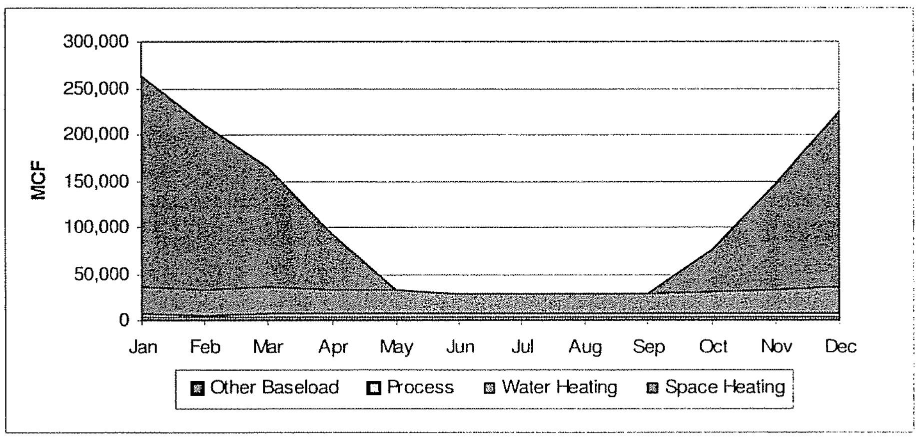


Figure 21. Monthly Manufacturing Gas Usage by End-Use

TECHNICAL POTENTIAL

The technical potential is defined by the application of maximum reasonable energy efficiency improvements to every residential and non-residential customer/building served by DEK. The technical potential also includes extensive application of site-based solar technologies, solar photovoltaic, and solar water heating, and small-scale site-based combined heat and power applied to existing gas loads. This estimate of technical potential includes both the energy savings attributable to the applied efficiency technologies as well as the peak load reductions proceeding from these energy savings, and from dispatched load reductions associated with appliance control and combined heat and power (CHP).

Our analysis of technical potential does not include fuel switching where we define fuel switching as replacing the fuel used to power an appliance. There are many applications of fuel switching that may be justifiable from the customer or the utility perspective, such as gas backed heat pumps or large commercial or industrial CHP, but these have not been included in the scope of this analysis. As explained below, we do include small-scale site-based generation of electricity through CHP in our estimates of technical potential.

Fundamental to an estimate of technical potential is the baseline situation. In this baseline, federal energy legislation has mandated the retirement of incandescent lighting. Using estimates based on EIA work the utility has incorporated this mandate in its latest forecast. In this estimate, the baseline is defined by the utility forecast which includes the effects of retiring incandescent lighting, but assumes no other energy efficiency efforts other than the normal response of customers to new products and to changes in utility costs. The effect of this incandescent phase out in the Kentucky service area is explicitly noted in Table 18 for the years of interest.

Table 18. Forecast Effect of Phased Out Incandescent Lighting

Year	Forecast Change, (MWH/year)
2012	0
2017	94,938
2025	99,457
2027	99,502

Note in the table that the effect of the lighting change is not evident until 2012, then in the next five years most of the incandescent lighting is phased out. After 2017 the effect remains essentially constant. Physically these mandated lighting reductions are part of the real overall savings picture. But this portion of the savings, since it has been mandated, is now part of the base case. Accordingly, this estimate of technical potential is based on the latest forecast which is reduced to include the lighting reductions, and the reported technical potential is similarly reduced.

Table 19 and Table 20, respectively, summarize the electric and gas technical potential as found for the base year, 2007, and for the planning years 2012, 2017, 2025 and 2027. The utility growth rates are based on growth ratios derived from the forecast as reduced for mandated lighting efficiency. Electric energy use is expressed as Total Energy, GWh/yr, including a loss ratio of 4.9 percent, and Load likewise includes losses. Gas energy is expressed as sales to ultimate customers in mmcf/yr, including a loss ratio of 2.2 percent, but gas use does not include company use or net injections to storage. The 2025 planning year is included for comparison to the Kentucky planning benchmark for that year. Note in these tables, that the technical potential savings percentages are presented with reference to the DEK customers included in this study as defined by the customer and sales count in this study. In general, the sales count includes all utility sales to residential, commercial, and industrial customers, but it excludes some special sales such as sales for resale and internal utility use.

Although these electric and gas technical potential savings estimates are presented here together, they were in fact derived by a separate analysis, treating each fuel as if it were a separate utility. However there is a linkage between gas savings and electric savings. This linkage is principally related to the interaction between gas space heating energy and electric internal gains in buildings. The gas usage is also increased by the assumed level of combined heat and power. These two gas/electric interactions will work to increase gas usage thereby reducing the reported gas savings and technical potential.

The technical potential energy savings for the portion examined for technical potential is about 31 percent energy savings for electric and 29 percent savings for gas. The customer stock for both these utilities involves predominant gas space and water heating, which leads to higher savings opportunities from space heating and water heating for gas customers. The electric savings proceed from lighting efficiencies, HVAC equipment improvements, and appliance efficiencies.

Table 19. Summary of Technical Potential for Electric Savings Over 20-Year Planning Horizon

	2007	**2012**	**2017**	**2025**	**2027**
Base Case Total Energy , GWh/yr	3,861	4,029	4,054	4,152	4,181
Technical Potential Total Energy Savings GWh/yr	1,250	1,312	1,264	1,275	1,276
Percent Reduction in Total Energy	32%	33%	31%	31%	31%
Base Case Summer System Peak Load – Aug (MW)	829	868	873	888	894
Technical Potential Summer Peak Savings (MW)	277	291	284	287	287
Percent Reduction Summer Peak	33%	34%	33%	32%	32%
Base Case Winter System Peak Load – Feb (MW)	654	685	694	704	707
Technical Potential Winter Peak Savings (MW)	275	289	285	286	287
Percent Reduction Winter Peak	42%	42%	41%	41%	41%
Load Control Summer Peak Load Reduction (MW)	43	43	43	43	43
Load Control Percent Peak Reduction	5%	4%	4%	4%	4%
CHP Load Control Summer Peak Reduction (MW)	94	94	94	94	94
CHP Load ControlPercent Peak Reduction	11%	11%	10%	10%	10%

Notice in Table 19 that the application of efficiency technology has led to reductions in annual energy use, GWh, of 31 percent. Note also that in the near term years, the technical potential savings are 32 to 33 percent, but in the later years this potential drops to 31 percent as the mandated lighting efficiency takes hold. And most significantly, the application of this broad range of efficiency measures has led to significant percentage reductions in both the winter and summer peak system load, MW, greater than the percentage energy reductions because the energy savings are most concentrated at peak times. The technical potential peak savings reported in Table 19 are a natural consequence of the energy savings only and do not include the further peak savings reported as the load control summer peak savings which are the result of deliberate load control dispatch events.

Table 20. Summary of Technical Potential for Gas Savings Over 20-Year Planning Horizon

	2007	2012	2017	2025	2027
Base Case Energy Sales, mmcf/yr	11,507	10,901	11,099	11,187	11,298
Technical Potential Energy Savings, mmcf/yr	3,261	3,036	3,204	3,247	3,286
Percent Reduction	28%	28%	29%	29%	29%

Notice in Table 20 that the percent savings for gas energy are about the same magnitude as the percentage savings for electricity. The technical potential gas savings are the net of the savings attributable to gas efficiency measures and an increase in gas usage caused by the CHP and an increase caused by the reduced internal gains caused by the electrical efficiency measures applied to the same population. Without these gas usage increases the gas savings from efficiency alone would have been in the range of 35 to 40 percent because the customer stock involves predominant gas space and water heating, which leads to higher savings opportunities from space and water heating gas customers.

Technical Potential Load Effects

With regard to DEK's reserve margin, an important aspect of the technical potential pertains to the changes in demand MW attributable to the efficiency measures. In general, changes in demand (and load) will vary from hour to hour and month to month. For the total of DEK customers, we have estimated the average hourly demand curve, and the peak demand curve for each month for the base case and for the technical potential case. These hourly demand curves are the aggregate distributed demand of the customers. The difference between the base case hourly demand and the technical potential case hourly demand is taken here as the technical potential demand offset. The system load offset is then derived from the system demand offset by increasing the demand to account for the associated T&D losses of 4.9 percent. A discussion of the energy and demand modeling methodology is found in the technical appendix.

Figure 22 shows the peak load curve for summer, August, and Figure 23 shows the peak load curve for winter, February. These figures have been colored to identify the source of the load savings. The red portion shows the savings from general efficiency measures and the yellow portion shows the load impact from the site-based solar electric and other solar applications.

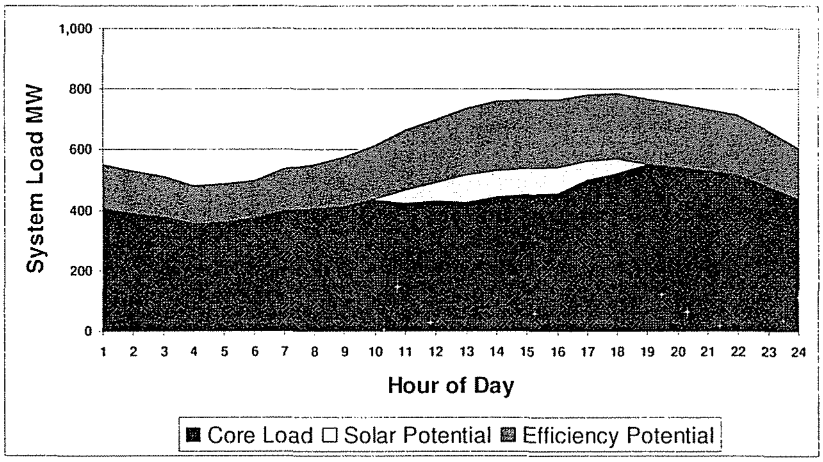


Figure 22. Technical Potential for Demand Reduction – Summer

In Figure 22 it is apparent that some of the significant summer load reductions are due to solar electric generation that is concentrated most during the peak days. Note also that there is some slight evidence of solar savings during non-daylight hours, which is due to solar heated water used later in the day. Figure 23 shows the composition of the winter peak demand in February.

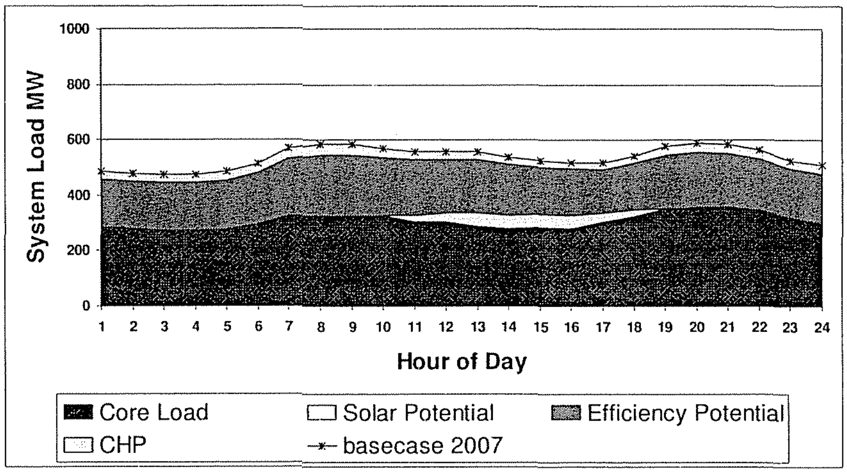


Figure 23. Technical Potential for Demand Reduction – Winter

It is noteworthy that the demand savings for winter are percentage wise larger than the demand savings for summer. This is because winter heating savings are quite strong and because the assumed combined heat and power acts at its fullest during winter peaks. These winter peak savings for Kentucky customers are larger than those reported for Ohio customers because there appears to be a greater percentage of resistance electric heating in Kentucky. It should be noted that these load savings are a by-product of the energy efficiency savings and the CHP, and do not include dispatched demand response or direct load control.

Technical Potential Load Control

Load control has long been a demonstrated option for managing peak load situations. Recent improvements in communications, networking, and controls have significantly increased capability for large scale control of various end-use loads. These advances are referred to here generally as Advanced Metering Infrastructure (AMI).

AMI employs metering and networking to allow large numbers of individual meters to be read remotely and designated loads to be toggled on command. The precise coordinated control of diverse loads can be used to reduce the total diversified system load during system peak periods. AMI also supports automatic meter reading, and facilitates the use of time of day or critical peak pricing and distribution O&M diagnostics. It is probable that advanced metering will eventually become a common part of the utility system based on these multiple benefits.

An upper bound of the demand reductions achievable by direct load control through AMI will be estimated here. It can be strictly argued that when air conditioners and water heaters are cycled off through direct load control, they involve behavioral choices, but if the cycles are properly designed, there will be almost no perceived loss of amenity. Physically, the precisely sequenced cycling afforded by AMI is leveraging the inherent benefits of the thermal storage of water heaters and the dwellings themselves to reduce peak demand.

Further demand reductions and energy reductions can be achieved through a variety of time of use or other rate designs. Such savings are essentially behavioral responses to higher prices. However, the focus of this technical potential study is on the physical potential for energy savings. The many possible avenues of energy savings caused by behavioral changes, while potentially significant, are not part of this study.

The upper bound of AMI related demand savings will be taken as defined by the control of 30 percent of the residential electric water heating load and the control of 45,000 residential /small commercial scale air conditioners. Figure 24 shows the effect of such a large scale control exercise. In Figure 24 note that the direct load control has reduced the peak demand in the hours of 14:00 to 17:00 with a maximum load reduction of 43 MW. The control of water heaters or air conditioners always involves a temporary increase in demand when these appliances are turned back on. Therefore, the control events must be carefully staged so that the temporary increase in demand does not just shift the peak a few hours.

In this example, the air conditioners are cycled off in three waves during the afternoon, and the water heaters are cycled off much later in the afternoon (around 6 PM). In this manner the demand reductions from the water heater cycling are counteracting the temporary demand increases as the air conditioners are brought back on line. In fact there is less benefit to cycling a water heater during system peak because that is a minimal usage time for water heaters. But later in the day, about 6 PM to 10 PM, water heater usage peaks and there is much more benefit to cycling. Figure 24 shows that with careful staging, the top of the system peak can be effectively shaved off. Note in Figure 24 that the demand has increased by about 11 MW during the non-peak hours of 1-4 AM as the water heaters are brought back on line.

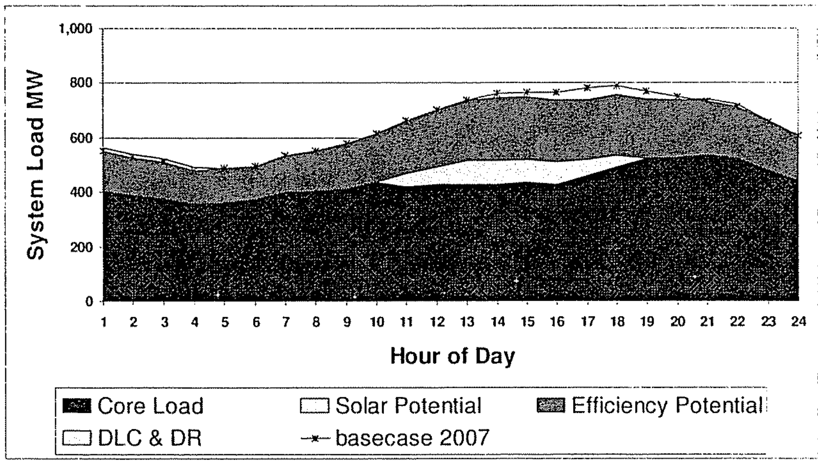


Figure 24. Direct Load Control Demand Reductions - Summer

In this example, only two types of loads have been controlled, unitary air conditioners and storage water heaters. Commercial lighting could also be controlled, but it is not considered here because lighting control, especially day lighting, is expected to be redundant with lighting control installed as an energy saving measure. Another class of demand reduction measures is associated with industrial load shedding contracts. These industrial load reductions can be quite large, even larger than the load reductions from the direct load control shown in Figure 24. These load reductions would be in addition to the reductions afforded by the direct load control illustrated here. These unique industrial contracts are not considered in this technical potential study.

It is evident in the figure that this type of DSM load reduction has limited potential relative to the load reduction proceeding generally from energy efficiency. While DR and DLC are potentially the most cost effective and most quickly deployed load reduction measures, they are limited. Nevertheless, these measures will need to play a significant role in any DSM portfolio.

Combined Heat and Power

Combined heat and power, CHP, can be a further type of load control. There are two classes of combined heat and power. The first class is applied to large steady thermal loads, usually at an industrial scale and usually these are recognized in the industrial forecast. This first class is the only type of CHP that has proved cost effective because it has a high load factor and uses the benefits from the full value of its thermal output. But because this class has a steady output, it has limited load control possibilities. The second class, referred to here as "micro CHP", is applied to space heat and water heat loads which are highly seasonal. It has a low load factor, which works against cost effectiveness, but it has strong summer load control possibilities because it has no load in the summer. While this class is usually not conventionally cost effective, the valuation of ancillary benefits such as carbon offsets, very favorable siting advantages, and strong capacity reserve will improve the cost effectiveness. The control of micro CHP for load offset purposes is significantly facilitated by an advanced metering infrastructure. The effect of this type of load control is shown in Figure 25.

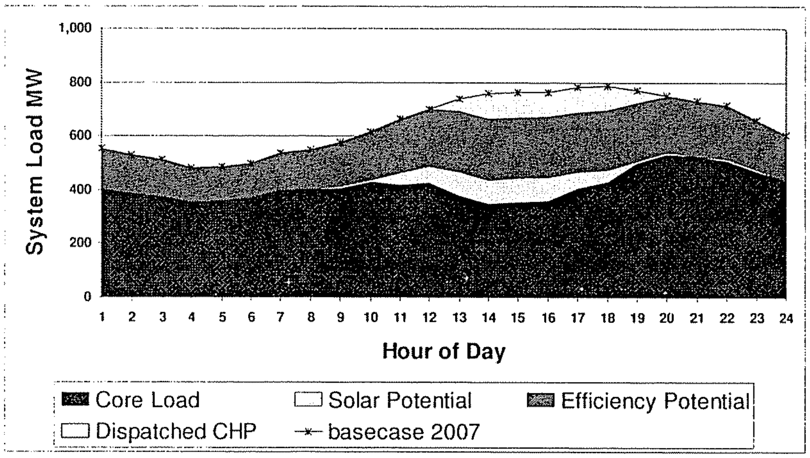


Figure 25. Load Control from Dispatched CHP - Summer

Note in this figure that CHP can be a very significant load control option, much greater than can be achieved by the direct load control of the 45,000 air conditioners illustrated in Figure 24. However, this technology is still emerging and no large scale demonstration of such control has been made. Also the heat rate for such electricity is high and the generation efficiencies may correspondingly be relatively low, in the 20 to 30 percent range. Notably, this resource is based on ultra clean and quiet combustion in sterling cycle engines or fuel cells, and it can potentially be readily sited anywhere in the service territory and used to balance distribution. At this time micro CHP is not yet ready to deploy beyond the demonstration stage. (By contrast, solar electric technology is fully ready to deploy in large scale with known performance and with a reasonably certain service life). But even though micro CHP is not ready for full deployment, a large scale deployment of 29,500 units (118 MW total), has been made part of this technical potential assessment as a placeholder because this technology is quickly maturing and is expected to be applicable within the 20-year planning window.

Principal Components of the Technical Potential

A strategic understanding of the possibilities and challenges of a large scale efficiency undertaking requires an understanding of the principal components of the energy technical potential. The technical potential for energy savings divides into four components: retrofit, new construction, solar, and CHP. These components are illustrated in Figure 26 for electric savings and Figure 27 for gas savings. These figures show these components over the twenty-year planning horizon in a color-coded fashion.

The retrofit potential, red, represents the technical potential of energy savings that can be achieved in the existing building stock. In this analysis the existing stock is taken as constant over the twenty-year time horizon. This is the largest portion of the technical potential, and it contains many energy inefficiencies that were embedded in the customer stock during the last half century. As such, these customers are disproportionately exposed to increasing energy costs, and there will (or could) be a tendency to migrate to more efficiency as a price response.

The technical potential for energy savings in new construction is shown by the green portion which increases in proportion to the amount of new construction and major retrofit. This is the smallest component of the technical potential, but it is persistently growing. The physical attributes of the new construction technical potential are quite similar to those in the retrofit technical potential: insulation, ventilation control, lighting, efficient heat pumps etc. But in the case of new construction, the cost for these measures is lower because it is an incremental cost on an existing construction process. Efficiency measures are generally never cheaper than when they are applied during initial construction. In this sense, the technical potential associated with new construction is a significant lost opportunity. A very important perspective on the new construction technical potential is that the associated builders, suppliers, and code agencies effectively become the reservoir of energy efficiency practices necessary to support the efficiency undertaking as a whole. New construction efficiency (and new appliance efficiency) is a key infrastructural investment in any long term efficiency plan.

The solar potential, yellow, is large and increases slightly with time and new construction, and as more treeless building sites are used. An important distinguishing feature of this potential is that it is at a maximum during summer and during the utility system peaks. With regard to solar applications, it is important to draw a perspective from the current state of building science. The design of increasingly efficient buildings has diminishing returns. It appears that building energy use reductions of more than 50 percent beyond the ASHRAE 90.1-2004 building code will be difficult to achieve without resorting to solar applications. The current thrust toward "net zero" buildings can practically only be achieved by significant applications of solar photovoltaic arrays. While these solar applications will require a large area exposed to sunlight, the required solar exposures usually lie within the geometries of most residential and commercial buildings. However, as later analysis will show, the solar potential is beyond the immediate cost effectiveness limit. But this category of potential is technically sound, very large, and homogenous. It may reasonably become cost effective within the 20-year planning window, and it is important to understand the role and size of this resource in the larger picture.

In Figure 26, the thin light blue line on the top is the savings due to the phase out of the incandescent lighting. It is intended to give perspective on the phase out savings (which are not counted in the technical potential) in proportion to the whole of the technical potential energy savings. In fact, these are strong savings and represent about 25 percent of the lighting in the residential sector.

In Figure 26, the violet line represents the energy generated by the micro CHP which has been applied to gas heated customers, 29,500 4-kW units. Electricity generated by CHP applied to an existing gas thermal load has a unique efficiency opportunity in terms of fuel use and in terms of carbon offset because the fuel use associated with the generated electricity is only the marginal increase in gas use. The CHP resource is strongly favored from the perspective of carbon calculations, and it also has significant benefit as summer capacity.

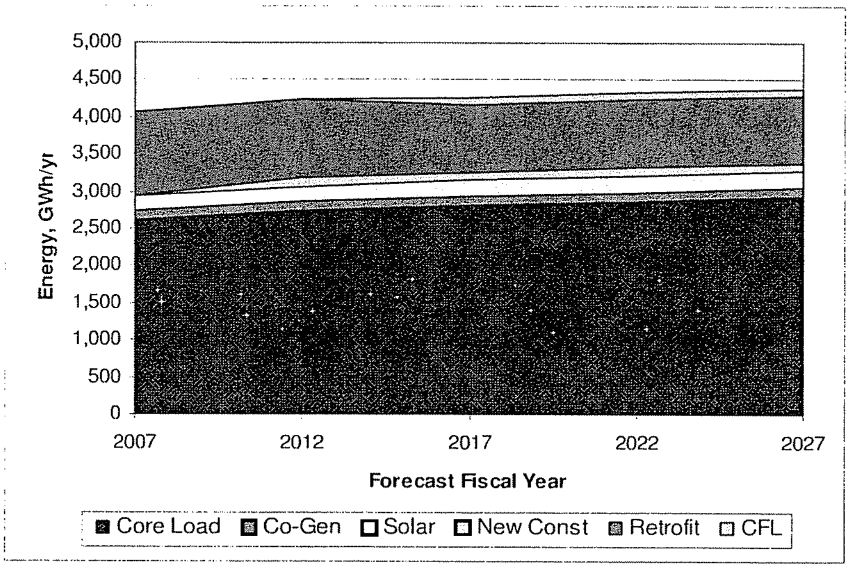


Figure 26. Electric Technical Potential over Planning Horizon

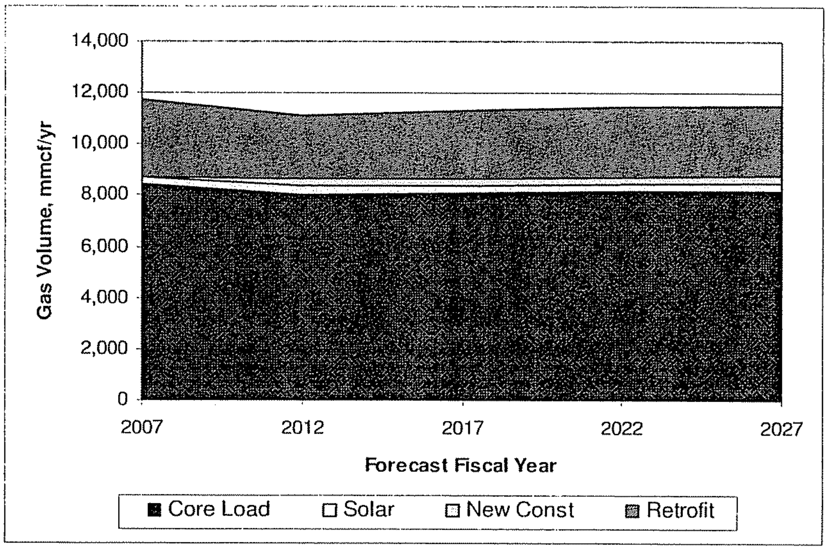


Figure 27. Gas Technical Potential over Planning Horizon

As matters currently stand, gas sales have been static or decreasing. There is no forecast for a migration of space or water heat loads to gas. The rationale has been that fuel market shares depend on many specific physical and economic particulars and are better left to the market to sort out. Although there is no change in gas heat market share, the gas usage in this technical potential model shows an increase due to the use of micro CHP and due to increased space heat needs incurred because of reduced electrical internal gains.

Therefore, the gas savings illustrated in Figure 27 are the net of gas savings due to efficiency measures and gas increases due to CHP and due to the increased gas space heat required to compensate for the reduced electrical gain from the lighting reductions associated with the electrical technical potential.

But it is important to recognize that gas space and water heating has a much lower carbon dioxide output for these end-uses than coal based electricity, and it is easily foreseeable that market and environmental forces could in this time period lead to slightly increased gas use. As perspective, Table 21 provides a brief theoretical comparison of the carbon emissions required to meet a thermal load of 100,000 BTU.

Table 21. Carbon Emissions

Heat Source	Pounds Carbon Emitted per 100,000 BTU Load
Coal/Electric Heat Pump at COP 3	7.09
Coal/Electric Heat as Modeled COP (1.3)	16.37
Direct Gas at 85% Efficiency	4.10
Gas Mechanical Heat Pump	2.38
Gas CHP Offsetting Coal/Electric	-3.62

Table 21 shows that gas heating has much lower carbon emissions than electric space or water heating. Note the impact of Gas CHP Offsetting Coal/Electric is especially noteworthy. This situation actually lowers carbon emissions, not just minimizing them as in the case of direct heating by gas. Currently, the economics of fuel choice relies on status quo economics that does not significantly include carbon emissions costs. If carbon emissions impacts are more significantly factored into these fuel choices, then the market could shift toward lower carbon options. Therefore, in program plans we have included a pilot demonstration project, for residential scale CHP.

In both Figure 26 and Figure 27 the largest energy use is that labeled "core load" which is the energy still necessary after the maximal application of efficiency and site generation assumed in this technical potential estimate. This core load assumes that utility customer behavior remains essentially constant: that thermostat settings remain constant and that energy costs rise as assumed in the forecast. Higher energy costs and/or thermostat changes can significantly lower this core load and increase the technical potential beyond that reported here.

Our analysis of technical potential shows that, as an upper bound, it is physically possible to cut energy usage and system peak load significantly. However, these estimates imply very large expenditures and cannot be considered realistic estimates of actual reductions because they are unconstrained by market, behavioral and budget considerations.

ELECTRIC MEASURES AND ECONOMIC POTENTIAL

In this section we present detailed information regarding energy efficiency technologies. These technologies, referred to as Energy Efficiency Measures (EEMs), cause a reduction in the load profiles of the end-uses presented in the prior section. In this section we derive estimates of economic potential based on the EEM details and market assessment results from the prior sections.

Energy Efficiency Measure Assessment

In order to evaluate technologies for their potential in electric DSM programs it is necessary to compile detailed information at the EEM level of detail. An EEM is a device or action that causes a drop in energy usage. The objective of EEM assessment or screening is to determine the likely set of cost effective measures which can then be used to populate DSM programs that deliver savings through standalone or bundled EEMs. An important by-product of this screening is the information necessary to construct a DSM supply curve for determining economic potential.

Our list of EEMs and assumptions was developed through an integrated approach that combined an extensive review of industry literature, the detailed analysis of DEK loads described earlier, and our own expert opinion. These assumptions and sources are documented in the appendixes. The assumptions required to calculate EEM cost effectiveness are shown in Table 22 for residential and Table 23 for non-residential. Each of these tables uses a standard layout to present the assumptions used to calculate real levelized cost (RLC) per kWh. A discussion of the cost effectiveness approach used to evaluate EEMs follows these two tables.

Descriptions of the columns presented in Table 22 and Table 23 are presented below.

End-Uses	EEMs are grouped by the end-use they address.
EEM Description	Brief description of the EEM. See the appendixes for a more detailed description.
EEM Reference	Code to uniquely identify an EEM in this project.
Application	For residential measures only, describes the segment of residential sector where the EEM assumptions are applicable. For example, the same EEM may have different assumptions for single family and multifamily applications.
Annual kWh Savings	Annual kWh savings per customer site.
Annual Therm Savings (Table 22 only)	Annual therm savings per customer site when EEM involves a technology with dual fuel impacts. Not applicable to non-residential.
Incremental Cost	The incremental cost of installing the EEM at the typical customer site, including any incremental equipment and labor expenses. Note: "incremental" refers to the costs over and above what would have been expended for a standard efficiency measure. All costs are in 2007 dollars.
Annual O&M	Annual operation and maintenance expenses over and above the O&M expenses incurred for standard efficiency measures. Most EEMs have zero incremental O&M expenses.
Measure Life	The average expected life of the measure.
Real Levelized Cost	The incremental cost and annual O&M expressed as a constant annual payment over the life of the measure and then divided by the annual savings. Real levelized cost provides a way of comparing EEMs with different attributes such as measure life on the same scale.

Table 22. Electric DSM Technology Assessment, Residential

End-Uses	EEM Description	EEM Reference	Application	Annual kWh Savings	Annual Therm Savings	Incremental Cost (dollars)	Annual O&M (dollars)	Measure Life (years)	Real Levelized Cost ($/kWh)
Customer-Sited Generation	Solar Photovoltaic	RE-1	All	3,300	0	20,000	10	25	0.3910
Residential Space Conditioning	Resist to SEER 13 Heat Pump	RE-2	Elec SF	6,000	0	10,000	20	10	0.2088
	Resist to SEER 13 Heat Pump	RE-3	Elec MF	4,800	0	10,000	20	10	0.2610
	SEER 8 to SEER 13 CAC	RE-4	Gas SF	1,400	0	3,500	20	10	0.3225
	SEER 8 to SEER 13 CAC	RE-5	Gas MF	1,200	0	3,500	20	10	0.3763
	Refrig Charge/Duct Tune-Up	RE-6	Elec	1,200	0	350	0	13	0.0292
	Refrig Charge/Duct Tune-Up	RE-7	Gas	300	47	350	0	13	0.0467
	SEER 13 to SEER 15 Heat Pump	RE-8	SF Elec New	800	0	1,000	20	20	0.1170
	SEER 13 to SEER 15 Heat Pump	RE-9	MF Elec New	700	0	1,000	20	20	0.1337
	SEER 13 to SEER 15 CAC	RE-10	SF Gas New	400	0	800	20	20	0.1972
	SEER 13 to SEER 15 CAC	RE-11	MF Gas New	350	0	800	20	20	0.2253
	Efficient Window AC	RE-12	All	200	0	150	10	13	0.1251
	Cool Roofs	RE-13	Elec	560	0	158	0	12	0.0301
	EE Windows	RE-14	Elec	1,334	0	2,500	0	25	0.1199
	Programmable Thermostats	RE-15	Elec	500	0	120	0	10	0.0296
	Ceiling Insulation (R6 to R30)	RE-16	Elec	1,800	0	750	0	25	0.0267
	Ceiling Insulation (R6 to R30)	RE-17	Gas	300	100	750	0	25	0.0640
	House Sealing using Blower Door	RE-18	Elec	1,000	0	500	0	13	0.0501
	House Sealing using Blower Door	RE-19	Gas	200	42	500	0	13	0.1001
	Ground Source Heat Pump	RE-20	Elec	5,382	0	7,000	20	25	0.0870
	Wall Insulation (R3 to R11)	RE-21	Elec	2,100	0	1,400	0	25	0.0427
	Wall Insulation (R3 to R11)	RE-22	Gas	400	100	1,400	0	25	0.0896
	Solar Siting/Passive Design	RE-23	New Elec	1,500	0	500	0	50	0.0155
	Energy Star Manufactured Home	RE-24	New	5,000	0	2,600	0	25	0.0333
	Energy Star Construction	RE-25	New Elec	4,223	0	3,000	0	50	0.0331
Load Management	Eliminate Old Refrigerators	RE-26	All	1,150	0	165	0	5	0.0322
	Set Back HVAC	RE-27	All	1,000	0	5	0	2	0.0027
Residential Appliances	Energy Star Clothes Washers	RE-28	All	400	0	400	0	18	0.0790
	Energy Star Dish Washers	RE-29	All	75	0	50	0	10	0.0822
	Energy Star Refrigerators	RE-30	All	100	0	200	0	18	0.1580
	Pool Pumps	RE-31	All	648	0	180	0	10	0.0342
Residential Lighting	Compact Fluorescent	RE-32	All	660	0	24	0	5	0.0082
	Daylighting Design	RE-33	New Elec	750	0	500	0	25	0.0427
	Occupancy Controlled Outdoor	RE-34	All	250	0	100	0	10	0.0493
Water Heating	Tank/Pipe Wrap and Water Temp Setpoint	RE-35	All	200	0	50	0	6	0.0477
	Low Flow Fixtures	RE-36	All	500	0	25	0	10	0.0062
	Heat Pump Water Heaters	RE-37	All	2,000	0	2,500	0	18	0.0987
	Tankless Water Heaters	RE-38	All	400	0	1,500	0	18	0.2962
	Solar Water Heaters	RE-39	All	2,600	0	6,000	20	25	0.1554
	Efficient Plumbing	RE-40	New Elec	500	0	500	0	25	0.0640
Emerging Technologies	Combined Heat/Power, Micro CHP	RE-41	SF Gas	5,000	0	10,000	220	20	0.1912
	Residential LED Lighting	RE-42	All	1,000	0	500	0	20	0.0368

Note: Dollar amounts are expressed in 2007 dollars.

Table 23. Electric DSM Technology Assessment, Non-Residential

End-Uses	EEM Description	EEM Reference	Annual kWh Savings	Incremental Cost (dollars)	Annual O&M (dollars)	Measure Life (years)	Real Levelized Cost ($/kWh)
Customer-Sited Generation	Solar Photovoltaic	CE-1	12,000	90,000	25	25	0.4822
C&I Space Conditioning	Small HVAC Optimization and Repair	CE-2	5,617	1,123	50	5	0.0538
	Commissioning - New	CE-3	40,630	37,000	0	5	0.2046
	Re/Retro-Commissioning Lite	CE-4	15,236	3,000	0	5	0.0442
	Low-E Windows 1500 ft2 New	CE-5	14,979	4,500	0	25	0.0192
	Low-E Windows 1500 ft2 Replace	CE-6	14,979	30,000	0	25	0.1282
	Premium New HVAC Equipment	CE-7	5,617	2,603	250	15	0.0862
	Large HVAC Optimization and Repair	CE-8	6,042	2,066	0	5	0.0768
Design (new)	Integrated Building Design (new)	CE-9	72,929	24,708	0	50	0.0158
	Efficient Package Refrigeration (new)	CE-10	20,140	2,986	0	15	0.0133
Motors & Drives	Electrically Commutated Motors	CE-11	4,028	1,345	0	15	0.0300
	Premium Motors	CE-12	3,745	412	0	15	0.0099
	Variable Speed Drives, Controls and Motor Applications Tune-Up	CE-13	20,140	17,346	0	15	0.0775
Power Distribution	Energy Star Transformers (new)	CE-14	1,007	82	0	18	0.0064
	Efficient AC/DC Power	CE-15	3,021	225	0	5	0.0167
Data Processing	Network Computer Power Management	CE-16	4,028	463	0	2	0.0610
Lighting	New Efficient Lighting Equipment	CE-17	20,140	5,297	0	18	0.0208
	Retrofit Efficient Lighting Equipment	CE-18	20,140	6,621	0	18	0.0260
	LED Exit Signs	CE-19	1,470	270	0	15	0.0165
	LED Traffic Lights (10)	CE-20	5,000	2,000	0	10	0.0493
	Perimeter Daylighting	CE-21	6,042	5,132	0	18	0.0671
Water Heating	Low Flow Fixtures	CE-22	6,000	1,000	0	10	0.0205
	Solar Water Heaters	CE-23	2,500	6,000	20	25	0.1616
	Heat Pump Water Heaters	CE-24	2,000	2,500	20	18	0.1087
Cooking and Laundry	Energy Star Hot Food Holding Cabinet	CE-25	4,100	1,100	0	15	0.0241
	Energy Star Electric Steam Cooker	CE-26	2,200	5,000	0	15	0.2044
	Pre-Rinse Spray Wash	CE-27	10,070	255	0	15	0.0023
	Restaurant Commissioning Audit	CE-28	20,140	1,486	0	5	0.0166
Refrigeration	Grocery Refrigeration Tune-Up and Improvements	CE-29	20,140	3,817	0	5	0.0426
	Refrigeration Casework Improvements	CE-30	10,070	3,323	10	10	0.0417
Other	VendingMiser®	CE-31	1,000	215	0	10	0.0265
	LED Outdoor Lighting	CE-32	1,000	500	0	20	0.0368

Note: Dollar amounts are expressed in 2007 dollars.

Cost Effectiveness[5]

Cost effectiveness of each EEM is measured by the real levelized cost per kWh. Real levelized cost expresses the total incremental cost and any annual operation and maintenance expense as a constant annual payment over the life of the measure divided by annual savings.[6] The advantage of RLC is that it normalizes for differences in measure life and other EEM attributes to provide a means of comparing EEMs in terms of their relative cost effectiveness. As will be demonstrated in the next section, RLC also provides a convenient method for determining economic potential. Assumptions on average annual savings, installed cost and measure life come from many sources, including the energy modeling work conducted as part of this project using segment-specific billing data for DEK customers.[7] In other words, our annual savings estimates are consistent with the modeled loads reported in the Market Assessment section of this report.

Incremental cost for the EEM screening step includes the incremental costs of installing the measure. Depending on the measure, this could be simply the cost of the high efficiency measure over and above the standard efficiency option. In other cases installation labor and site modifications may also be required for the high efficiency model and, hence, would be included in incremental cost. Tax credits and other incentive payments were not considered at this stage of the analysis.

It should be pointed out that program design may have an impact on some of the EEM screening assumptions. An owner-installed delivery option, for example, may result in lower installed cost than a contractor installation but come at the possible loss of useful measure life. Such tradeoffs are important program design considerations but beyond the scope of EEM analysis. For the purposes of this stage of analysis the EEM assumptions provide a reasonable starting point for our assessment of energy efficiency options.

Energy efficiency measures in Table 22 and Table 23 have been grouped by major end-use categories. Measures considered in the screening include combined heat and power (cogeneration) and solar electric. In principle these measures can provide very large energy savings, but they are usually not cost effective. They are included in this screening to keep a broad perspective in the analysis and to reach toward a more full understanding of the possibilities and physical limits of potential.

[5] Two types of cost effectiveness analysis are presented in this report. This section deals only with technology assessment using levelized cost. More comprehensive analysis is required at the program level. See Appendix B in the final report for a discussion of each type of cost effectiveness analysis.

[6] The formula for this calculation is presented in Appendix B. A real discount rate of 4.0 percent was used. The total incremental cost of measures with both electric and gas savings has been prorated between the two fuels. When gas savings are involved the total incremental cost is split 40% electric and 60% gas.

[7] The modeling is described in more detail in Appendix A and EEM assumptions are described in their respective appendixes.

Cost Effectiveness Rankings

The residential and non-residential measures are ranked by cost effectiveness in Table 24 and Table 25, respectively. Descriptions of the columns in these tables are presented below.

EEM Reference	Unique EEM reference number.
EEM Description	Brief description of the EEM. See appendixes for a more detailed description.
Application	For residential measures only, describes the segment of residential sector where the EEM assumptions are applicable. For example, the same EEM may have different assumptions for single family and multifamily applications.
Real Levelized Cost ($/kWh)	The incremental cost and annual O&M expressed as a constant annual payment over the life of the measure and then divided by the annual savings. Entries in the EEM ranking table are sorted from least cost (lowest RLC) to highest cost measures.
Annual Savings per Site (kWh)	Annual kWh savings per customer site.
Potential Sites	An estimate of the potential number of customer sites that could have the EEM installed without regard to cost. See appendixes for more information on determining this estimate for each measure.
Potential Annual Savings (MWh)	Total annual energy savings potential in MWh derived by multiplying the annual savings per site by the number of potential sites.

It is apparent in Table 24 that the most cost effective measures are retrofit measures applied to electrically heated residences. Some measures with large technical potential are shown to have relatively high cost (e.g. replacing resistance heat with a heat pump).

Table 24. Ranked Electric Measures, Residential

EEM Reference	EEM Description	Application	Real Levelized Cost ($/kWh)	Annual Savings per Site (kWh)	Potential Sites	Potential Annual Savings (MWh)
RE-27	Set Back HVAC	All	0.003	1000	6,233	6,233
RE-36	Low Flow Fixtures	All	0.006	500	31,167	15,584
RE-32	Compact Fluorescent	All	0.008	660	7,480	4,937
RE-23	Solar Siting/Passive Design	New Elec	0.016	1500	9,974	14,960
RE-16	Ceiling Insulation (R6 to R30)	Elec	0.027	1800	14,960	26,929
RE-6	Refrig Charge/Duct Tune-Up	Elec	0.029	1200	18,551	22,261
RE-15	Programmable Thermostats	Elec	0.030	500	22,939	11,470
RE-13	Cool Roofs	Elec	0.030	560	0	0
RE-26	Eliminate Old Refrigerators	All	0.032	1150	12,467	14,337
RE-25	Energy Star Construction	New Elec	0.033	4223	9,974	42,118
RE-24	Energy Star Manufactured Home	New	0.033	5000	6,233	31,167
RE-31	Pool Pumps	All	0.034	648	2,493	1,616
RE-42	Residential LED Lighting	All	0.037	1000	7,480	7,480
RE-33	Daylighting Design	New Elec	0.043	750	6,233	4,675
RE-21	Wall Insulation (R3 to R11)	Elec	0.043	2100	11,133	23,379
RE-7	Refrig Charge/Duct Tune-Up	Gas	0.047	300	28,300	8,490
RE-35	Tank/Pipe Wrap and Water Temp Setpoint	All	0.048	200	18,700	3,740
RE-34	Occupancy Controlled Outdoor	All	0.049	250	12,467	3,117
RE-18	House Sealing using Blower Door	Elec	0.050	1000	24,934	24,934
RE-17	Ceiling Insulation (R6 to R30)	Gas	0.064	300	14,960	4,488
RE-40	Efficient Plumbing	New Elec	0.064	500	0	0
RE-28	Energy Star Clothes Washers	All	0.079	400	24,934	9,974
RE-29	Energy Star Dish Washers	All	0.082	75	31,167	2,338
RE-20	Ground Source Heat Pump	Elec	0.087	5382	3,740	20,129
RE-22	Wall Insulation (R3 to R11)	Gas	0.090	400	11,220	4,488
RE-37	Heat Pump Water Heaters	All	0.099	2000	24,934	49,868
RE-19	House Sealing using Blower Door	Gas	0.100	200	37,401	7,480
RE-8	SEER 13 to SEER 15 Heat Pump	SF Elec New	0.117	800	6,233	4,987
RE-14	EE Windows	Elec	0.120	1334	12,828	17,116
RE-12	Efficient Window AC	All	0.125	200	24,934	4,987
RE-9	SEER 13 to SEER 15 Heat Pump	MF Elec New	0.134	700	3,740	2,618
RE-39	Solar Water Heaters	All	0.155	2600	27,427	71,311
RE-30	Energy Star Refrigerators	All	0.158	100	6,233	623
RE-41	Combined Heat/Power, Micro CHP	SF Gas	0.191	5000	31,167	155,836
RE-10	SEER 13 to SEER 15 CAC	SF Gas New	0.197	400	6,233	2,493
RE-2	Resist to SEER 13 Heat Pump	Elec SF	0.209	6000	3,740	22,440
RE-11	SEER 13 to SEER 15 CAC	MF Gas New	0.225	350	3,740	1,309
RE-3	Resist to SEER 13 Heat Pump	Elec MF	0.261	4800	3,740	17,952
RE-38	Tankless Water Heaters	All	0.296	400	3,740	1,496
RE-4	SEER 8 to SEER 13 CAC	Gas SF	0.323	1400	11,220	15,708
RE-5	SEER 8 to SEER 13 CAC	Gas MF	0.376	1200	14,812	17,774
RE-1	Solar Photovoltaic	All	0.391	3300	31,167	102,852
Note: Dollar amounts are expressed in 2007 dollars.						

Another energy saver with poor cost effectiveness is the replacement of poorly performing central air conditioners on a gas heated residence by more efficient ones. This poor cost effectiveness relates to the high initial cost of the equipment, and to the relatively low cooling savings. Generally measures that pertain to efficient new construction are reasonably cost effective because EEMs can be installed at the time of construction with low incremental cost impacts.

The non-residential measures are ranked in Table 25 by cost effectiveness. As with residential, measures pertaining to building efficient new stock are generally cost effective. Also, measures associated with tuning and properly maintaining HVAC and refrigeration equipment are generally cost effective.

Lighting, new design and commissioning are both cost effective and large. Another favored category is small HVAC Optimization and Repair; it is also cost effective and large. As in the case of residential, the least cost effective measures are efficient glazing, solar water heat and solar photovoltaic.

Table 25. Ranked Electric Measures, Non-Residential

EEM Reference	EEM Description	Real Levelized Cost ($/kWh)	Annual Savings per Site (kWh)	Potential Sites	Potential Annual Savings (MWh)
CE-27	Pre-Rinse Spray Wash	0.002	10,070	271	2,732
CE-14	Energy Star Transformers (new)	0.006	1,007	950	956
CE-12	Premium Motors	0.010	3,745	1,356	5,080
CE-10	Efficient Package Refrigeration (new)	0.013	20,140	678	13,659
CE-9	Integrated Building Design (new)	0.016	72,929	1,356	98,925
CE-19	LED Exit Signs	0.017	1,470	3,391	4,985
CE-28	Restaurant Commissioning Audit	0.017	20,140	271	5,464
CE-15	Efficient AC/DC Power	0.017	3,021	2,713	8,196
CE-5	Low-E Windows 1500 ft2 New	0.019	14,979	2,713	40,637
CE-22	Low Flow Fixtures	0.021	6,000	678	4,069
CE-17	New Efficient Lighting Equipment	0.021	20,140	2,713	54,637
CE-25	Energy Star Hot Food Holding Cabinet	0.024	4,100	271	1,112
CE-18	Retrofit Efficient Lighting Equipment	0.026	20,140	4,748	95,615
CE-31	VendingMiser®	0.027	1,000	271	271
CE-11	Electrically Commutated Motors	0.030	4,028	1,356	5,464
CE-32	LED Outdoor Lighting	0.037	1,000	2,713	2,713
CE-30	Refrigeration Casework Improvements	0.042	10,070	271	2,732
CE-29	Grocery Refrigeration Tune-Up and Improvements	0.043	20,140	271	5,464
CE-4	Re/Retro-Commissioning Lite	0.044	15,236	2,804	42,719
CE-20	LED Traffic Lights (10)	0.049	5,000	1,356	6,782
CE-2	Small HVAC Optimization and Repair	0.054	5,617	3,527	19,810
CE-16	Network Computer Power Management	0.061	4,028	2,713	10,927
CE-21	Perimeter Daylighting	0.067	6,042	2,035	12,293
CE-8	Large HVAC Optimization and Repair	0.077	6,042	1,167	7,048
CE-13	Variable Speed Drives, Controls and Motor Applications Tune-Up	0.077	20,140	1,085	21,855
CE-7	Premium New HVAC Equipment	0.086	5,617	1,356	7,619
CE-24	Heat Pump Water Heaters	0.109	2,000	814	1,628
CE-6	Low-E Windows 1500 ft2 Replace	0.128	14,979	678	10,159
CE-23	Solar Water Heaters	0.162	2,500	1,356	3,391
CE-26	Energy Star Electric Steam Cooker	0.204	2,200	271	597
CE-3	Commissioning - New	0.205	40,630	0	0
CE-1	Solar Photovoltaic	0.482	12,000	1,356	16,278
Note: Dollar amounts are expressed in 2007 dollars.					

Economic Potential

Economic potential is defined as the total energy savings available at a specified long-term avoided cost of energy. Technologies with levelized costs that are lower than the avoided cost of energy are included in estimates of economic potential. A DSM supply curve provides a flexible framework for presenting economic potential that reflects the direct relationship between the long-term marginal cost of energy supply and energy efficiency potential. Unlike point estimates, DSM supply curves show the economic potential at several levels of marginal supply cost. The incremental cost of measures does not include program delivery and administration expenses that will be required to actually achieve energy savings. In order to provide a more realistic estimate of the economic potential, a 30 percent adder for program delivery expenses is added to incremental measure costs. Although the 30 percent adder is based on program budgets developed for other studies, it is meant as a rough estimate of the cost of actually acquiring the DSM resource. More refined estimates of program costs will be developed in the next section.

The DSM supply curve for residential is shown in Figure 28 which shows the cumulative kWh savings from all measures listed in Table 24 with a levelized cost less than the corresponding point on the graph. Two supply curves are presented, one that only includes the incremental measure cost and one with an adder for program delivery costs, as described above. Since the supply with program delivery costs is more realistic of actual costs, it will be used to estimate the economic potential for this study. For example, there are approximately 230 million kWh of annual savings available at a cost $0.06 per kWh or less. Estimated residential economic potential increases to 270 million kWh annually at a cost of $0.08 per kWh or less.

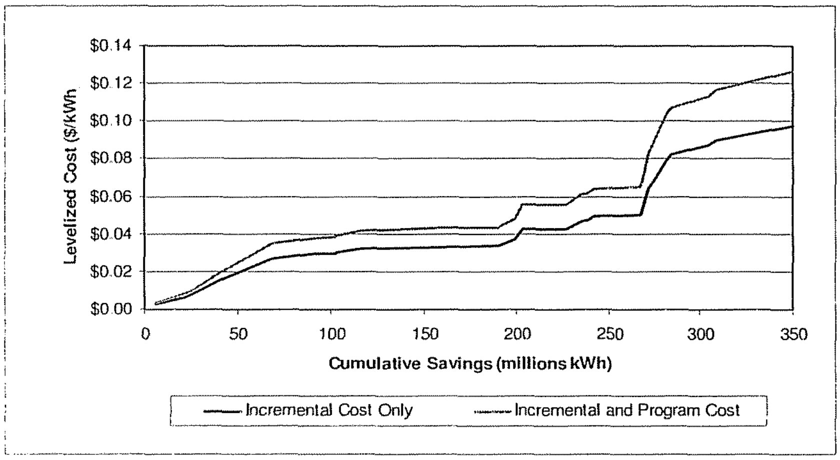


Figure 28. Residential Electric DSM Supply Curve

DEK marginal cost of avoided supply depends on the load shape and longevity of savings.[8] Using $0.06 per kWh as an approximate marginal cost of supply, residential economic potential is estimated at 227 million kWh annually.

The DSM supply curve for non-residential is shown in Figure 29 and, like residential, represents an alternate format for the information in Table 25 and includes a supply curve with an adder for program delivery expenses.

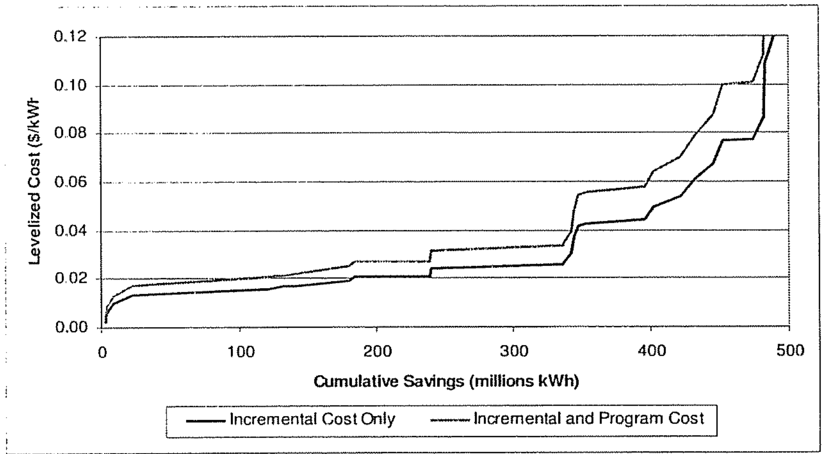


Figure 29. Non-Residential Electric DSM Supply Curve

Figure 29 shows that a large amount of the non-residential efficiency savings are available at levelized costs of $0.04 per kWh or less. Over $0.04 per kWh the supply curve is considerably steeper. Using an approximate marginal cost of supply of $0.06, we estimate annual economic potential in the non-residential sector to be approximately 395 million kWh.

Both the residential and non-residential DSM supply curves show a diminishing return as the levelized cost rises above $0.10 per kWh. About half of the full technical potential is available at levelized costs of less than $0.06 per kWh. Our estimate of total economic potential in both segments is 622 million kWh annually.

[8] Marginal cost of supply vary by time of day and season and the amount of avoided peak load. Since different measures have different load shapes, they also have different marginal supply cost. When measures are grouped into programs, these differences are reflected in the breakeven marginal cost of energy supply for that program which represents the cost that the program must fall under in order to be cost effective.

GAS MEASURES AND ECONOMIC POTENTIAL

In this section we present detailed information regarding energy efficiency technologies. These technologies, referred to as Energy Efficiency Measures (EEMs), cause a reduction in the load profiles of the end-uses presented in the prior section. In this section we derive estimates of economic potential based on the EEM details and market assessment results from the prior sections.

Energy Efficiency Measure Assessment

In order to evaluate technologies for their potential in electric DSM programs it is necessary to compile detailed information at the EEM level of detail. An EEM is a device or action that causes a drop in energy usage. The objective of EEM assessment or screening is to determine the likely set of cost effective measures which can then be used to populate DSM programs that deliver savings through standalone or bundled EEMs. An important by-product of this screening is the information necessary to construct a DSM supply curve for determining economic potential.

Our list of EEMs and assumptions was developed through an integrated approach that combined an extensive review of industry literature, the detailed analysis of DEK loads described earlier, and our own expert opinion. These assumptions and sources are documented in the appendixes. The assumptions required to calculate EEM cost effectiveness are shown in Table 26 for residential and Table 27 for non-residential. Each of these tables uses a standard layout to present the assumptions used to calculate real levelized cost (RLC) per therm. A discussion of the cost effectiveness approach used to evaluate EEMs follows these two tables.

Descriptions of the columns presented in Table 26 and Table 27 are presented below.

End-Uses	EEMs are grouped by the end-use they address.
EEM Description	Brief description of the EEM. See the appendixes for a more detailed description.
EEM Reference	Code to uniquely identify an EEM in this project.
Application	For residential measures only, describes the segment of residential sector where the EEM assumptions are applicable. For example, the same EEM may have different assumptions for single family and multifamily applications.
Annual Therm Savings	Annual therm savings per customer site.
Incremental Cost	The incremental cost of installing the EEM at the typical customer site, including any incremental equipment and labor expenses. Note: "incremental" refers to the costs over and above what would have been expended for a standard efficiency measure. All costs are in 2007 dollars.
Annual O&M	Annual operation and maintenance expenses over and above the O&M expenses incurred for standard efficiency measures. Most EEMs have zero incremental O&M expenses.
Measure Life	The average expected life of the measure.
Real Levelized Cost	The incremental cost and annual O&M expressed as a constant annual payment over the life of the measure and then divided by the annual savings. Real levelized cost provides a way of comparing EEMs with different attributes such as measure life on the same scale.

Table 26. Gas DSM Technology Assessment, Residential

End-Uses	EEM Description	EEM Reference	Application	Annual Therm Savings	Incremental Cost (dollars)	Annual O&M (dollars)	Measure Life (years)	Real Levelized Cost ($/therm)
Appliance Efficiency	Solar Water Heater	RG-1	SF MF All	137	6,000	10	25	2.8866
	EE Water Heater with EF >= 0.6	RG-2	SF	50	180	0	15	0.3238
	EE Water Clothes Washer	RG-3	SF	30	500	0	15	1.4990
	Gas Clothes Dryer (Energy Star)	RG-4	SF	13	100	0	18	0.6076
	Gas Stove/Oven	RG-5	SF	5	100	0	18	1.5799
	Tank/Pipe Wrap	RG-6	SF	2	10	0	6	0.9538
	Low Flow Fixtures	RG-7	SF	27	25	0	10	0.1142
	Tankless WH Reqd	RG-8	SF	75	500	0	15	0.5996
	Tankless Discretionary	RG-9	SF	75	1,100	0	15	1.3191
Furnace Efficiency	AFUE 65 to 82 SFe	RG-10	SF Est	156	1,100	10	5	1.6480
	AFUE 65 to 82 MFe	RG-11	MF Est	98	1,100	10	5	2.6234
	AFUE 65 to 92 SFe	RG-12	SF Est	200	750	10	25	0.2900
	AFUE 65 to 92 MFe	RG-13	MF Est	106	750	10	25	0.5473
	AFUE 82 to 92 SFe	RG-14	SF New	85	750	10	25	0.6825
	AFUE 82 to 92 MFe	RG-15	MF New	55	750	10	25	0.5310
	AFUE 82 to 92 SFn	RG-16	SF New	45	750	10	25	1.2891
	AFUE 82 to 92 MFn	RG-17	MF New	27	750	10	25	2.1485
	Programmable Thermostats	RG-18	SF	35	120	2	10	0.4799
	Proper HVAC Sizing	RG-19	SF	49	50	0	18	0.0324
	HVAC Tune-Up	RG-20	SF	40	75	0	3	0.6757
	CO Remediation	RG-21	SF	117	200	0	10	0.0843
Shell Efficiency	EE Windows	RG-22	SF	98	2,500	0	25	1.6411
	Ceiling Insulation (R11 to R38)	RG-23	SF	105	1,000	0	25	0.6096
	Ceiling Insulation (R30 to R38)	RG-24	SF	50	500	0	25	0.6401
	Ceiling Insulation (R19 to R38)	RG-25	SF	70	750	0	25	0.6858
	House Sealing using Blower Door	RG-26	SF	75	500	0	13	0.6676
	Duct Seal	RG-27	SF	50	350	0	13	0.7010
	Wall Insulation (R0 to R11)	RG-28	SF New	140	1,400	0	25	0.2560
	Wall Insulation (R11 to R19)	RG-29	SF	195	1,750	0	25	0.5744
	Floor/Basement Insulation	RG-30	SF	98	1,000	0	25	0.6564
	Energy Star Construction	RG-31	SF New	285	3,000	0	50	0.4900
	Solar Siting	RG-32	SF New	90	500	0	50	0.2586

Note: Dollar amounts are expressed in 2007 dollars.

Table 27. Gas DSM Technology Assessment, Non-Residential

End-Uses	EEM Description	EEM Reference	Annual Therm Savings	Incremental Cost (dollars)	Annual O&M (dollars)	Measure Life (years)	Real Levelized Cost ($/therm)
Appliance Improvements	Solar Water Heater	CG-1	300	10,000	250	25	2.9671
	Low Flow Fixtures	CG-2	600	1,000	0	10	0.2055
	EE Water Heater with EF >= 0.6	CG-3	500	3,500	0	15	0.6296
	Energy Star Gas Oven	CG-4	616	5,000	0	15	0.7306
	ES Gas Stove	CG-5	462	4,000	0	15	0.7793
	ES Gas Clothes Dryer	CG-6	539	4,000	0	15	0.6679
	Commissioning Audit	CG-7	400	1,794	0	5	1.0075
Shell Efficiency	Roof Insulation	CG-8	600	1,875	0	25	0.2000
	Low-E Windows 1500 ft2	CG-9	400	2,250	0	25	0.3601
	Low-E Windows 1500 ft2 Replace	CG-10	400	7,500	0	25	1.2002
	Ceiling Insulation (R11 to R38)	CG-11	600	1,875	0	25	0.2000
	Ceiling Insulation (R30 to R38)	CG-12	69	1,250	0	25	1.1596
	Ceiling Insulation (R19 to R38)	CG-13	300	1,875	0	25	0.4001
	House Sealing using Blower Door	CG-14	69	500	0	13	0.7257
	Duct Seal	CG-15	60	350	0	13	0.5842
	Wall Insulation (R0 to R11)	CG-16	259	3,125	0	25	0.7723
	Wall Insulation (R11 to R19)	CG-17	346	4,375	0	25	0.8094
	Floor/Basement Insulation	CG-18	173	1,400	0	25	0.5180
Furnace Efficiency	EE Boiler	CG-19	2,400	20,000	50	20	0.6340
	Proper HVAC Sizing	CG-20	385	0	0	18	0.0000
	HVAC Tune-Up	CG-21	154	300	0	3	0.7025
	CO Remediation	CG-22	231	400	0	10	0.2136
	Integrated Building Design	CG-23	518	3,000	0	50	0.2696
	AFUE 82 to 92 SFe	CG-24	846	750	25	15	0.1092
	AFUE 65 to 92 SFe	CG-25	1,539	750	25	15	0.0601
Controls	Commissioning - New	CG-26	1,000	2,500	0	5	0.5616
	Re/Retro-Commissioning	CG-27	650	1,500	0	5	0.5184
	Controls	CG-28	2,000	4,500	250	15	0.3274
	Programmable Thermostats	CG-29	207	240	0	13	0.1161

Note: Dollar amounts are expressed in 2007 dollars.

Cost Effectiveness[9]

Cost effectiveness of each EEM is measured by the real levelized cost per therm. Real levelized cost expresses the total incremental cost and any annual operation and maintenance expense as a constant annual payment over the life of the measure divided by annual savings.[10] The advantage of RLC is that it normalizes for differences in measure life and other EEM attributes to provide a means of comparing EEMs in terms of their relative cost effectiveness. As will be demonstrated in the next section, RLC also provides a convenient method for determining economic potential. Assumptions on average annual savings, installed cost and measure life come from many sources, including the energy modeling work conducted as part of this project using segment-specific billing data for DEK customers.[11] In other words, our annual savings estimates are consistent with the modeled loads reported in the Market Assessment section of this report.

Incremental cost for the EEM screening step includes the incremental costs of installing the measure. Depending on the measure, this could be simply the cost of the high efficiency measure over and above the standard efficiency option. In other cases installation labor and site modifications may also be required for the high efficiency model and, hence, would be included in incremental cost. Tax credits and other incentive payments were not considered at this stage of the analysis.

It should be pointed out that program design may have an impact on some of the EEM screening assumptions. An owner-installed delivery option, for example, may result in lower installed cost than a contractor installation but come at the possible loss of useful measure life. Such tradeoffs are important program design considerations but beyond the scope of EEM analysis. For the purposes of this stage of analysis the EEM assumptions provide a reasonable starting point for our assessment of energy efficiency options.

Energy efficiency measures in Table 26 and Table 27 have been grouped by major end-use categories. Measures considered in the screening include combined heat and power (cogeneration) and solar electric. In principle these measures can provide very large energy savings, but they are usually not cost effective. They are included in this screening to keep a broad perspective in the analysis and to reach toward a more full understanding of the possibilities and physical limits of potential.

[9] Two types of cost effectiveness analysis are presented in this report. This section deals only with technology assessment using levelized cost. More comprehensive analysis is required at the program level. See Appendix B in the final report for a discussion of each type of cost effectiveness analysis.

[10] The formula for this calculation is presented in Appendix B. A real discount rate of 4.0 percent was used.

[11] The modeling is described in more detail in Appendix A and EEM assumptions are described in their respective appendixes.

Cost Effectiveness Rankings

The residential and non-residential measures are ranked by real levelized cost in Table 28 and Table 29, respectively. Descriptions of the columns in these tables are presented below.

EEM Reference	Unique EEM reference number.
EEM Description	Brief description of the EEM. See appendixes for a more detailed description.
Application	For residential measures only, describes the segment of residential sector where the EEM assumptions are applicable. Includes a 30% adder for program delivery expenses. For example, the same EEM may have different assumptions for single family and multifamily applications.
Real Levelized Cost ($/therm)	The incremental cost and annual O&M expressed as a constant annual payment over the life of the measure and then divided by the annual savings. Entries in the EEM ranking table are sorted from least cost (lowest RLC) to highest cost measures.
Annual Savings per Site (therms)	Annual therm savings per customer site.
Potential Sites	An estimate of the potential number of customer sites that could have the EEM installed without regard to cost. See appendixes for more information on determining this estimate for each measure.
Potential Annual Savings (therms)	Total annual energy savings potential in therms derived by multiplying the annual savings per site by the number of potential sites.

Table 28. Ranked Gas Measures, Residential

EEM Reference	EEM Description	Application	Real Levelized Cost ($/therm)	Annual Savings per Site (therms)	Potential Sites	Potential Annual Savings (therms)
RG-19	Proper HVAC Sizing	SF	0.032	49	8,435	411,253
RG-21	CO Remediation	SF	0.084	117	5,904	690,905
RG-7	Low Flow Fixtures	SF	0.114	27	42,174	1,138,700
RG-28	Wall Insulation (R0 to R11)	SF New	0.256	140	8,435	1,180,874
RG-32	Solar Siting	SF New	0.259	90	12,652	1,138,700
RG-12	AFUE 65 to 92 SFe	SF Est	0.290	200	8,435	1,686,963
RG-2	EE Water Heater with EF >= 0.6	SF	0.324	50	33,739	1,686,963
RG-18	Programmable Thermostats	SF	0.480	35	21,087	738,047
RG-31	Energy Star Construction	SF New	0.490	285	8,435	2,403,923
RG-15	AFUE 82 to 92 MFe	MF New	0.531	55	4,217	231,957
RG-13	AFUE 65 to 92 MFe	MF Est	0.547	106	8,435	894,091
RG-29	Wall Insulation (R11 to R19)	SF	0.574	195	4,217	822,506
RG-8	Tankless WH Reqd	SF	0.600	75	16,870	1,265,223
RG-4	Gas Clothes Dryer (Energy Star)	SF	0.608	13	25,304	328,958
RG-23	Ceiling Insulation (R11 to R38)	SF	0.610	105	6,748	708,525
RG-24	Ceiling Insulation (R30 to R38)	SF	0.640	50	6,748	337,393
RG-30	Floor/Basement Insulation	SF	0.656	98	12,652	1,233,759
RG-26	House Sealing using Blower Door	SF	0.668	75	21,087	1,581,528
RG-20	HVAC Tune-Up	SF	0.676	40	21,087	843,482
RG-14	AFUE 82 to 92 SFe	SF New	0.682	85	8,435	716,959
RG-25	Ceiling Insulation (R19 to R38)	SF	0.686	70	8,435	590,437
RG-27	Duct Seal	SF	0.701	50	21,087	1,054,352
RG-6	Tank/Pipe Wrap	SF	0.954	2	42,174	84,348
RG-16	AFUE 82 to 92 SFn	SF New	1.289	45	8,435	379,567
RG-9	Tankless Discretionary	SF	1.319	75	8,435	632,611
RG-3	EE Water Clothes Washer	SF	1.499	30	25,304	759,134
RG-5	Gas Stove/Oven	SF	1.580	5	10,122	50,609
RG-22	EE Windows	SF	1.641	98	21,087	2,056,265
RG-10	AFUE 65 to 82 SFe	SF Est	1.648	156	4,217	657,916
RG-17	AFUE 82 to 92 MFn	MF New	2.148	27	843	22,774
RG-11	AFUE 65 to 82 MFe	MF Est	2.623	98	1,687	165,322
RG-1	Solar Water Heater	SF MF All	2.887	137	22,774	3,109,072

Note: Dollar amounts are expressed in 2007 dollars.

The non-residential measures are ranked in Table 29 by real levelized cost.

Table 29. Ranked Gas Measures, Non-Residential

EEM Reference	EEM Description	Real Levelized Cost ($/therm)	Annual Savings per Site (therms)	Potential Sites	Potential Annual Savings (therms)
CG-20	Proper HVAC Sizing	0.000	385	1,669	642,105
CG-25	AFUE 65 to 92 SFe	0.060	1,539	1,335	2,054,735
CG-24	AFUE 82 to 92 SFe	0.109	846	668	565,052
CG-29	Programmable Thermostats	0.116	207	1,001	207,287
CG-8	Roof Insulation	0.200	600	1,335	801,108
CG-11	Ceiling Insulation (R11 to R38)	0.200	600	668	400,554
CG-2	Low Flow Fixtures	0.205	600	1,669	1,001,385
CG-22	CO Remediation	0.214	231	668	154,105
CG-23	Integrated Building Design	0.270	518	668	345,812
CG-28	Controls	0.327	2,000	601	1,201,662
CG-9	Low-E Windows 1500 ft2	0.360	400	788	315,103
CG-13	Ceiling Insulation (R19 to R38)	0.400	300	1,335	400,554
CG-18	Floor/Basement Insulation	0.518	173	668	115,493
CG-27	Re/Retro-Commissioning	0.518	650	801	520,720
CG-26	Commissioning - New	0.562	1,000	1,335	1,335,180
CG-15	Duct Seal	0.584	60	2,670	160,222
CG-3	EE Water Heater EF >= 0.6	0.630	500	1,669	834,488
CG-19	EE Boiler	0.634	2,400	668	1,602,216
CG-6	ES Gas Clothes Dryer	0.668	539	334	179,789
CG-21	HVAC Tune-Up	0.702	154	1,669	256,842
CG-14	House Sealing using Blower Door	0.726	69	2,670	184,255
CG-4	Energy Star Gas Oven	0.731	616	334	205,474
CG-16	Wall Insulation (R0 to R11)	0.772	259	668	172,906
CG-5	ES Gas Stove	0.779	462	334	154,105
CG-17	Wall Insulation (R11 to R19)	0.809	346	668	230,986
CG-7	Commissioning Audit	1.007	400	668	267,036
CG-12	Ceiling Insulation (R30 to R38)	1.160	69	668	46,064
CG-10	Low-E Windows 1500 ft2 Replace	1.200	400	1,335	534,072
CG-1	Solar Water Heater	2.967	300	668	200,277

Note: Dollar amounts are expressed in 2007 dollars.

Economic Potential

Economic potential is defined as the total energy savings available at a specified long-term avoided cost of energy. Technologies with levelized costs that are lower than the avoided cost of energy are included in estimates of economic potential. A DSM supply curve provides a flexible framework for presenting economic potential that reflects the direct relationship between the long-term marginal cost of energy supply and energy efficiency potential. Unlike point estimates, DSM supply curves show the economic potential at several levels of marginal supply cost. The incremental cost of measures does not include program delivery and administration expenses that will be required to actually achieve energy savings. In order to provide a more realistic estimate of the economic potential, a 30 percent adder for program delivery expenses is added to incremental measure costs. Although the 30 percent adder is based on program budgets developed for other studies, it is meant as a rough estimate of the cost of actually acquiring the DSM resource. More refined estimates of program costs will be developed in the next section.

The DSM supply curve for residential is shown in Figure 30 which shows the cumulative therm savings from all measures listed in Table 28 with a levelized cost less than the corresponding point on the graph. Two supply curves are presented, one that only includes the incremental measure cost and one with an adder for program delivery costs, as described above. Since the supply with program delivery costs is more realistic of actual costs, it will be used to estimate the economic potential for this study. For example, there are approximately 6 million therms of annual savings available at a cost $0.60 per therm or less. Estimated residential economic potential increases near 15 million therms annually at a cost of $0.90 per therm or less.

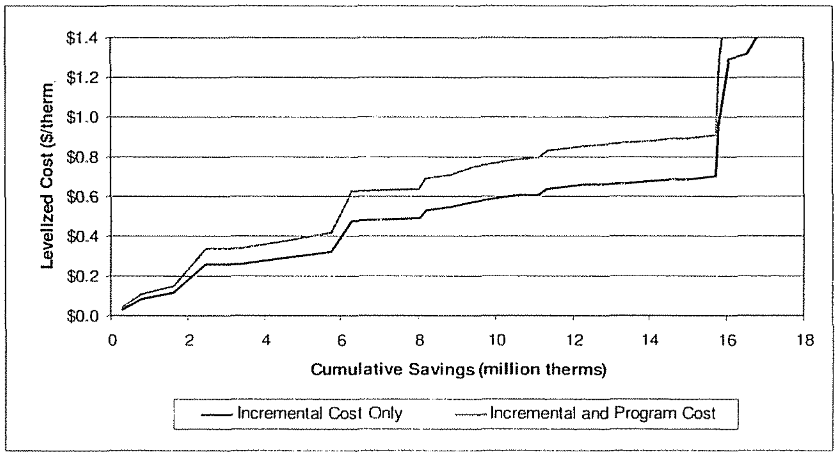


Figure 30. Residential Gas DSM Supply Curve

Using $0.90 per therm as an approximate marginal cost of supply, residential economic potential is estimated at 15 million therms annually.

The DSM supply curve for non-residential is shown in Figure 31 and, like residential, represents an alternate format for the information in Table 29.

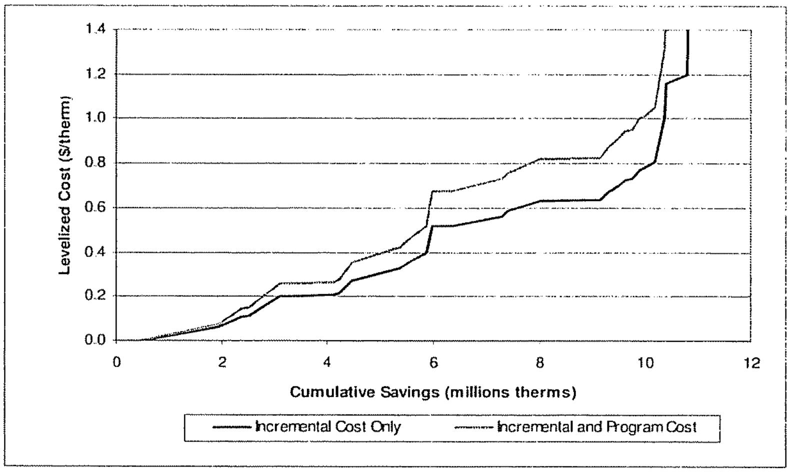


Figure 31. Non-Residential Gas DSM Supply Curve

Figure 31 shows that much of the non-residential efficiency savings are available at levelized costs of less than $0.80 per therm. Using an approximate marginal cost of supply of $0.90, we estimate annual economic potential in the commercial sector to be approximately 9.3 million therms.

Both the residential and non-residential DSM supply curves show a diminishing return as the levelized cost rises above $1.00 per therm. Our estimate of total economic potential in both segments is 24.3 million therms annually (2,358 MMCF).

DSM PROGRAMS

Programs proposed in this section of the report are designed to save kWh and therms and to provide tools to control electrical load (kW). Programs are created as bundles of related energy savings measures and/or demand reduction measures. The cost effectiveness of the individual measures is shown in the measure tables in the previous section of this report, where individual measure rankings may be reviewed. [In addition, Figure 28 through Figure 31 also include a proxy for program costs.] In moving from the level of consideration of individual measures to the full program level in this section of the study, we have included the program administrator's program costs (sometimes called the utility program costs) along with the costs of the individual measures that have been assembled into each program. The cost-effectiveness tests applied at the program level include the additional costs to manage the programs and costs of program evaluation. Cost-effectiveness testing of the programs requires assumptions about the relative frequency of individual measures included in each program option. Using this approach, recommended programs are listed in Table 30.

The company will, of course, make the final selection of programs to be submitted for regulatory approval. For programs ultimately selected and approved, Duke Energy Kentucky will then develop a scope of work and will then (for most programs – any that are not determined to be best run internally) issue a RFP to the program vendor community to elicit proposals from which a vender may be selected. Each vendor will propose full program designs in their bid package. The final program designs (the ones actually implemented) will be based on the planned design as approved by the Commission, the scope of work developed by Duke Energy, and the selected vendor's proposal.

Today, most DSM programs are managed with a small internal staff responsible for vendors who do most of the work to implement the programs, develop relationships essential to increasing customer participation, carry out day-to-day operations, and perform the work of data entry for program tracking.[12] There will need to be a sufficient internal DSM staff to insure that program control is efficient and effective and that responsibilities and lines of accountability of vendors to the company are kept crystal clear.

The programs presented below were designed to capture the most cost-effective opportunities from the Energy Efficiency Measures (EEMs) identified earlier in this report. Cost effectiveness results are presented for all of the programs in the following section of the report. Each of the program plans presented in this section contains information on program design, participation, expected savings, tracking concerns, and implementation budget.

[12] Be sure to require vendors to provide consistent and timely tracking system inputs as a condition of submitting a bid. The program tracking system is usually best internal to the company (so it will be consistent across programs rather than each vendor bringing their own system), but the detailed input is usually best made part of program vendor responsibilities (so as to avoid duplication of input effort).

The program information is organized as follows:

- Description of program design including measures and incentives. This description leads off each program plan.
- Rationale for the program. This is a brief description of the logic of the program.
- Participation and measures included in the program, along with expected energy savings. This provides a five-year overview of number of participants and expected energy savings (annual kWh savings, therm savings, and kW reductions).
- Marketing Plans. A brief description of suggested marketing efforts specific to the program.[13]
- Program Tracking Considerations
- Detailed Budget Plans. Annual program implementation budgets for five years.

In some of the program descriptions names of organizations or products are given. These are not recommendations of specific groups or brands, but are included as links for developing further information.

In addition to the specific plans for each program, it is recommended to have a general marketing and promotional effort to support DSM and to help customers become aware of the programs. This will include effective energy efficiency education efforts, including education in the schools and an energy audit web tool. These overall DSM related activities are discussed in greater detail in the Cost Effectiveness section.

[13] While marketing is addressed for each program, we recommend bundling the programs so that from a customer perspective there are no more than nine options. Although programs will be selected and evaluations performed on the individual programs, for customer communications a simplified menu approach is more appropriate. For a model of how the menu approach works, go to http://www.pge.com/index.html. This site divides into "For my Home," and "For my Business." Then programs are listed branching from these two options. The programs as they appear to the customer are constructed to make sense from the logic of customer communication and the logic of efficient program administration, rather than as many individual programs.

Table 30. Program Recommendations

No.	Program Name	Description	Recommended
		Direct Load Control Programs	
1	C&I Peak Reduction	Air conditioner Direct Load Control for commercial and industrial customers	Yes
2	Residential Peak Reduction	Air conditioner and electric hot water heater Direct Load Control for residential customers	Yes
		Research and Demonstration Projects	
3	Renewables and Demonstrations	Demonstrations to push limits and learning for new technologies; and to build customer attention to green and DSM/DR programs	Yes*
		Commercial and Industrial Programs	
4	C&I Incentives	Sets of improvements or special measures proposed for individual situations	Yes
5	C&I Rebates	Prescriptive measures for non-residential customers	Yes
6	C&I Retro-Commissioning Lite	Tuning of controls	Yes
7	C&I HVAC Optimization	Check and optimization of HVAC units	Yes
8	C&I Audit	Audit program focused on food processing and refrigeration (supermarkets and restaurants)	Yes
9	C&I New Construction	New buildings	Yes
		Residential Programs	
10	Residential Whole House	Free remote audits with kit available to all customers; on-site audit with direct install of low-cost items and kit for fifty dollars (refundable against installation cost of items recommended in audit)	Yes
11	Residential Rebates	Energy efficient lighting and clothes washers	Yes
12	Residential Appliance Recycling	Pick-up and environmental disposal	Yes
13	Residential New Construction	New buildings	Yes
14	Residential Solar Siting	Solar orientation, passive design, work on codes	Yes
15	Residential Low and Moderate Income Weatherization	Homes with electric heat and electric hot water, income at or below 150% of the federal poverty level or at or below 80% of median income	Yes*

*Note that Program 3 (Renewables and Demonstrations) and Program 15 (Residential Low and Moderate Income Weatherization) do not pass the TRC test, but are still recommended. Renewables and Demonstrations programs advance the knowledge with specific technologies and also provide educational opportunities in the community. Low and Moderate Income programs provide important services that help to more equitably address the energy burden for this segment of the population. All other programs pass the TRC test and the overall portfolio of programs also passes the TRC test.

Program 1. Commercial and Industrial Peak Reduction

The Commercial and Industrial Peak Reduction Program is proposed as an addition to the company's existing and highly effective PowerShare and PowerManager programs. Duke Energy, following on the experience of Cinergy, has mastered the art of load control programs for large commercial and industrial customers and offers several options to these customers through PowerShare. Duke Energy has become a national leader both through the development of PowerShare and through its support of the development of DSMore™. Program 1, Commercial and Industrial Peak Reduction, is directed to a different customer segment, the medium-sized commercial and small industrial customers. This program is directed solely to provision of load control to reduce peak kW for medium size commercial and small industrial customers. The Commercial and Industrial Peak Reduction program is assumed to be piggybacked on a wider "smart grid" initiative. The company will have its own internal preference for type of meters and brand(s). The systems may be one-way or two-way. Smart meter technology generally supports:

- time-of-use prices, where the cost of electricity is lower during off-peak periods and higher during times of peak use;
- direct load control, a feature that allows automatic adjustments to central air conditioning units during periods of peak demand during summer months in exchange for price incentives on electric rates; and
- the ability to pre-pay for electricity service.

For this program, we focus on load control, although clearly the new smart grid technologies offer the opportunity to explore development of several other kinds of customer service initiatives, including time of use pricing. A load control program is a dispatch program. In a dispatch program, a switch can be engaged to send a signal which directly reduces load. Direct load control is an important approach to peak reduction because it offers low cost to the company and is dispatchable.

Rationale

Load (KW) constraints are one of the most costly events a utility encounters. During peak times when demand escalates and there is a problem with meeting demand with additional generation supply (either physically or at reasonable cost), the cost per kW to the company can escalate exponentially. For this reason, in these situations load control is essential to control costs and insure service.

Participation and Measures

Measures are shown below.

Table 31. Measures – C&I Peak Reduction

Demand Control Measures
DLC – Non Res AC

Projected participation by year is shown in the table below.

Table 32. Estimated Participation and Savings – C&I Peak Reduction

Potential participants	3,000
Per participant savings (kWh):	0
Per participant savings (kW):	9.5
Per participant gas savings (CCF):	0

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	30	1.0%	-	286	-
Year 2	60	2.0%	-	572	-
Year 3	90	3.0%	-	858	-
Year 4	120	4.0%	-	1,144	-
Year 5	150	5.0%	-	1,430	-
Cumulative	450	15.0%	-	4,290	-

Marketing Plans

Marketing should take advantage of current concerns for mitigating climate problems by emphasizing a green marketing theme and can include the following elements:

- Proposed marketing efforts are to include mention of the program in any communications with commercial and industrial customers regarding energy efficiency program options; such as, bill inserts, recognition window stickers for participating businesses, and promotion using the Duke Energy website.
- The small commercial class is not expected to be easy to enlist. Generally, these customers will be concerned about the effects of the cycling on clients and staff. It is expected that this program may cause a temperature fluctuation of about 2 degrees. If this can be communicated or demonstrated it may ease fears about effects on customers or production.
- The small commercial class is not assigned account representatives, so this will be a limiting factor in communications.
- The issue of owner-occupied versus tenant-occupied space will also be a challenge in promoting participation in this program. The marketing and promotion effort will give priority to owner-occupied facilities.

Program Tracking Considerations

Direct load control is data intensive and load management data is precise. When load events are called either for capacity shortages or as tests, the systems self-validate. Care needs to be taken to insure the collection of data elements sufficient to show the baseline condition at the time an event is called and the response to the call as a kW effect. The duration of each event for evaluation purposes should also last long enough to show the affected units back on line to demonstrate there are no unexpected effects.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost to Duke Energy for offering this program to customers involves budgets for:

- A participant incentive of $250 each summer (5 monthly payments of $50).
- Cost of equipment prorated to the DLC effort ($100) plus the cost of connecting the controlled equipment ($150).

Cost to the participants is to accept the temporary load control when incidents are called.

Table 33. Estimated Five-Year Program Budget - C&I Peak Reduction

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$50,000	$0	$0	$0	$0	$50,000	6%
DSM Staffing		$44,000	$44,000	$66,000	$66,000	$88,000	$308,000	37%
Program Monitoring & Evaluation		$15,000	$15,000	$15,000	$15,000	$15,000	$75,000	9%
Variable Program Costs								
Incentives (paid annually to participants)	$250	$7,500	$22,500	$45,000	$75,000	$112,500	$262,500	31%
Delivery & Other	$323	$9,675	$19,350	$29,025	$38,700	$48,375	$145,125	17%
Total Budget		$126,175	$100,850	$155,025	$194,700	$263,875	$840,625	100%

Program 2. Residential Peak Reduction

This program is directed solely to provide load control to reduce peak kW through control of air conditioning (AC) equipment. The program is assumed to ride on top of a deployment of "smart grid" technologies, and is expected to be a precursor to eventual system-wide implementation of the technologies. The company will have its own internal preferences as to meter types and brand(s). Generally these are digital meters with a one-way or two-way radio frequency communications capability. Generally, the smart meter technology supports:

- time-of-use prices, where the cost of electricity is lower during off-peak periods and higher during times of peak use,
- direct load control, a feature that allows automatic adjustments to central air conditioning units during periods of peak demand during summer months in exchange for price incentives on electric rates, and
- the ability to pre-pay for electricity service.

For this program, we focus on Residential load control, although clearly the new smart grid technologies offer the opportunity to explore development of several other kinds of customer service initiatives, including time of use pricing. A load control program is a dispatch program. In a dispatch program, a switch can be engaged to send a signal which directly reduces load. Direct load control is an important approach to peak reduction because it offers low cost to the company and is dispatchable.

Rationale

Load (KW) constraints are one of the most costly events a utility encounters. During peak times when demand escalates and there is a problem with meeting demand with additional generation supply (either physically or at reasonable cost), the cost per kW to the company can escalate exponentially. For this reason, in these situations load control is essential to control costs and insure service. Water heaters are not included in this program due to the cost of connecting water heaters. We had originally included water heaters, not to deal directly with peak calls (the residential AC serve that purpose), but to reduce the rebound effect from the residential air conditioners as they come back into service following a peak call. If Duke experiences excessive rebound effects, the control of water heaters should be reexamined along with other measures.

Participation and Measures

Measures are shown below.

Table 34. Measures – Residential Peak Reduction

Demand Control Measures
DLC – Residential AC
DLC – Residential Hot Water

Projected participation by year is shown in the table below.

Table 35. Estimated Participation and Savings - Residential Peak Reduction

Potential participants	62,775
Per participant savings (kWh):	0
Per participant savings (kW):	0.9
Per participant gas savings (CCF):	0

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	1,256	2.0%	-	1,143	-
Year 2	1,883	3.0%	-	1,714	-
Year 3	2,511	4.0%	-	2,285	-
Year 4	3,139	5.0%	-	2,856	-
Year 5	3,767	6.0%	-	3,428	-
Cumulative	12,556	20.0%	-	11,426	-

Marketing Plans

Marketing should take advantage of current concerns for mitigating climate problems by emphasizing a green marketing theme and can include the following elements:

- Proposed marketing efforts should include mention of the program in any communications with customers regarding energy efficiency program options such as bill inserts, recognition window stickers for participating homes, media coverage of how to manage electric bills, customer service representatives, and promotion using the Duke Energy website.
- Residential communications for the program can reach out to customers with high bill complaints and to customers with payment problems as well as to general promotion to customers concerned with keeping costs low and interested in mitigating global warming.
- Direct load control for AC units can be installed without the customer being at home, since the AC units are located outside. Also, an electrician is not required.
- Direct load control for water heaters requires access to the home and also requires an electrician. For these reasons, water heaters were not included in the load control program. The water heater component is simply a sink to absorb any potential snapback from control of the AC units, and does not constitute a primary load control goal in itself. From a technical perspective, the hot water heater is a useful addition, even though there are many fewer hot water heaters than AC units available.

Program Tracking Considerations

Direct load control is data intensive and load management data is precise. When load events are called either for capacity shortages or as tests, the systems self-validate. Care needs to be taken to insure the collection of data elements sufficient to show the baseline condition at the time an event is called and the response to the call as a kW effect. The duration of each event for evaluation purposes should also last long enough to show the affected units back on line to demonstrate there are no unexpected effects.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost to Duke Energy for offering this program to customers involves budgets for:

- A participant incentive of $25 each summer (5 monthly payments of $5).
- Cost of equipment prorated to the DLC effort ($100) plus the cost of connecting the controlled equipment ($150).

Cost to the participants is to accept the temporary load control when incidents are called.

Table 36. Estimated Five-Year Program Budget – Residential Peak Reduction

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$30,000	$0	$0	$0	$0	$30,000	0 6%
DSM Staffing		$44,000	$44,000	$66,000	$66,000	$88,000	$308,000	6 4%
Program Monitoring & Evaluation		$15,000	$15,000	$15,000	$15,000	$15,000	$75,000	1 6%
Variable Program Costs								
Incentives (paid annually to participants)	$25	$31,400	$78,475	$141,250	$219,725	$313,900	$784,750	16 3%
Delivery & Other	$288	$361,100	$541,363	$721,913	$902,463	$1,083,013	$3,609,850	75 1%
Total Budget		$481,500	$678,838	$944,163	$1,203,188	$1,499,913	$4,807,600	100.0%

Program 3. Renewables and Demonstrations

This program is designed to advance knowledge (R&D) and to be used for communications and promotions. It contains five program elements: solar photovoltaic, solar hot water, ground source heat pumps, combined heat and power (CHP) and the "Go Deep" project. Each of these program elements is currently non-cost-effective and together, the set is not cost-effective. However, this program in included in the recommended programs for three reasons. First, it is a source for a small number of technology demonstration projects that can be used for promoting interest in energy efficiency. This can include a small number of solar demonstration projects at schools, a ground source heat pump demonstration and sponsoring a few homes for the "Go Deep" project.

Since most people are interested in "Green" programs, these examples will fit with and encourage this interest. Second, each of the demonstrations is at the edge of current technology in its area. This will keep key company staff current in solar, ground source, and "Go Deep" technologies. Third, each of these has sufficient scale possibilities that make them sufficiently powerful to address climate change and, at the same time running these demonstrations will place the company in with companies in a leadership role in developing these technologies.

Rationale

Each of these program elements push technology beyond current cost-effective limits, but, at the same time, present coherent pathways towards the future of energy efficiency applications. The "Go Deep" project is based on a German model using a "passive house" strategy. The goal is to reduce energy use by 80 percent in new and existing homes. The principles of this approach include tight super-insulated homes with a thick building envelope and high performance windows and doors. According to the organizer of the "Go Deep" project, Linda Wigington, "Our housing is facing a crisis of obsolescence, and we have a lion share of existing houses that need to be dealt with to reduce energy in the near term." In this approach structure and appliances are parts of the solution as is "how a family lives in a house". "Go Deep" is a national project in which individual utilities sponsor a small number of homes in the 1,000 home pilot. Early results suggest that attaining the savings goal is possible, and the focus is on system replacements and increasing efficiencies.[14]

[14] "Go Deep," is a "Plan C" project, capable of addressing global warming if fully rolled out. Currently it would require addition of a strong carbon value (in the neighborhood of $30-$35) to permit roll out under the TRC test. However, the Go Deep pilot is finding efficiencies are cutting costs for these new techniques. It is important to participate in this effort, to be ready in case there is a rapid ramp up of implementation to address climate change.

Participation and Measures

Measures are shown below.

Table 37. Measures and Incentives – Renewables and Demonstrations

Measure/Program Element	Measure Number		Incentive Amount
	Electric	Gas	
Solar PV	RE-1	RG-1	100%
Solar Hot Water	RE-39		100%
Ground Source Heat Pump	RE-20		100%
Combined Heat and Power (CHP)	RE-41		100%
Go Deep	Demo	Demo	100%

Because this is a promotional and R&D program there will be only a very small number of projects each year.

Table 38. Estimated Participation and Savings - Renewables and Demonstrations

Potential participants	10,000
Per participant savings (kWh):	3,488
Per participant savings (kW):	1.3
Per participant gas savings (CCF):	10

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	2	0.0%	6,976	3	20
Year 2	2	0.0%	6,976	3	20
Year 3	2	0.0%	6,976	3	20
Year 4	2	0.0%	6,976	3	20
Year 5	2	0.0%	6,976	3	20
Cumulative	10	0.0%	34,880	13	100

Marketing Plans

These projects will be used to create interest in energy efficiency through public demonstration projects and to provide referrals to the other programs. Marketing and promotion may be assisted by exploring cost sharing by localities.

Program Tracking Considerations

Since these are demonstration programs data collection will focus on technical documentation of each project.

Detailed Budget Plans

An estimated five-year budget for this program is provided below.

Table 39. Estimated Five-Year Program Budget - Renewables and Demonstrations

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$25,000	$0	$0	$0	$0	$25,000	4%
DSM Staffing		$44,000	$44,000	$44,000	$44,000	$44,000	$220,000	39%
Program Monitoring & Evaluation		$20,000	$20,000	$50,000	$20,000	$50,000	$160,000	29%
Variable Program Costs								
Incentives	$8,530	$17,060	$17,060	$17,060	$17,060	$17,060	$85,300	15%
Delivery & Other	$7,000	$14,000	$14,000	$14,000	$14,000	$14,000	$70,000	12%
Total Budget		$120,060	$95,060	$125,060	$95,060	$125,060	$560,300	100.0%

Program 4. Commercial and Industrial Incentives

This is a gas and electric energy savings program. The program targets only commercial and industrial accounts. The program is a totally custom program, designed to develop exceptionally productive energy savings opportunities in cooperation with the customer. Both electric and natural gas measures will be included. Each project will be specially designed. The incentive will be the amount required to lower the customer payback to two years, up to a maximum of 60 percent of incremental cost. It is expected that projects will need to be carried out in narrow time windows as dictated by conditions specific to the customer's operations and that evaluation will consist primarily of short term instrumentation and spot metering. For the first nine months of each program year, no project may be allocated more than 10 percent of the measures budget allocated for this program. The hurdle rate for projects under this program will be set to insure only the most cost-effective projects are selected so as to insure cost recovery.

Rationale

Some commercial and industrial customers will offer special opportunities for energy savings, either brought to Duke Energy by the customer (or the customer's ESCO), or as identified by company account representatives and engineers. By providing a 60 percent cost share in co-developing projects, plus a 60 percent "buy down," customer projects will be likely to move forward. Experience will show whether a 60 percent buy down is enough to attract projects. If this percentage proves too low (based on response to the program) the percentage buy down will be raised. Experience with similar projects in the Northeast has led utilities to offer 90 to 75 percent buy downs in this program sector.

Participation and Measures

Measures are shown below.

Table 40. Measures and Incentives – C&I Incentives

Measure	Measure Number	Incentive Amount
Custom Program (gas and electric) – designed to meet a selected cost-benefit ratio	Not Applicable (Customer Specified)	60% of cost of study to develop project proposal and 60% of energy efficiency improvements

Because of the custom nature of the project, there will not be a large number of participants in any one year.

Table 41. Estimated Participation and Savings - C&I Incentives

Potential Participants	570
Per participant Savings (kWh):	173,100
Per Participant Savings (kW):	20.7
Per participant gas savings (CCF):	2,915

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	2	0.0%	346,200	41	5,831
Year 2	3	0.0%	519,300	62	8,746
Year 3	3	0.0%	519,300	62	8,746
Year 4	4	0.0%	692,400	83	11,662
Year 5	4	0.0%	692,400	83	11,662
Cumulative	16	0.0%	2,769,600	331	46,647

Marketing Plans

This program is in every respect a custom program. An example of this type of program is NSTAR Electric's Compressed Air Leak Detection and Remediation Program (http://www.compressedairchallenge.org and www.nstaronline.com/business/energy_efficiency). Also see Pacific Power's Energy FinAnswer and Energy FinAnswer Express programs at http://www.pacificpower.net/Navigation/Navigation925.html. It is expected that these will be high return projects in terms of savings achieved. As a program control tool, for the first nine months of each program year, funds to any one participant will be capped at 10 percent of program funds allocated to incentives for this program.

Program Tracking Considerations

Data requirements will vary with the specifications for each project. In some cases, utility billing meter information is capable of the level of detail required to assess program impacts. In other cases, spot metering or other types of assessment may be required. In any case, the program manager should collect, at a minimum, information about all customer electrical equipment, hours of operation, etc. It is expected that evaluations will primarily take the form of short term instrumentation and spot metering with engineering review. Since these are custom projects, it will be particularly important in insure provision is made to assess the kWh, therm, and/or kW condition that constitutes the baseline, and then measure the change due to the DSM improvements.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost to Duke Energy for offering this program to customers involves budgets for:

- Administrative costs to develop, advertise, oversee and monitor the program.
- A customer incentive of 60 percent to defray the cost and energy study and improvements.

Costs to participating customers include the remainder of energy study cost to develop project proposals, provision for staff involvement in developing and monitoring the project, and the remainder of equipment costs.

Table 42. Estimated Five-Year Program Budget – C&I Incentives

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$30,000	$0	$0	$0	$0	$30,000	3%
DSM Staffing		$44,000	$44,000	$44,000	$44,000	$44,000	$220,000	25%
Program Monitoring & Evaluation		$16,000	$24,000	$24,000	$32,000	$32,000	$128,000	15%
Variable Program Costs								
Incentives								
	$28,510	$57,020	$85,530	$85,530	$114,040	$114,040	$456,160	53%
Delivery & Other	$2,000	$4,000	$6,000	$6,000	$8,000	$8,000	$32,000	4%
Total Budget		$151,020	$159,530	$159,530	$198,040	$198,040	$866,160	100.0%

Program 5. Commercial and Industrial Rebates

This is a gas and electricity energy savings program. The program targets non-residential customers eligible for gas and electric prescriptive measures. These will include commercial and industrial customers. For-profit, non-profit, and public agencies (such as schools) will be included.

Rationale

Rebates are straightforward reimbursements of a portion of customer cost of specific rebated energy efficiency items. Many customers have concerns about the high first cost associated with some of the larger energy efficiency investments (e.g. HVAC systems or energy management systems). Duke Energy's proposed incentives will help remove that barrier. Some customers may also need technical assistance to determine what equipment is appropriate for their facilities. Duke Energy will help address that problem by pre-qualifying ESCOs and then making the list of pre-qualified ESCOs available to interested customers. As an example of this program type, NYSERDA's EnergySmart(SM) Commercial/Industrial Performance Program (CIPP) is implemented entirely by ESCOs. Since the program started in 2004, the number of qualifying ESCOs in New York State has increased significantly, thus facilitating program implementation. ESCO involvement will provide customers with technical expertise to determine what equipment is most appropriate for them, as well as energy savings monitoring.

Participation and Measures

Representative measures are shown in the table below. Measures may be added or deleted from the prescriptive list as information is gained during program planning and administration. The incentive level for these measures is 50 percent. Although we have included a $1,000 simple audit expense, the program could be run without an audit. Audit costs, if any, are also incented at 50 percent with full reimbursement when measures are installed.

With regard to street lighting, there is some controversy over whether the new LED streetlights are ready to move into full scale program implementation. Some cities, such as Ann Arbor and Anchorage are going to full scale implementation, while others (such as New York City) are trying a few lights on an experimental basis. Although some cities are now putting in large numbers of Light Emitting Diode (LED) streetlights, MEEA is currently recommending them on a demonstration basis for use in parking lots that have cobra-headed lights with shorter (about twenty feet high) poles. The LED units snap in to replace the old cobra bulb, making use of the existing cobra head and the existing poles. MEEA informally estimates an approximate current payback in the Midwest of about nine years.[15] Duke Energy already has some direct experience with test installations of the new streetlights, and direct experience is the best basis on which to adjust level of effort.

[15] Duke Energy is a MEEA member, and so may contact Jay Wrobel, Program Director (312) 587-8390, extension 16, for information on specific brands and current costs in developing this measure.

Table 43. Measures and Incentives – C&I Rebates

Measure	Measure Number		Incentive Amount
	Electric	Gas	
New Efficient Lighting	CE-17		50%
Retrofit Efficient Lighting	CE-18		50%
LED Exit Signs	CE-19		50%
Efficient Package Refrigeration	CE-10		50%
Hot Food Cabinet	CE-25		50%
Electrically Commutated Motors	CE-11		50%
Premium Motors	CE-12		50%
Energy Star Transformers	CE-14		50%
Energy Star Water Heater		CG-3	50%
Energy Star Oven		CG-4	50%
Energy Star Stove		CG-5	50%
Energy Star Clothes Dryer		CG-6	50%
Energy Efficient Boiler		CG-19	50%
Furnace AFUE 92+		CG-24	50%
Programmable Thermostat		CG-29	50%
LED Traffic Lights	CE-20		50%
LED Streetlight	CE-32		50%

A rigorous analysis of program cost effectiveness is presented in the next section but all of the measures included in this program are cost effective based on the measure-specific benefit-cost ratio (see Table 23).

Projected participation by year is shown in the table below.

Table 44. Estimated Participation and Savings - C&I Rebates

Potential Participants	10,000
Per participant Savings (kWh):	22,282
Per Participant Savings (kW):	5.1
Per participant gas savings (CCF):	-184

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	300	3.0%	6,684,600	1,515	(55,350)
Year 2	500	5.0%	11,141,000	2,525	(92,250)
Year 3	600	6.0%	13,369,200	3,030	(110,700)
Year 4	700	7.0%	15,597,400	3,535	(129,150)
Year 5	700	7.0%	15,597,400	3,535	(129,150)
Cumulative	2,800	28.0%	62,389,600	14,141	(516,599)

Marketing Plans

Duke Energy will need to advertise this program during its initial stages, and also will need to actively recruit ESCOs to work in its service territory. We recommend some general advertising, primarily in the form of brochures and mailings targeted to potential program participants. Duke Energy should work directly with business associations and contact some customers through account representatives. The budget below provides for some general advertising at business events, as well as brochures and premiums. The incentive level for the program is 50 percent.

Program Tracking Considerations

The program manager should insure that the vendor managing this program has an excellent tracking system and provision should be made to gather in-service date and technical data about equipment being replaced as well as the energy savings measures that will replace old equipment.

Detailed Budget Plans

An estimated five-year budget for the Commercial and Industrial Rebate Program is provided below. The anticipated cost to Duke Energy for offering this program to customers involves budgets for:

- Administrative costs to develop, advertise, oversee and monitor the program.
- A customer incentive to defray the cost of an energy audit for those customers, although the primary strategy will be for ESCO development of audits.
- Incentives for installing energy efficient equipment.

Costs to participating customers include the remainder of equipment and installation costs.

Table 45. Estimated Five-Year Program Budget – C&I Rebates

	Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Total
Fixed Program Costs								
Implementation & Other Annual Cost		$50,000	$0	$0	$0	$0	$50,000	0%
DSM Staffing								
		$44,000	$44,000	$66,000	$88,000	$88,000	$330,000	3%
Program Monitoring & Evaluation		$10,000	$7,500	$80,000	$7,500	$80,000	$185,000	2%
Variable Program Costs								
Incentives	$4,020	$1,206,000	$2,010,000	$2,412,000	$2,814,000	$2,814,000	$11,256,000	92%
Delivery & Other	$130	$39,000	$65,000	$78,000	$91,000	$91,000	$364,000	3%
Total Budget		$1,349,000	$2,126,500	$2,636,000	$3,000,500	$3,073,000	$12,185,000	100.0%

Program 6. Commercial and Industrial Retro-Commissioning Lite

This is a gas and electricity energy savings program. The program targets commercial and industrial customers with a usage profile that indicates a possible high value from gas, electric, and gas/electric retro-commissioning. Although direct requests may also be received, typical the program begins off-site with a scan of billing records using EZ Sim or a similar tool. This screening process will select a pool of buildings for which it looks like retro-commissioning is highly likely to produce substantial energy savings. Building commissioning is a process that is associated with new buildings; a quality assurance process that is followed to facilitate new buildings performing as designed. Retro-commissioning applies a similar process to existing buildings. The goal is insure that a building operates efficiently and effectively.

The focus of this pilot program is in insuring efficient operation, rather than on upgrading equipment. The program conducts a low-cost "tuning" of electricity related building systems. The tuning typically involves control systems such as energy management systems that may be improperly programmed, or controls that are out of calibration. When problems are identified and demonstrated, they may have major economic effects. When this type of problem exists, retro-commissioning resolves such problems at low cost. This project will also steer participants towards the Commercial and Industrial Rebates and Commercial and Industrial Incentives programs.

Rationale

Most buildings have never been commissioned, so the commissioning of an existing building may be able to identify and correct high priority operating deficiencies and verify proper operations. The focus will typically be on energy-using equipment, lighting, and controls. Further, this program is designated as "retro-commissioning lite," since it will involve engagements of about $3,000 to $4,000 per building[16], rather than the $10,000 to $52,000 associated with full retro-commissioning.[17] The objective will be to find the best buildings for the program. These will be buildings with significant energy problems that can be easily detected and easily fixed. Energy savings will be documented by engineering calculations and evaluated using EZ Sim. The persistence of energy savings will also be tested.

Participation and Measures

Measures are listed below.

Table 46. Measures and Incentives – C&I Retro-Commissioning Lite

Measure	Measure Number		Incentive Amount
	Electricity	Gas	
Retro Commissioning Lite	CE-4		$1,500 (50%)
Gas Retro-Commissioning		CG-27	$2,000 (50%)

[16] This is per building; an individual project may have more than one building.
[17] See Haasl &Terry Sharp, A Practical Guide for Commissioning Existing Buildings. Washington, DC: Office of Building Technology, State and Community Programs, US Department of Energy. Prepared by Portland Energy Conservation, Inc. and Oak Ridge National Laboratory, April 1999.

Because it will take some time to put the program in place and to reach the targeted customers, we plan for participation in the program's first year to be lower than in subsequent years, and expect that many of the first year participants are likely to be smaller businesses with more flexibility in their decision making.

Table 47. Estimated Participation and Savings – C&I Retro-Commissioning Lite

Potential Participants				10,000	
Per participant Savings (kWh):				15,236	
Per Participant Savings (kW):				3.4	
Per participant gas savings (CCF):				632	
Program Year	**Incremental *Participants***	**Percent *Participation***	***kWh Saved***	***kW Saved***	***CCF Saved***
Year 1	100	1.0%	1,523,600	336	63,168
Year 2	200	2.0%	3,047,200	672	126,336
Year 3	300	3.0%	4,570,800	1,008	189,504
Year 4	400	4.0%	6,094,400	1,344	252,672
Year 5	500	5.0%	7,618,000	1,681	315,841
Cumulative	1,500	15.0%	22,854,000	5,042	947,522

Marketing Plans

We recommend some general advertising within the business community, primarily in the form of brochures and mailings targeted to potential program participants; also coordination with business associations. The budget below provides for some general advertising at business events, as well as brochures and premiums. Since this program will operate using internal prescreening, direct contacts to selected businesses and institutions will also be useful. Air Advice is currently running a similar program for the Oregon Energy Trust.

Program Tracking Considerations

The program manager should collect, at a minimum, information about all customer electrical equipment, hours of operation, etc. The major concern will be for complete and accurate documentation of "before" and "after" energy use and demand impacts. Monitoring over the duration of energy savings and demand reduction is also a concern. Savings stability can be monitored through a monthly billing analysis.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost for offering this program to customers involves budgets for:

- Administrative costs to develop, advertise, oversee and monitor the program.
- Incentives for installing energy efficient equipment.[18]

Costs to participating customers include the remainder of equipment costs.

[18] Incentive amounts are based on the average incentive given in NYSERDA's EnergySmartSM CIPP program, discounted to allow participation by smaller commercial customers. The average CIPP program participant receives $17,000 in incentives. We have discounted that number to $9,750.

Table 48. Estimated Five-Year Program Budget – C&I Retro-Commissioning Lite

	Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Total
Fixed Program Costs								
Implementation & Other Annual Cost		$50,000	$0	$0	$0	$0	$50,000	2%
DSM Staffing		$44,000	$44,000	$44,000	$44,000	$44,000	$220,000	8%
Program Monitoring & Evaluation		$80,000	$80,000	$80,000	$80,000	$80,000	$400,000	14%
Variable Program Costs								
Incentives	$1,500	$150,000	$300,000	$450,000	$600,000	$750,000	$2,250,000	77%
Delivery & Other	$0	$0	$0	$0	$0	$0	$0	0%
Total Budget		$324,000	$424,000	$574,000	$724,000	$874,000	$2,920,000	100.0%

This program also serves as a feeder program for the prescriptive program (Program 5, C&I Rebates).

Program 7. Commercial and Industrial HVAC Optimization

This is a program using an electric measure to produce both gas and electric energy savings. The program was designed on the premise that much commercial and industrial Heating Ventilation and Cooling (HVAC) is not operating as planned. A typical assignment envisioned in this program is to do on-site testing of HVAC units, and review their operation as an integrated building system. For example, out of twelve rooftop units, it is likely that two will be operating out of specification due to improper installation, subsequent damage to units, or problems with controls. In the case of a large school, built in sections over time, it would not be unusual to find adjacent units, some cooling and some heating, and other units damaged while most units are performing as designed.

Rationale

Most buildings have never had a focused look at the working of the HVAC systems. This program will deploy HVAC specialists to test units and make recommendations for their efficient operation as a building system. This will primarily involve repair of units and control adjustments, but may also involve recommendations for modification to air circulation within buildings.

Participation and Measures

Measures are listed below.

Table 49. Measures and Incentives – C&I HVAC Optimization

Measure	Electric Measure Number	Incentive Amounts
Small HVAC Optimization (2 units)	CE-2	25%

Participation is indicated in the table below.

Table 50. Estimated Participation and Savings – C&I HVAC Optimization

Potential Participants				6,120	
Per participant Savings (kWh):				11,234	
Per Participant Savings (kW):				2.5	
Per participant gas savings (CCF):				463	
Program Year	**Incremental Participants**	**Percent Participation**	**kWh Saved**	**kW Saved**	**CCF Saved**
Year 1	61	1.0%	685,274	152	28,218
Year 2	122	2.0%	1,370,548	305	56,435
Year 3	184	3.0%	2,067,056	460	85,116
Year 4	245	4.0%	2,752,330	612	113,333
Year 5	306	5.0%	3,437,604	765	141,551
Cumulative	918	15.0%	10,312,812	2,295	424,653

Marketing Plans

It is likely that company representatives can help develop lists of buildings that will be likely candidates for this program. In addition, there should be coordination with business associations. The budget below provides for some general advertising at business events, as well as brochures and premiums. A limiting factor in marketing and promotion will be the issue of owner-occupied versus leased space. Better than 50 percent of commercial space is conditioned by these units.

Program Tracking Considerations

This is an applied technical program that will be dependent on the quality and completeness of technical drawings and brief technical explanation provided by the program staff. Evaluation will rely on this information and may also involve spot metering and (where applicable) billing analysis.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost for offering this program to customers involves budgets for:

- Administrative costs to develop, advertise, oversee and monitor the program.
- Incentives to cover HVAC inspection and evaluation of air flows where necessary.

Costs to participating customers include the remainder of costs (for repairs to HVAC equipment and remodeling to permit better airflow within buildings).

Table 51. Estimated Five-Year Program Budget – C&I HVAC Optimization

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$50,000	$0	$0	$0	$0	$50,000	5%
DSM Staffing		$44,000	$44,000	$44,000	$44,000	$44,000	$220,000	23%
Program Monitoring & Evaluation		$10,000	$7,500	$80,000	$7,500	$80,000	$185,000	19%
Variable Program Costs								
Incentives	$560	$34,160	$68,320	$103,040	$137,200	$171,360	$514,080	53%
Delivery & Other	$0	$0	$0	$0	$0	$0	$0	0%
Total Budget		$138,160	$119,820	$227,040	$188,700	$295,360	$969,080	100.0%

This program also serves as a feeder program for the prescriptive program (Program 5, C&I Rebates).

Program 8. Commercial and Industrial Audit

This is a gas and electric energy savings program. The program is targeted to food service facilities and grocery store/supermarkets. It consists of refrigeration improvements, improvements to refrigeration to reduce load, and restaurant commissioning audits (designed to optimize controls and limit energy losses in food service facilities). The program will also serve as a feeder to Program 5, C&I Rebates.

Rationale

There are consistent energy savings to be obtained from food service facilities (primarily restaurants) and the refrigeration end-use in grocery stores and supermarkets. There are three DSM measures in this program, listed in the table below.

Participation and Measures

Measures are listed below.

Table 52. Measures and Incentives – C&I Audit

Measure	Measure Number		Incentive Amount
	Electric	Gas	
Restaurant Commissioning Audit	CE-28	CG-7	50%
Refrigeration Tune-Up	CE-29		50%
Refrigeration Casework	CE-30		50%

Participation is indicated in the table below.

Table 53. Estimated Participation and Savings – C&I Audit

Potential Participants	890
Per participant Savings (kWh):	13,292
Per Participant Savings (kW):	4.6
Per participant gas savings (CCF):	187

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	9	1.0%	119,628	41	1,679
Year 2	18	2.0%	239,256	82	3,359
Year 3	27	3.0%	358,884	123	5,038
Year 4	36	4.0%	478,512	164	6,717
Year 5	45	5.0%	598,140	205	8,397
Cumulative	135	15.0%	1,794,420	616	25,190

Marketing Plans

It is likely that company representatives can develop lists of buildings that will be likely candidates for this program. In addition, there should be coordination with business associations. The budget below provides for incentives and some general advertising at business events, as well as, brochures.

Program Tracking Considerations

This is an applied technical program that will be dependent on the quality and completeness of technical drawings and brief technical explanation provided by the program staff developed on-site for each project. Evaluation will rely on this information and may also involve spot metering and (where applicable) billing analysis.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost for offering this program to customers involves budgets for:

- Administrative costs to develop, advertise, oversee and monitor the program.
- Incentives to cover a portion of the audits and tune-ups.

Costs to participating customers include the remainder of incremental costs not covered by the incentives. If additional incentive is found to be necessary to increase participation rates, Duke Energy could consider paying 100 percent of the audit costs if clients install recommended measures.

Table 54. Estimated Five-Year Program Budget – C&I Audit

	Cost per	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of
Fixed Program Costs								
Implementation & Other Annual Cost		$50,000	$0	$0	$0	$0	$50,000	11%
DSM Staffing		$22,000	$22,000	$22,000	$22,000	$22,000	$110,000	23%
Program Monitoring & Evaluation		$10,000	$7,500	$80,000	$7,500	$80,000	$185,000	39%
Variable Program Costs								
Incentives	$790	$7,110	$14,220	$21,330	$28,440	$35,550	$106,650	23%
Delivery & Other	$130	$1,170	$2,340	$3,510	$4,680	$5,850	$17,550	4%
Total Budget		$90,280	$46,060	$126,840	$62,620	$143,400	$469,200	100.0%

This program also serves as a feeder program for the prescriptive program (Program 5, C&I Rebates).

Program 9. Commercial and Industrial New Construction

This is a gas and electricity energy savings program. The program targets new commercial and industrial construction. The program provides rebates for developing projects that are at least 30 percent more efficient than the newest ASHRAE code. Incentives are offered to project owners or, for government buildings, to the design team. These incentives will cover 50 percent of the incremental cost difference between standard and energy efficient equipment, or the amount of the incentive will be enough to decrease the incremental cost to a 1.5 year payback, whichever is less. The focus of this program is on integrated design. Prospective vendors should be asked to propose a method of determining incremental cost for Duke Energy review. As a control tool, for the first nine months of each year, no project may be allocated more than 10 percent of the budget allocated for efficiency improvements for this program.

This program is based on National Grid's Design 2000 Plus program. For comparison, Western Mass Electric's (WMECo's) Energy Conscious Construction program covers most costs plus, for larger and complex projects, provides design assistance.[19] National Grid's Design 2000 Plus program initially covered 60 to 90 percent of incremental cost plus a comprehensive design approach for larger and complex projects.[20] More recently, as a mature program, National Grid Design 2000 Plus now covers 75 percent of incremental cost.[21] The program will follow the Advanced Buildings System approach developed by the New Buildings Institute.[22]

Rationale

This program is designed to overcome first cost barriers by providing incentives that cover the incremental cost, and to provide information to project developers and design teams. Payback can be on the order of three to five years. The trend for this type of program is now towards prescription packages.

Participation and Measures

Measures are listed below.

Table 55. Measures and Incentives – C&I New Construction

Measure	Measure Number		Incentive Amounts
	Electric	Gas	
Integrated Building Design All Electric	CE-9		50% of Incremental Cost
Integrated Building Design Electric/Gas		CG-23	50% of Incremental Cost

[19] See: www.wmeco.com/business/saveenergy/energyefficiencyprograms.
[20] See: www.aceee.org/utility/9angriddesign2000.pdf.
[21] See: www.nationalgridus.com/masselectric/business/energyeff/4_new.asp.
[22] See: http://www.advancedbuildings.net/index.htm. Note that leading programs are adopting the NBI approach.

Projected participation is shown in the table below.

Table 56. Estimated Participation and Savings - C&I New Construction

Potential Participants	100
Per participant Savings (kWh):	48,862
Per Participant Savings (kW):	9.2
	798

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	2	2.0%	97,724	18	1,596
Year 2	3	2.5%	146,586	28	2,395
Year 3	3	3.0%	146,586	28	2,395
Year 4	3	3.3%	146,586	28	2,395
Year 5	6	5.5%	293,172	55	4,789
Cumulative	17	3.3%	830,654	157	13,570

Marketing Plan

The target of the marketing effort will be the project owners and the design teams. Programs of this type usually involve direct personal relationship building, training sessions or seminars, direct marketing, and meetings.

Program Tracking Considerations

New construction projects present a particular challenge for program tracking since there is not an actual baseline building to compare to the new structure. This means that the contrast to baseline conditions will require simulation software that can model the incremental energy efficiency improvements. The specific assumptions built-in to the model should be recorded so that they are evident, and the simulation software package employed must be in general use for DSM applications in which current practice (as built) conditions are used to develop the energy savings that derive from the measures installed. Simulation software is required to take sometime complex interaction effects into account.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost to Duke Energy for offering this program to customers involves budgets for:

- Administrative costs to develop, advertise, oversee and monitor the program.
- Incentives for the installation of recommended measures as demonstrated through the provision of receipts by the customer.

Costs to participating customers include the customer share of the costs of covered measures and equipment and installation costs.

Table 57. Estimated Five-Year Program Budget – C&I New Construction

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$20,000	$0	$0	$0	$0	$20,000	4%
DSM Staffing		$22,000	$22,000	$22,000	$22,000	$22,000	$110,000	21%
Program Monitoring & Evaluation		$10,000	$7,500	$80,000	$7,500	$80,000	$185,000	35%
Variable Program Costs								
Incentives	$12,350	$24,700	$37,050	$37,050	$37,050	$74,100	$209,950	39%
Delivery & Other	$500	$1,000	$1,500	$1,500	$1,500	$3,000	$8,500	2%
Total Budget		$77,700	$68,050	$140,550	$68,050	$179,100	$533,450	100.0%

Program 10. Residential Whole House

This is a gas and electricity energy savings program. The program includes the two residential energy assessment options that are carried out remotely, by mail or Internet and an on-site audit with direct installation of minor measures. In both remote options, a residential customer can conduct a residential energy assessment using a computerized home energy auditing program. The remote audit program is the same for both the Internet and mail options, and works by linking to actual billing data for the residential account. The remote program is open to all customers and free to all customers. However, the program will work best for gas and electric heat customers and this is the focus of the remote audit program. In addition, for gas and electric heat customers who complete the remote audit, Duke Energy will send a small kit of energy efficiency items. As a more advanced option, the program will also offer an on-site audit for Duke Energy's electric heat customers for a $50 fee, as discussed below. The savings in the remote elements of this program are computed based on the items in the kit, and no savings is assumed for the remote audit step.

Rationale

The remote elements of this program are open to all residential customers at no charge to provide easy access to energy efficiency recommendations tailored to the home. Since it is conducted by Internet or mail, it can be done to suit a customer's schedule. The remote elements are an entry-level degree of customer engagement, providing a way for customers to begin to get direct information on what they can do to make their home more energy efficient.

For homes with gas or electric heat, the separate program element for an on-site energy audit with direct install of minor measures provides the option of a higher level in-home audit for a small fee, *refunded if audit recommendations are implemented.* The on-site audit program element targets households in existing single family homes and condos and (with a different permission structure) for multifamily dwellings. The program includes an on-site audit and encourages households to save electricity through the installation of energy efficiency measures. The audit, for example, might recommend air sealing, insulation, and other measures.

The On-Site Audit with direct install program element will provide households with a walk-through examination of their home by a trained auditor/contractor using standard audit software for identifying existing conditions related to electric energy usage. The auditor will identify specific energy saving opportunities that could be installed by the contractor upon approval of a job scope by the customer. The contractor will convey energy saving tips during the walk-through, and attempt to be comprehensive in their assessment of opportunities regardless of their particular specialization. Customers will pay $50 of the audit cost, and have their audit cost credited to their bill if they proceed with installation of *at least one* of the recommended measures. The recommendations of the auditor are expected to be standard measures associated with whole house weatherization, such as ceiling insulation, wall insulation, air sealing, etc.

At the same time, during the walk-through audit, the contractor will install the measures in the Direct Install Kit at no cost to the customer and additional low-cost measures (see Table 58). At the conclusion of the site visit, customers will be provided with a check list of preliminary recommendations from the audit, to be followed within one week by a full report generated by the audit software. The program will take credit for kit measures after degrading the kit savings for expected installation rates. Expected installation rates of 80 percent for CFL's, 60 percent for showerheads, and 75 percent for aerators were used to calculate program savings for the mailed kits. Savings from the on-site audit are only counted for installed measures at the time of the audit and recommended measures subsequently installed and rebated. There is a 50 percent incentive for recommended measures beyond those directly installed during the audit.

The package of direct install measures is modeled after Wisconsin's Home Performance with Energy Star program with emphasis on their E-Saver Kit component, which includes these measures plus a programmable thermostat, but only included one CFL.[23] Programmable thermostats have recently become controversial (see Appendix). To overcome problems with programmable thermostats, the program will focus on easy-to-read, easy-to-use equipment and provide customer education.

The remote elements provide easy access to energy saving information tailored using computerized energy use information and an electronic protocol. The on-site audit with direct install of minor measures program element provides a step up to an on-site audit. This program element, in addition, may serve as a predecessor to a full Home Performance with Energy Star program, providing a framework to work with contractors to develop Home Performance with Energy Star, if such a program is desired in the second program cycle.

Participation and Measures

Measures are shown in the table below, and may be added or subtracted during the program based on experience.

Table 58. Measures and Incentives – Residential Whole House

Measures – Remote Program Elements	**Measure Number**		**Incentive Amount**
	Electric	**Gas**	
CFLs (4)	RE-32		100%
Showerheads (2) and Aerators (3)	RE-36		100%
Showerheads (2) and Aerators (3)		RG-7	100%
Measures – On-Site Program Element			
All of Remote Program Elements plus:			
Wall Insulation	RE-21		50%
Wall Insulation		RG-28	50%
Ceiling Insulation	RE-16		50%
Ceiling Insulation		RG-25	50%
Refrigerator Charge & Duct Tune-Up	RE-6		50%
Refrigerator Charge & Duct Tune-Up		RG-27	50%
House Seal	RE-18		50%
House Seal		RG-26	50%
WH Tank/Pipe Wrap & Temp Set	RE-35		50%
WH Tank/Pipe Wrap & Temp Set		RG-6	50%
Programmable Thermostat	RE-15		50%
Programmable Thermostat		RG-18	50%
Compact Fluorescent Lights (12)	RE-32		100%

[23] State of Wisconsin Department of Administration Focus on Energy Statewide Evaluation, Evaluation of the Home Performance with Energy STAR Whole House Component, April 24, 2003.

There is no cost in the remote program elements to participating customers for the remote audit and kit. There is a $50 fee for the on-site audit, however this is credited to the bill if at least one program recommended measure is installed (recommended measures will be supported by the company at a 50% rebate).

Projected participation by year is shown in the table below. Most participants are expected to be remote only with the remainder receiving the on-site audit.

Table 59. Estimated Participation and Savings - Residential Whole House

Potential Participants				116,900	
Per participant Savings (kWh):				485	
Per Participant Savings (kW):				0.1	
Per participant gas savings (CCF):				19	
Program Year	**Incremental Participants**	**Percent Participation**	**kWh Saved**	**kW Saved**	**CCF Saved**
Year 1	876	0.7%	424,860	88	16,323
Year 2	1,461	1.2%	708,585	147	27,224
Year 3	2,045	1.7%	991,825	206	38,107
Year 4	2,337	2.0%	1,133,445	236	43,548
Year 5	2,629	2.2%	1,275,065	265	48,989
Cumulative	9,348	8.0%	4,533,780	943	174,191

Marketing Plans

Duke Energy will need to actively market this program in customer communications, such as bill stuffers. Employees can also make customers aware of this program if they contact the company about energy efficiency or a need to lower bills. The remote program elements are low-involvement lead-in programs that will help develop prospects for other programs.

In developing the kit for the remote program elements, strategic attention should be placed on the kit as a marketing tool. First, insure that the kit items are attractively packaged and that the package itself is attractive. The focus should be on making the kits attractive and interesting as well as technical. Possibly some non-energy but useful health and safety items can be included, as well as helpful literature. Since many customers are more interested in "green" items to try to reduce carbon and save the planet, marketing staff should ask for suggestions and perhaps create a "green" theme. For example, one year the Washington DC Energy Office obtained a tire gauge for inclusion in each kit, donated by a local business. For the basic kit items, it is important to consider the value of paying a bit more for "higher end" better performing and better looking items. Again, the kit is part of the marketing and promotion of this program. The kits should also be available at cost from the company's website.

The on-site program element represents a step up in engagement and commitment for an on-site energy audit that can lead to full weatherization retrofit with a 50 percent level of support from the utility company. As noted above, the on-site element can be developed into a full Home Performance with Energy Star program for the second program cycle.

Program Tracking Considerations

The program elements in this program (remote and on-site) are packaged programs provided by a vendor. All data requirements should be part of the program database.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost to Duke Energy for offering this program to customers involves budgets for:

- Administrative costs to develop, advertise, oversee and monitor the program.
- Direct program costs, including a vendorized Internet/mail-in energy assessment program.
- Direct program costs for the audit/direct install vendor.

There is no cost in the remote program elements to participating customers for the remote audit and kit. There is a fifty dollar fee for the on-site audit, however this is credited to the bill if at least one program recommended measure is installed (recommended measures will be supported by the company at a 50% rebate).

Table 60. Estimated Five-Year Program Budget – Residential Whole House

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$20,000	$0	$0	$0	$0	$20,000	2%
DSM Staffing		$44,000	$44,000	$44,000	$44,000	$44,000	$220,000	17%
Program Monitoring & Evaluation		$10,000	$7,500	$80,000	$7,500	$100,000	$205,000	16%
Variable Program Costs								
Incentives	$69	$60,269	$100,517	$140,696	$160,786	$180,875	$643,142	50%
Delivery & Other	$20	$17,520	$29,220	$40,900	$46,740	$52,580	$186,960	15%
Total Budget		$151,789	$181,237	$305,596	$259,026	$377,455	$1,275,102	100.0%

Program 11. Residential Rebates

This program is designed to produce both gas and electric energy savings. The Residential Rebates program is focused on rebates for CFLs and energy efficient appliances.

The promotion will provide rebate coupons to Duke Energy customers toward the purchase of CFLs, LEDs, and energy efficient appliances. The coupon approach gives the program administrator direct control over where coupons will be made available and for which sales outlets.[24]

The dollar amount for the appliance incentive for this promotion is *lower than might be expected* based on industry experience in prior years. This is due in part to recent changes in the Energy Star program and the overall success of the Energy Star strategy as demonstrated by the gradual increase in energy efficiency of base case (non-Energy Star) equivalent products. This is also why refrigerators and dishwashers are not included among the appliances for which rebates are provided.

For clothes washers, MEEA utilities have been using a $75 to $100 rebate, however this amount includes an arranged manufacturer rebate of $25 to $50. According to a September 2006 Consortium for Energy Efficiency (CEE) report, Alliant Energy provided a $50 rebate for vertical axis and a $100 rebate for horizontal axis clothes washers. To communicate a consistent message, the rebate for clothes washers is set at $100. Efficiency Vermont provided a $50 rebate for a CEE Tier 3a clothes washer and $25 for a room AC. The Long Island Power Authority clothes washer rebate is $15, $35, or $50 to customers along with a $50 clothes washer rebate for builders who install a clothes washer with a modified energy factor (MEF) of 2.0 or higher.[25] National Grid provides a $100 clothes washer rebate for washers with MEF of 1.8 or higher. United Illuminating and Connecticut Light & Power both provide a $20 or $50 clothes washer rebate. Sacramento Municipal Utility District (SMUD) has clothes washer rebates at $75 and $125 depending on CEE tier level.

[24] The coupon approach is available as a "packaged" approach through Energy Federation Incorporated (EFI), which can also provide coupon processing services (www.efi.org). WECC administers several similar programs. Marketing and promotional plans for this program area have been developed collaboratively through the Consortium for Energy Efficiency (CEE). Part of the reality of this kind of program is the need to work through a program vendor. The vendor offers a full package of features, one of the most important of which is contact with the national offices of big-box and other chain stores. Duke Energy may also want to explore making promotions available through locally owned and operated stores. Big-box stores are already primed and looking for cooperation with utilities and program vendors in this area will already have relationships with national offices of the big-box stores that can be activated for Duke Energy. For lighting promotions, Wal-Mart has announced a major CFL initiative designed to introduce at least one CFL to each of its 100 million US customers over the next few years. In initiating this campaign, Wal-Mart has devoted additional shelf space to CFLs and arranged with GE for an initial 21 percent cut in the price of CFLs. We can expect a number of promotions for 4-packs, 6-packs, 12-packs, an increasing variety of bulb types, and possible additional price reductions. Although this initiative has received major buzz, other stores, such as Home Depot and Lowe's are implementing similar CFL promotions, and a trip to any of these big-box stores will show that extensive shelf space is now dedicated to promotion of a wide variety of Energy Star CFLs. These big-box initiatives are compatible with the lighting promotion design and can be viewed as additional leverage for program efforts. Utilities with current CFL DSM programs have been working with both local and big box retailers, and see any further contributions on the part of manufacturers and retailers in cutting prices and extending promotions as contributing to their programs.

[25] The higher the MEF, the more efficient the clothes washer.

Rationale

The appliance and lighting program elements both improve the product mix in favor of energy efficient technologies for the service territory by promoting the purchase and stocking of efficient replacement units. Appliance promotions are best developed on a national level with participation by utilities and governments. Energy Star has overcome all of the defects of the earlier local or regional promotional programs through a single national program structured to periodically advance program standards and regulate minimum efficiencies. At the same time, it is structured to work with regional marketing initiatives and local promotion.[26]

CFL promotions are also best developed by leveraging national campaigns (such as "Save a Light - Save the World"), including federal investments in marketing and promotion by EPA and the now coordinated efforts developed through utility cooperation with big-box stores.

Participation and Measures

Measures are shown in the table below.

Table 61. Measures and Incentives - Residential Rebates

Measures/Program Element	Measure Number		Incentive Amount
	Electric	Gas	
Energy Star Clothes Washers	RE-28		$100 per unit
Gas Water Heater		RG-2	$25 per unit
Gas Clothes Dryer		RG-4	$25 per unit
Tankless Water Heater		RG-8	$125 per unit
HE Furnace AFUE 92+		RG-14	$188 per unit
Energy Star CFL Instant Coupon	RE-32		$1
Energy Star CFL 2-Pak Coupon	RE-32		$2
Energy Star CFL 4-Pak Coupon	RE-32		$4
CFL 6-Pak Coupon	RE-32		$6
CFL 8	RE-32		$8
LED Holiday Light Strings	NA		Up to 3 free if 3 or more traded in

Light Emitting Diode (LED) Holiday Light Strings, the last measure listed in Table 61 is included as a promotional item, and is not part of Measure RE-32 or a tested measure. The Holiday Lighting Exchange has proven to be a very well accepted part of the energy efficiency efforts in California and Alaska. In California it helps focus public attention on the greater energy efficiency effort. In the California programs (run throughout the state) in the month of December the utilities include LED Holiday Light Strings in their standard CFL exchange programs. Customers may bring in three or more strings of old inefficient holiday lights and exchange them for up to three strings of LED Holiday Lights.[27]

[26] For example, for the history of the residential clothes washer initiative, see Shel Feldman Management Consulting, Research into Action incorporated, and Xenergy incorporated, The Residential Clothes Washer Initiative, A Case Study of the Contributions of a Collaborative Effort to Transform the Market, prepared for the Consortium for Energy Efficiency, June 2001 (http://www.cee1.org/eval/RCWI_eval.pdf).
[27] The new LED holiday lights use only 0.04 watts per bulb (compare with 0.4 watts for newer miniature lights or 5 watts/bulb for C7 screw-in lights, or 10 watts per standard bulb). The retail cost of a string of 100 LED lights is approximately 3 times the

Projected participation by year is shown in the table below.

Table 62. Estimated Participation and Savings - Residential Rebates

Potential Participants (yearly)				116,900	
Per participant Savings (kWh):				331	
Per Participant Savings (kW):				0.1	
Per participant gas savings (CCF):				-2	
Program Year	**Incremental Participants**	**Percent Participation**	**kWh Saved**	**kW Saved**	**CCF Saved**
Year 1	3,507	3.0%	1,160,817	221	(7,747)
Year 2	8,183	7.0%	2,708,573	515	(18,077)
Year 3	10,521	9.0%	3,482,451	662	(23,241)
Year 4	14,028	12.0%	4,643,268	883	(30,989)
Year 5	16,366	14.0%	5,417,146	1,030	(36,153)
Cumulative	52,605	45.0%	17,412,255	3,311	(116,207)

Marketing Plans

Proposed marketing efforts include the use of utility bill stuffers, and coordinated advertising with selected retail outlets. This type of program is best implemented using implementation vendors and the program elements already exist in nationally available programs for utilities to implement, and selection of a regional vendor will provide added value in the form of detailed program and technology knowledge and relationships. A basic assumption in the development of this program is that it is not so much the size of the rebate so much as the existence of a rebate and the skill in developing engaging promotions and long-term relationships with the appliance industry and dealers that will help move the more energy-efficient products.[28, 29]

The basic marketing goals for the appliance program elements come from the Consortium for Energy Efficiency and are provided below:[30]

- Consumers understand and value the benefits from energy-efficient features.
- Retail sales force is knowledgeable about Energy Star and considers it a meaningful distinction for making a sale.
- Manufacturers market and promote energy-efficient products and/or features.
- Energy efficiency, defined by Energy Star performance levels, becomes a standard feature or is available across all manufacturers' product lines.
- Energy Star represents the most energy efficient quality products available.

cost of a string of 100 miniature lights. To work out a comparison, assume that lights are used 5 hrs/day or 150 hours for a month. For current information, see Questline, "Lighting Up the Holidays: An Energy Cost Comparison" at www.questline.com/Article.aspx?userID=365464&articleID=3457&NL=5439. We thank Betsy Krieg at Pacific Gas & Electric for this updated information. When run as an exchange, we have observed that the majority of strings turned in appear to be the 10 watt and 5 watt bulbs. For strings of 100 bulbs this replacement by 0.04 watt LED bulbs is a major difference for this end-use.

[28] See the WECC paper on residential appliances at http://www.aceee.org/utility/ngbestprac/wecc.pdf. Note that this paper is for a natural gas clothes washer program, however "lessons learned" regarding relationships and promotion would apply across appliance programs.

[29] A review of rebates offered across the US indicates that most utilities are offering rebates from this kind of marketing and promotional perspective rather than from a direct resource acquisition perspective. See the Database of State Incentives for Renewables & Efficiency, (DSIRE), maintained by the North Carolina Solar Center for the Interstate Renewable Energy Council (IREC) funded by the U.S. Department of Energy (DSIRE) at (http://www.dsireusa.org/library/includes/techno.cfm?EE=1&RE=0).

[30] CEE's National Residential Home Appliance Market Transformation Strategic Plan, December 2000 (http://www.cee1.org/resid/seha/seha-plan.php3).

The Energy Star residential lighting promotion will parallel the Energy Star appliance promotion to reach residential customers through retail outlets. The lighting promotion provides direct incentives to consumers to facilitate their purchase of energy-efficient lights. The incentive is in the form of discounted pricing available for lighting products that carry the Energy Star logo.

This program is justified based on direct energy savings targets but also has a significant market transformation dimension. Generally, throughout the US, the Energy Star program has been affecting the types of lighting products available in stores:

- The relative amount of available lighting shelf space assigned to Energy Star lighting products is increasing dramatically in "big box" stores.
- The quality of CFL lighting has dramatically increased.
- The diversity of CFL styles and applications has greatly increased.
- There has been as sizable decrease in the cost of energy-efficient lighting, and with it an increase in store sponsored promotions featuring price discounts.
- At the same time, there is still variation in lighting quality between manufacturers and types of CFLs.

In this program, Duke Energy will be an active participant in the US Energy Star campaign. Through this participation, it is expected that the company will move more Energy Star lighting into retail stores, help make energy efficient lighting more affordable to its customers, and provide a continuing and responsible guidance and energy efficiency education message to customers.

Incentives will be implemented by coupons, in-store markdowns, or upstream manufacturer buy-downs. A coupon approach is more suitable for a service territory because it gives the program administrator direct control over where coupons are available and for which sales outlets.[31] The lighting promotion program is modeled after a set of promotional programs that is implemented by Energy Federation Incorporated. These programs are sponsored by Connecticut Light and Power, United Illuminating Company, the Cape Light Compact, National Grid, NSTAR Electric, and Western Massachusetts Electric.

Program Tracking Considerations

Data collection and documentation for program purposes and monthly/annual reporting will be included as features of the vendor program "package." Data estimation of the baseline market and market potential for the specific Energy Star appliances promoted should be refined as a part of the vendor services and developed for each product type. Data estimation of the baseline market and market potential for Energy Star bulbs and fixtures in the DEK service territory should be refined as a part of the vendor services and developed for each product type (CFL, type of CFL, CFL pack, LED holiday lights). In addition, for the program evaluation, data collection to compute free-riders and spillover effects for computing Net-to-Gross ratios will need to be worked out prior to program

[31] An alternative or parallel approach is the "lighting catalog," which can be an extensive catalog of lighting options offered by a fulfillment vendor or a simple option for purchase of limited types of CFLs over the Duke Energy website. For customers not near a cooperating big box or local store, an Internet option is a valuable addition from a customer service perspective. At the same time, there is a 'trade off' since the market transformation dimension of this program is better met by working with existing supply channels and existing retail outlets.

implementation, and responsibilities for collecting data inputs will need to be carefully defined along with workable accountability relationships.

Detailed Budget Plans

As in the other programs, the anticipated cost to Duke Energy for offering this program to customers involves budgets for:

- Administrative costs to develop, advertise, oversee and monitor the program.
- Vendor services for the program vendor (assuming use of existing turnkey program elements).
- Incentives for the installation of approved measures as demonstrated through the provision of coupons collected and processed from the retail outlets.

The cost to participating customers is the customer's share of the cost (cost of product after the rebate).

Table 63. Estimated Five-Year Program Budget – Residential Rebates

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$20,000	$0	$0	$0	$0	$20,000	2%
DSM Staffing		$22,000	$22,000	$22,000	$22,000	$22,000	$110,000	9%
Program Monitoring & Evaluation		$10,000	$0	$100,000	$7,500	$80,000	$197,500	17%
Variable Program Costs								
Incentives	$11	$40,104	$93,577	$120,313	$160,418	$187,154	$601,567	50%
Delivery & Other	$5	$17,535	$40,915	$52,605	$70,140	$81,830	$263,025	22%
Total Budget		$109,639	$156,492	$294,918	$260,058	$370,984	$1,192,092	100.0%

Program 12. Residential Appliance Recycling

This is an electricity savings program. The recycling program improves the in-service technology mix for the service territory by removing energy hog appliances and deleting them from existence in an environmentally friendly way. Appliance recycling is available primarily through two national program vendors, both of which bring the necessary environmentally sound technologies and procedures to the program.

This program targets households with second refrigerators or freezers. The program will provide free refrigerator and or freezer pick up. The contractor will pick up, disable, and recycle the unit(s). Once Duke Energy receives verification that the refrigerator has been recycled, the customer will receive a $30 incentive. This number is based on the amount offered by Nevada Power Company.[32]

Rationale

This program targets residential customers with second refrigerators or freezers, preferably those older than 1997. The program is designed to take these inefficient older refrigerators off the market entirely, and to do so in an environmentally-sustainable manner. Duke Energy will pay a $30 incentive to each customer to help persuade them to get rid of the second refrigerator or freezer, and will also cover the cost associated with removing the refrigerator or freezer and recycling its components. As a program option, old window AC units may also be picked up ($20 customer incentive) from homes in which a visit is scheduled to pick up a refrigerator or a freezer. This option is now being developed by the firms that operate this type of program and may be explored with the bidders.

Participation and Measures

Measures are shown below.

Table 64. Measures and Incentives – Residential Appliance Recycling

Measure	Electric Measure Number	Incentive Amount
Refrigeration/Freezer Recycling	RE-26	$30
Window AC Unit Recycling	(Optional, may be developed, discuss with vendor)	$20

[32] The $30 incentive is based on the Nevada Power Company incentive, which has elicited a strong positive response from customers. Wisconsin Public Services offers a $50 incentive, but we believe Duke Energy's program will be successful with the lower incentive amount.

Table 65. Estimated Participation and Savings – Residential Appliance Recycling

Potential Participants	29,295
Per participant Savings (kWh):	1,150
Per Participant Savings (kW):	0.2
Per participant gas savings (CCF):	0

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	1,465	5.0%	1,684,750	273	-
Year 2	1,758	6.0%	2,021,700	328	-
Year 3	2,051	7.0%	2,358,650	382	-
Year 4	2,344	8.0%	2,695,600	437	-
Year 5	2,636	9.0%	3,031,400	491	-
Cumulative	10,254	35.0%	11,792,100	1,912	-

Marketing Plans

This program will be marketed directly to consumers through bill inserts, direct mailing materials, and through refrigerator distributors. The program will need to mail information to customers on a regular schedule (twice a year basis, or more frequently as needed to produce the desired participation rates), and through point-of-purchase information at trade ally facilities. The two primary program vendors for this type of program are Appliance Recycling Centers of America, Inc. (ARCA)[33] and JACO Environmental, Inc. (JACO)[34].

Program Tracking Considerations

The program vendor will be required to supply a detail database sufficient to demonstrate the age and condition of units picked up and also to demonstrate that the units are properly destroyed and recycled. In addition, the database should be sufficient to supply data necessary for program evaluation.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost to Duke Energy includes:

- Administrative costs to develop, advertise, oversee and monitor the program.
- Incentive payments to customers of $30.
- Contractor payment.

There are no costs to participating customers.

Table 66. Estimated Five-Year Program Budget – Residential Appliance Recycling

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$20,000	$0	$0	$0	$0	$20,000	1%
DSM Staffing		$22,000	$22,000	$22,000	$22,000	$22,000	$110,000	5%
Program Monitoring & Evaluation		$10,000	$0	$100,000	$7,500	$80,000	$197,500	10%
Variable Program Costs								
Incentives	$165	$241,725	$290,070	$338,415	$386,760	$434,940	$1,691,910	84%
Delivery & Other	$0	$0	$0	$0	$0	$0	$0	0%
Total Budget		$293,725	$312,070	$460,415	$416,260	$536,940	$2,019,410	100.0%

[33] Appliance Recycling Centers of America, Inc. (ARCA), 7400 Excelsior Blvd., Minneapolis, MN 55426 [952-930-9000] [www.arcainc.com].
[34] JACO Environmental, Inc. (JACO), 7115 Larimer Road, Everett, WA 98208 [425-290-6291] [www.jacoinc.net].

Program 13. Residential New Construction

This is a gas and electricity energy saving, "beyond Energy Star" strategy for new residential construction. Recent changes in Energy Star and the general success of Energy Star in improving the performance of baseline (Non Energy Star) new homes have negatively affected the cost-effectiveness of the standard Energy Star program. In the Energy Star program, there are many builder pathways (called Building Options Packages) to enable manufacturers to meet Energy Star criteria. Many Energy Star builders, in order to be sure of meeting the Energy Star criterion, now build beyond it. From a utility perspective, supporting "beyond Energy Star" homes is the only viable option to insure cost-effectiveness of this program element.

Energy Star homes are homes that are independently certified and are more efficient, comfortable and durable than standard homes constructed according to local building codes. Energy Star homes feature additional insulation; better windows, doors and bath ventilation; and high efficiency appliances such as furnaces, AC units, heat pumps, and water heaters. These improvements beyond current practice typically cost home buyers a factor of two to three times the actual cost to builders for the energy efficiency improvements. This provides excellent leverage in an upstream program model that can provide something like two to three times the customer value for each dollar of upstream buy down.

The builder pathway indicated in the table above is an example taken from the set of possible pathways – builder options that that will produce a "beyond Energy Star" result. A package such as this is essential to keep the program cost-effective. The incremental cost of $3,000 per home plus a $400 inspection fee in the illustrative measure package represents a generalized measure package.

Incentives for new residential buildings programs vary greatly across utilities. For example, the Eugene Water and Electric Board (EWEB) provides incentives of $250 or $1,000, and other utilities in the Pacific Northwest states provide $1,000, $1,500, or $2,000. NYSERDA and Long Island Power Authority (LIPA) in New York provide incentives from $750 to $3,500 to builders of Energy Star homes. New Hampshire utilities provide up to $3,000. Southern California Edison provides incentives up to $700, depending on climate zone.

Rationale

The Energy Star Plus program element is necessary due to the overall success of the Energy Star concept. Baseline homes have become increasingly energy efficient, enough so that to mitigate the risk of not being cost-effective, program homes must be taken to a beyond Energy Star level of performance.

Participation and Measures

Measures are shown below.

Table 67. Measures and Incentives -- Residential New Construction

Measure	Measure Number		Incentive Amount
	Electric	Gas	
Energy Star Construction	RE-25		$1,500
Energy Star Construction		RG-31	$900
Inspection Service Fee			$200

Note that the $1,500 incentive amount for electric Energy Star construction is a melded value (see discussion of this measure in the measure appendix).

Projected participation by year is shown in the table below.

Table 68. Estimated Participation and Savings - Residential New Construction

Potential Participants	1,500
Per participant Savings (kWh):	1,214
Per Participant Savings (kW):	0.3
Per participant gas savings (CCF):	249

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	15	1.0%	18,210	4	3,739
Year 2	30	2.0%	36,420	9	7,478
Year 3	45	3.0%	54,630	13	11,217
Year 4	45	3.0%	54,630	13	11,217
Year 5	45	3.0%	54,630	13	11,217
Cumulative	180	2.4%	218,520	54	44,869

Marketing Plans

For beyond Energy Star homes, only the top income segments are likely to be effectively in the market for very energy efficient new homes. This is particularly so now with problems in mortgage markets and general tightening of credit. The financial incentive is provided directly to homebuilders to help offset the additional cost to build an Energy Star home. This gives the incentive a multiplier of between two and three. This program element is a vendor delivered program requiring an experienced Energy Star program vendor. The program vendor provides all of the detailed knowledge and relationships to put the program in place with a restricted set of measures to reach savings levels significantly beyond Energy Star using a set of builder options packages. While the customer has higher first cost, the customer pays less for energy over the life of the home and on a life cycle basis comes out well ahead financially. The program vendor will also provide the established channels to national builders, establish relationships with local builders, and will come supplied with all manner of promotional materials.

The key, according to the Texas Energy Star program is in promoting the value of the brand to builders who would like to differentiate their product. Marketing methods include:

- Newspaper and real estate guide ads
- Signage

- Marketing materials
- Builder and subcontractor training and ongoing technical assistance
- Training in the advantages of Energy Star homes for all the builders, sales staff, realtors, and the lending community.
- Seminars and literature targeted at consumers. This is a valuable addition to a marketing effort because consumers can create a market pull.

Key points to include in a beyond Energy Star program element are:[35]

- Establish a single stable multi-year approach. This will give stability to builders and allow the program to grow more readily.
- Establish a single, simple, and high program standard of efficiency. This is important because it lets builders know where they stand and what is expected.
- Establish good relationships with area builders and developers.
- Ensure that staff professionalism, delivery systems, equipment, marketing materials and quality assurance are all of high quality.
- Maintain strict adherence to specifications based on sound building science and economics to maintain program credibility and consistency.
- Establish a process for certifying and documenting homes built to requirements.[36]
- Develop a solid infrastructure of experienced, well-known and respected organizations.
- Develop targeted incentives that are well coordinated with marketing and other service-related materials.
- Coordinate with health and safety standards and codes for residential construction.
- Provide ongoing technical training for builders and subcontractors.
- Promote builders buy-in into the program by getting them financially invested in the program through advertising, building requirements, and training so they will support all aspects of the program.[37]
- New construction is an excellent area to review for strategic combination of gas and electric energy efficiency measures.

Program Tracking Considerations

As Energy Star homes, Energy Star Plus homes are certified by HERS raters, and Duke Energy will need to work with the HERS raters and the program vendor to establish a workable data tracking system. There are several models for this system, for example the "Dashboard" system developed by Paragon Consulting Services.

Detailed Budget Plan

An estimated five-year budget for this program is provided below. The anticipated cost to Duke Energy for the beyond Energy Star program element involves costs for:

- Administrative costs to develop, oversee, and monitor the program. A vendor contract to market and deliver the new home program, including funding of HERS raters.
- Cooperative advertising budget as part of an inclusive marketing and promotional budget.
- Incentives to be paid to the builder.

Costs to participating customers include the customer's outlay for any remaining incremental cost of the Energy Star Plus home.

[35] Drawn from Vermont Energy Star Program, managed by Efficiency Vermont.
[36] Texas Energy Star Program.
[37] Texas Energy Star Program.

Table 69. Estimated Five-Year Program Budget – Residential New Construction

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$10,000	$0	$0	$0	$0	$10,000	2%
DSM Staffing		$22,000	$22,000	$22,000	$22,000	$22,000	$110,000	20%
Program Monitoring & Evaluation		$15,000	$10,000	$60,000	$10,000	$60,000	$155,000	29%
Variable Program Costs								
Incentives	$960	$14,400	$28,800	$43,200	$43,200	$43,200	$172,800	32%
Delivery & Other	$500	$7,500	$15,000	$22,500	$22,500	$22,500	$90,000	17%
Total Budget		$68,900	$75,800	$147,700	$97,700	$147,700	$537,800	100.0%

Program 14. Residential Solar Siting

This is a gas and electric energy savings program. Passive solar design and orientation reduce a home's heating and cooling costs and makes the home more comfortable with better lighting and better internal temperature control. Here we focus on orientation (we include in the orientation shifting *existing* plans for windows to place more on the south side of the home and additional passive solar measures may be optionally included).[38] This program differs from the others in that, in addition to assisting with solar siting of individual homes, Duke Energy will work with local, county and state code authorities with the goal of inserting a preference for solar siting into building codes. This provision would require consideration of solar siting, but would not make solar siting mandatory. It would also remove all legal barriers to solar siting.

Rationale

Passive solar orientation places a home on the building site in such a way that the home takes full advantage of the sun's natural heat. With the long side of the home facing to the south, the structure will capture solar heat in the winter and block solar gain in the summer.[39] While there is no need to change the house design, moving windows to the home's south side will enhance its solar performance. If the south-facing window area reaches 8 to 10 percent of floor area, the home can be called "sun tempered." This is an inexpensive way to gain a substantial and long term energy savings advantage. Design for shading is an important consideration in this program.

A full-fledged "passive solar" home has south facing glass area of 15 to 20 percent of floor area. With this much glass, additional features must be added, such as thermal storage mass and summer shading. Many builders choose to keep the project simple by sticking to the sun-tempered level.

Solar orientation, in itself, can reduce annual home heating costs by from 10 to 20 percent (extrapolating from a Bonneville Power Administration study for the Pacific Northwest), and, if the home also has air conditioning, reduce cooling costs similarly (based on California studies). If "sun tempering" or fully passive solar improvements are also made, the savings increase. Also, people generally feel more "natural" and comfortable in a home that takes maximum advantage of natural lighting.

Costs for the solar orientation program element will also include staff work with municipalities, counties and state offices to work towards codes that remove all barriers to solar orientation, and require documentation of builder/home owner consideration of solar orientation.

[38] We expect that insuring solar orientation will lead to most homes also increasingly adopting elements of passive solar design, however, for this program we assume only solar orientation.
[39] If, further, south-facing window area is at least ten percent of floor area, the home is "sun tempered" resulting in higher energy efficiency. As a further step, a fully passive solar home will add thermal storage mass and summer shading, and special windows will be used.

Participation and Measures

Measures are shown below.

Table 70. Measures and Incentives – Residential Solar Siting

Measures	Measure Number		Incentive Amounts
	Electric	Gas	
Inspection/Review Service Fee and Solar Orientation of New Homes	RE-23	RG-32	100% (up to $500)
Work on local, county and state codes	Internal staff work	Internal staff work	100% Duke Energy effort

Projected participation by year is shown in the table below.

Table 71. Estimated Participation and Savings – Residential Solar Siting

Potential Participants	150
Per participant Savings (kWh):	150
Per Participant Savings (kW):	0.0
Per participant gas savings (CCF):	79

Program Year	Incremental Participants	Percent Participation	kWh Saved	kW Saved	CCF Saved
Year 1	15	10.0%	2,250	1	1,181
Year 2	30	20.0%	4,500	1	2,362
Year 3	45	30.0%	6,750	2	3,542
Year 4	45	30.0%	6,750	2	3,542
Year 5	45	30.0%	6,750	2	3,542
Cumulative	180	24.0%	27,000	7	14,169

Marketing Plans

The solar orientation program element is targeted to all markets segments for which new housing is being constructed. Since we limit the focus to solar orientation (while expecting this focus to also increase participation in other solar options), there is no new cost to the builder or buyer for this feature. The aim of the codes effort will be to have codes changed to require that builders and home buyers actively consider the advantages of solar orientation in placement of homes on lots and to insure that local, county, and state codes remove all barriers to solar orientation. There are no substantial customer costs for orienting a home on a lot to take natural advantage of energy supplied freely by the Sun, though it is expected that once builders and home owners consider solar orientation, it will lead towards rapid adoption of "sun tempered" and fully passive solar designs.

Program Tracking Considerations

For the solar orientation program element, a careful process evaluation of the company's effort to improve municipal, county, and state codes will provide necessary documentation of effort. For individual homes affected by this program, there should be a certification as to proper solar siting, and of other aspects of passive design to the extent they are included.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. The anticipated cost to Duke Energy for the Solar Siting program element involves costs for:

- Administrative costs to develop, oversee, and monitor the program.
- Cooperative advertising budget as part of an inclusive marketing and promotional budget.
- Incentives
- Costs to work with municipal, county and state government codes organizations.

Table 72. Estimated Five-Year Program Budget – Residential Solar Siting

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$10,000	$0	$0	$0	$0	$10,000	3%
DSM Staffing		$22,000	$22,000	$22,000	$22,000	$22,000	$110,000	30%
Program Monitoring & Evaluation		$15,000	$10,000	$60,000	$10,000	$60,000	$155,000	42%
Variable Program Costs								
Incentives	$500	$7,500	$15,000	$22,500	$22,500	$22,500	$90,000	25%
Delivery & Other	$0	$0	$0	$0	$0	$0	$0	0%
Total Budget		$54,500	$47,000	$104,500	$54,500	$104,500	$365,000	100.0%

Program 15. Residential Low and Moderate Income Weatherization

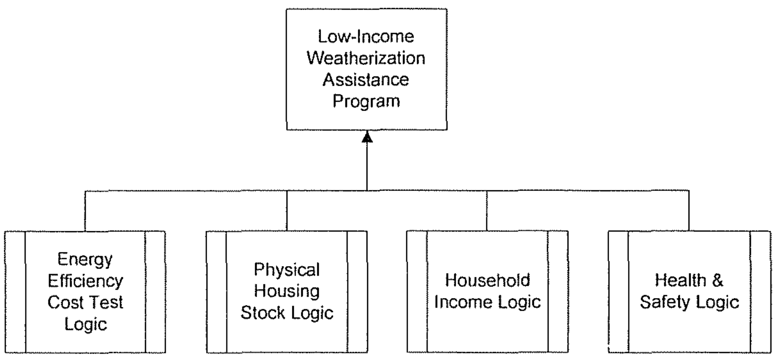
This is a gas and electric energy savings program. The program will serve residential customers. There are two program elements, based on household income. The first program element is the Residential Low Income Program which will serve customers up to an including 150 percent of the Federal Poverty Level. It is modeled on the federal Weatherization Assistance Program (WAP). The second program element is to serve income limited households from 150 percent of the Federal Poverty Level to 80 percent of the state median household income (this is the upper limit of eligibility for public housing under federal Department of Housing and Urban Development regulations). It is modeled on the "Gap" programs now implemented by many US electric and gas utilities to assist households with income deficiencies, but above the cut off level for low income programs. The two program elements will be identical except for the income cut offs to determine eligibility.

It is expected that the homes served by these program elements will be primarily single family owner-occupied homes and manufactured owner-occupied homes. However, and although the permission structure is different, and typically much less work can be done in a rental unit than in an owner-occupied home, we recommend that rules be developed for inclusion of apartments and rental units in this program.

Rationale

Low-income programs are different from traditional DSM programs. They are a special case in that they attempt to cover four objectives:

- Like other DSM programs, a core objective is to provide energy savings (DSM savings).
- Unlike other DSM programs, a second core objective is to provide repairs necessary to install energy savings improvements in a part of the housing stock that is often old and substandard in comparison to middle and upper income housing.
- Provide DSM service to customers who otherwise could not obtain DSM improvements due to cost.
- Due to problems with low-income housing stock, address health and safety concerns.



For these reasons, the prevailing practice in the area of low-income programs is not to focus solely on the "California tests" traditionally used in DSM program review.[40] Instead, commissions have been adopting different

[40] For low-income programs, program cost-effectiveness is a lesser issue, although still an important objective. Because of their particular focus on the special needs of disadvantaged households, low-income energy efficiency programs are generally not held to the same cost-effectiveness criteria as utility energy-efficiency "resource" programs (i.e., they are not judged with a strict "total resource cost" test). More typically, the focus is on the magnitude of utility bill savings to participating customers,

tests for low-income programs. For example, the DC Commission uses an "Expanded All Ratepayers Test" incorporating several "non-energy benefits" for low-income programs. In California, if the benefit-cost ratio on the Total Resource Cost (TRC) test is 0.8 or above, the California commission uses a "Modified Participant Test" and Utility Cost Test that includes "non-energy benefits" for screening measures for low-income programs. A measure is accepted into the program if it passes either test. Thus, the TRC test result for the Southern California Edison Low-Income Energy Management Assistance Program was 0.63 for 2004 and 0.61 for 2005. Similarly, the TRC for Pacific Gas & Electric's Low-Income Energy Partners Program was 0.41 for 2004.

Participation and Measures

The types of weatherization measures to be offered are shown in the table below. This program is free to qualifying participants each year until funds are exhausted.

Table 73. Measures – Residential Low and Moderate Income Weatherization

Measure	Measure Number	
	Electric	Gas
Showerheads (2) and aerators (3)	RE-36	RG-7
Wall insulation	RE-21	RG-28
Ceiling insulation	RE-16	RG-25
Refrigerator Charge & Duct Tune-Up	RE-6	RG-27
House Seal	RE-18	RG-26
WH Tank/Pipe Wrap and Temp Set	RE-35	RG-6
Programmable Thermostat	RE-15	RG-18
Compact Fluorescent Lights (12)	RE-32	
Note: Measures above are illustrative. It is expected that the program will adopt the measure list of the Kentucky WAP program.		

For developing participation, the Low Income program limit of 150 percent of the Federal Poverty Level has been retained for the new program to facilitate compatibility and cost sharing with the Kentucky Weatherization Assistance Program.[41] However, consistent with the direction of current practice, the upper limit for the Moderate Income Weatherization Assistance Program is 80 percent of median household income. This conforms closely to the Department of Housing & Urban Development upper limit of low income used to determine eligibility for public housing.[42]

rather than the utility system avoided energy supply costs. Also, low-income programs often include broader "non-energy benefits" (NEBs) such as lowered credit and collection costs and avoided bad debt for the utility, and improved health and safety for customers. See: Kushler, Martin, Dan York & Patti Witte, "Meeting Essential Needs: The Results of a National Search for Exemplary Utility-Funded Low-Income Energy Efficiency Programs." Washington, DC: American Council for an Energy-Efficient Economy, Report Number U053, September 2005.

[41] For methods and advantages of cost coordination, see Hill, Lawrence J. & Marilyn A. Brown, "Estimating the Cost-Effectiveness of Coordinated DSM Programs." *Evaluation Review*, Vol. 19 No. 2, April 1995, Pp. 181-196.

[42] The federal poverty metric, though updated using the Consumer Price Index each year, is a corrupted metric that is based on wildly inaccurate assumptions regarding household composition, availability of foodstuffs, and overlooks significant household costs. Replacing the poverty metric, many states rely at least in part on percentages of median income. The best metric of income insufficiency is developed using the family budget study method, developed by Wider Opportunities for Women and the Ford Foundation. Using the Department of Housing and Urban Development definition of low income (80% of median income) rather than the Department of Health and Human Services definition (60% of median income) goes a long way towards making the eligibility criterion reflect the material reality of household economic situations today.

Table 74. Estimated Participation and Savings - Residential Low and Moderate Income Weatherization

Potential Participants			47,929		
Per participant Savings (kWh):			1,591		
Per Participant Savings (kW):			0.5		
Per participant gas savings (CCF):			94		
Program Year	**Incremental Participants**	**Percent Participation**	**kWh Saved**	**kW Saved**	**CCF Saved**
Year 1	120	0.2%	190,920	54	11,335
Year 2	144	0.3%	229,104	65	13,602
Year 3	168	0.3%	267,288	76	15,869
Year 4	168	0.3%	267,288	76	15,869
Year 5	168	0.3%	267,288	76	15,869
Cumulative	768	1.6%	1,221,888	349	72,546

Marketing Plans

Marketing for this program is expected to be coordinated with the state weatherization program, which already has outreach activity through the sub-grantee agencies. The number of program slots to be allocated to the Moderate Income program is expected to be a matter for continuing decision as economic conditions change. It is very important to have the capability to serve electrically heated homes above the 150 percent of poverty level since the federal poverty measurement system is systematically off by a factor of approximately two, and the situation of a home somewhat above the 150 percent cut off may easily be more difficult than a home just below the 150 percent cut off. The assignment of slots between the Low Income and Moderate Income programs is likely to depend on circumstances that will develop and change. Care will need to be taken to try to insure that the programs are not over-subscribed in any given year.

- The delivery contractor will be responsible for recruitment, taking into account referrals from Duke Energy.
- Proposed marketing efforts include the use of utility bill stuffers for customer education, and mention of the program in communications with customers regarding energy efficiency program options.
- Customer relations and collections staff will be trained to refer electric heat customers if they are within the income range and enquire about weatherization or experience payment problems.

Program Tracking Considerations

Data collection and documentation for program purposes and annual reporting will require a tracking system. The selected delivery contractor will be requested to carry out most of the data entry for this system.

Detailed Budget Plans

An estimated five-year budget for this program is provided below. Costs to participating customers will be customer's time and permitting access to the home for improvements. As with the current low-income programs, attempts should be made to coordinate with Kentucky WAP for program delivery and cost sharing.

Table 75. Estimated Five-Year Program Budget – Residential Low and Moderate Income Weatherization

	Cost per Participant	Year 1	Year 2	Year 3	Year 4	Year 5	5-Yr Total	Percent of Total
Fixed Program Costs								
Implementation & Other Annual Cost		$20,000	$0	$0	$0	$0	$20,000	1%
DSM Staffing		$22,000	$22,000	$22,000	$22,000	$22,000	$110,000	4%
Program Monitoring & Evaluation		$10,000	$10,000	$85,000	$10,000	$90,000	$205,000	8%
Variable Program Costs								
Incentives	$1,004	$120,528	$144,634	$168,739	$168,739	$168,739	$771,379	29%
Delivery & Other	$2,000	$240,000	$288,000	$336,000	$336,000	$336,000	$1,536,000	58%
Total Budget		$412,528	$464,634	$611,739	$536,739	$616,739	$2,642,379	100.0%

PROGRAM COST EFFECTIVENESS

Program cost effectiveness analysis answers the question of would we be better off with the DSM program compared to not having the program. The answer almost always depends on who is asking the question. In other words, better off from whose perspective? Standard DSM cost effectiveness analysis includes five perspectives that will be addressed in this report:

- Total Resource Cost (TRC)
- Societal (a variant of the TRC)
- Participant
- Ratepayer Impact (RIM)
- Utility Cost (also known as Administrator Cost)

We used DSMore software from Integral Analytics to compute each of the tests listed above. A detailed discussion of cost effectiveness methodology, including the standard tests listed above, is included in Appendix B. In this section, we present the results of the cost effectiveness analysis beginning with a discussion of assumptions. Cost effectiveness results are then presented for each perspective and DSM program.

Expected Program Costs

Program budgets over the first five years of program activity are shown for each program in the DSM Programs section. We recommend a minimum of five years for program implementation and tuning for maximum effectiveness. Program budgets include the cost of incentives and other program specific expenses including evaluation. They also include costs for fully loaded program staffing, administration and DSM related overhead.

Fully loaded staffing costs were calculated using assumptions regarding FTE required for program administration multiplied by the cost per FTE. A weighted average cost per FTE of $88,000 was calculated assuming a 4-to-1 ratio of support to managerial labor requirements. Fully loaded labor cost assumptions of $80,000 for support and $120,000 for managerial staff were used in the calculation.

The program budgets presented in this report include all program-specific fixed and variable expenses paid by the program administrator. It is important to understand that actual expenditures will vary from planned expenditures in their timing and distribution between specific DSM programs. For this reason it is important for the program administrator to have flexibility in the administration of DSM program funding without having to obtain approval from the Public Utility Commission.

We recommend that flexibility include the following:

- Roll over unspent funds within program budgets at end-of-year to categories within the same program in the next year.
- Reallocate program funds across line items within a program.
- Shift up to 25 percent of total budget among approved programs at any time within a program year.

Having some flexibility in the administration of program funding will assist in the management of programs and enable staff to fine tune efforts for maximum resource effectiveness.

Miscellaneous Program Assumptions

Energy savings expected from the program are based on the designs and assumptions presented earlier in this report. Key assumptions affecting the annual savings and program cost effectiveness are shown in Table 78 on page 107. Most of the items listed in Table 78 were addressed in the DSM Programs section. The savings life is calculated from the life of individual measures weighted by program savings and represents the duration of energy savings flowing from a participant in the program. The net-to-gross ratio captures the effect of free-riders, participants in the program who would have installed the energy efficient measures without the program. Higher ratios imply a lower rate of free-riders in the program.

Avoided Costs

The avoided or marginal cost associated with a reduction in energy and demand is of primary importance when evaluating the cost effectiveness of DSM programs. These costs represent the value of avoided electric and gas loads. Duke Energy's avoided costs are the reduction in the cost of supply compared to what it would have been without the reduction in loads and include all incremental energy, transmission and distribution costs as well as the cost of avoided capacity. These costs vary by time of day and month. We used the assumptions embedded in DSMore to capture this variance, along with the hourly savings profile we constructed for each program from our modeling efforts.

Cost Effectiveness Results

In this section, we present the findings of the cost effectiveness analysis which provides a systematic comparison of the program benefits and costs discussed in previous sections. Results are shown for the five perspectives mentioned at the beginning of this section.

The Societal and TRC perspectives are the broadest of the cost effectiveness tests. As the name implies, TRC shows the total cost of the resource relative to supply side resources. Since environmental externalities were not considered, the TRC and Societal only differ with respect to tax credits paid to the participant. Such credits lower the TRC but are considered a transfer payment from the perspective of the Societal Test. The Participant Test shows the economics of program participation from the participant's perspective and reflects benefits from lower bills and incentive payments. Elements of program design, such as incentive payments, can greatly impact participant economics. For most programs the lost revenue calculation in the RIM Test exceeds the avoided cost of supply causing the programs to fail the RIM Test. The Utility Cost Test reveals that when only costs paid by the program administrator are considered, the cost of the acquired resource is generally lower than the TRC unless the utility pays for the full cost of installation. From a TRC perspective, all but three of the programs are cost effective.

Other Assumptions

Free-riders, program participants who would have installed the measure without the program, are measured through the net-to-gross ratio. A ratio of 1.0 assumes no free-riders. Most programs assume 5 to 10 percent free-riders, net-to-gross ratios of 0.95 to 0.90, respectively. These assumptions are based on subjective professional opinion.

Accurate estimates are beyond the scope of this study and involve specialized research that can cost several hundred-thousand dollars. There is debate over the appropriateness of including free-riders without also including free-drivers, an opposite and offsetting impact.

Currently Recommended Programs

We initially formulated our slate of DSM programs from the results of our market assessment, a review of best practices and our own experience. All programs turned out to be cost effective except for the Renewables and Demonstrations and the Residential Low and Moderate Income Weatherization programs. Both of these programs are recommended despite the cost effectiveness results.

We have chosen to recommend a Renewables and Demonstrations program because the solar potential has been demonstrated in this report to represent a large energy resource that could be tapped into to meet a significant amount of future demand. The solar resource is also technically mature and readily deployable. These and other issues that go beyond the scope of this report argue for a Renewables and Demonstrations program. Also, conditions may change in the future which cause solar or other renewable technologies to become cost effective.

Our recommendation is to implement all of the programs included in this report. These programs are listed below:

Commercial and Industrial Peak Reduction	Residential Peak Reduction
Renewables and Demonstrations	Residential Whole House
Commercial and Industrial Incentives	Residential Rebates
Commercial and Industrial Rebates	Residential Appliance Recycling
Commercial and Industrial Retro-Commissioning Lite	Residential New Construction
Commercial and Industrial HVAC Optimization	Residential Solar Siting
Commercial and Industrial Audit	Residential Low and Moderate Income Weatherization
Commercial and Industrial New Construction	

The budget and savings impacts of recommended programs are provided in Table 76.

Table 76. Energy Savings and Annual Budget for Recommended Programs

Year	Cumulative kWh Savings (millions)	Cumulative MMCF Savings	Program Budget (millions $)	Cost per Customer	Percent of Revenue
1	12.9	7.0	$ 4.60	$ 30.87	1.0%
2	35.1	20.8	$ 5.71	$ 37.92	1.3%
3	63.3	43.3	$ 7.66	$ 50.42	1.7%
4	97.9	73.4	$ 8.01	$ 52.17	1.8%
5	136.2	113.1	$ 9.46	$ 60.99	2.1%

Recommended programs result in an overall TRC benefit-cost ratio of 1.9 including direct and indirect program expenses and are expected to achieve 136 million kWh and 113 MMCF in annual savings after five years of operation. The annual budget for recommended programs increases with program implementation efforts, reaching $9.5 million in Year 5. Spending on recommended programs reaches $61 per customer and 2.1 percent of total annual revenue in program Year 5. These figures include direct and indirect program expenses.

The first five years of program operations are estimated to generate $36 million of NPV over the life of the savings using the TRC perspective, approximately $3.4 million on an annual basis.[43] This includes indirect program expenses that support the overall DSM effort but were not included in the program specific cost effectiveness analysis. For example, program databases for tracking all programs typically require initial and on-going development expenditures. We estimate that annual expenditures of approximately $650,000 should be allotted for the following types of expenses:

- School energy education program (educational work in schools with students, including provision of kits) ($100,000)
- Computer systems development, including household energy audit capability ($150,000)
- Program research and development ($50,000)
- Staff development and professional organizations ($200,000)
  - Certification of two staff in evaluation
  - Attendance at various professional conferences and training seminars
  - Membership in CEE and E-Source
- Umbrella DSM Marketing and Customer Awareness ($150,000)

The portfolio cost-effectiveness reported above includes these general DSM expenses in the results.

Demand side management spending and savings information reported to the Energy Information Administration (EIA) is shown in Table 77 for utilities with between 200,000 to 1,000,000 customers. Spending levels reported for 2005 have been adjusted to 2007 dollars. The results show a wide range of spending and savings. Spending per customer ranges from less than $1 to over $90 on the high end. When expressed as a percent of revenue, DSM spending ranges from less than one-tenth of a percent to over 4 percent. Energy savings ranges from two-tenths of a percent of kWh sales to over 10 percent. The spending levels per customer recommended in this action plan are higher than the average spending per customer reported in Table 77 but well within the range of spending.

[43] The NPV for the portfolio of programs is calculated by summing the NPV of recommended programs shown in Table 79 and subtracting indirect program expenses. Dividing the result by the weighted life of recommended programs (14.0 years) yields an estimate of NPV on an annual basis.

Table 77. Comparison of DSM Program Spending and Savings

Name of Utility	Ownership	DSM Spending per Customer	kWh Saved as % kWh Sales	DSM Spending as % Revenue
El Paso Electric Company	Investor Owned	0.39	0.2	0.0
Aquila Inc	Investor Owned	0.46	0.0	0.0
Cincinnati Gas & Electric Company	Investor Owned	0.98	0.9	0.0
Pennsylvania Electric Co	Investor Owned	3.44	0.1	0.2
Metropolitan Edison Co	Investor Owned	3.78	0.0	0.2
Colorado Springs City of	Municipal	4.41	0.4	0.3
Entergy Gulf States Inc	Investor Owned	4.85	0.0	0.1
Tucson Electric Power Co	Investor Owned	4.92	1.1	0.2
Salt River Project	Political Subdivision	5.75	0.5	0.3
Kentucky Utilities Co	Investor Owned	6.39	0.2	0.3
Indianapolis Power & Light Co	Investor Owned	7.46	0.3	0.4
San Antonio City of	Municipal	7.62	0.1	0.3
PSI Energy Inc	Investor Owned	8.00	1.5	0.4
Southwestern Public Service Co	Investor Owned	8.69	0.4	0.3
Sierra Pacific Power Co	Investor Owned	9.90	0.4	0.3
Central Maine Power Co	Investor Owned	12.10	0.1	1.6
Omaha Public Power District	Political Subdivision	12.15	0.1	0.7
Louisville Gas & Electric Co	Investor Owned	12.41	0.5	0.7
Avista Corp	Investor Owned	14.30	9.4	0.9
Nevada Power Company	Investor Owned	15.10	0.9	0.6
Idaho Power Co	Investor Owned	15.81	1.3	1.0
NorthWestern Energy LLC	Investor Owned	18.74	4.5	1.2
Commonwealth Electric Co	Investor Owned	20.06	5.5	1.5
Wisconsin Power & Light Co	Investor Owned	22.13	3.6	1.1
Northern States Power Co	Investor Owned	22.35	5.1	1.3
Tampa Electric Co	Investor Owned	25.96	3.1	0.9
Gulf Power Co	Investor Owned	26.66	5.4	1.2
Public Service Co of NH	Investor Owned	32.37	2.8	1.4
Hawaiian Electric Co Inc	Investor Owned	33.58	0.4	0.8
Narragansett Electric Co	Investor Owned	38.66	6.4	1.9
MidAmerican Energy Co	Investor Owned	39.91	2.4	2.0
Sacramento Municipal Util Dist	Political Subdivision	40.23	10.7	2.1
Austin Energy	Municipal	50.99	4.8	2.0
Seattle City of	Municipal	55.26	9.3	3.5
Western Massachusetts Elec Co	Investor Owned	55.96	8.5	2.8
Boston Edison Co	Investor Owned	62.88	8.5	2.3
United Illuminating Co	Investor Owned	80.06	9.0	3.2
Interstate Power and Light Co	Investor Owned	92.73	2.6	4.1
Average		23.09	2.92	1.11
Note: Values are for total residential and commercial customers at utilities with 200,000 to 1,000,000 customers.				

Source: US DOE Energy Information Administration Form 861

Table 78. Program Assumptions

Program #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Program Name	C&I Peak Reduction	Res Peak Reduction	Renewables & Demonstration	C&I Incentives	C&I Rebates	C&I Retro Comm. Lite	C&I HVAC Optimization	C&I Audit	C&I New Construction	Res Whole House	Res Rebates	Res Appliance Recycle	Res New Construction	Res Solar Siting	Res Low & Moderate Income
Electric savings (kWh)	0	0	3,488	173,100	22,282	15,236	11,234	13,292	48,862	485	331	1,150	1,214	150	1,591
Gas Savings (CCF)	0	0	10	2,915	-184	632	463	187	798	19	-2	0	249	79	94
Installed incremental cost	$250	$250	$10,600	$47,520	$7,841	$3,000	$2,246	$1,570	$24,708	$103	$35	$165	$3,000	$500	$1,004
Savings life (years)	15.0	15.0	32.9	10.0	18.2	5.0	5.0	5.3	25.0	11.5	4.2	5.0	25.0	25.0	15.6
Net to gross ratio	1.00	1.00	1.00	0.75	0.80	0.90	0.80	0.95	0.95	0.75	0.85	0.85	1.00	1.00	1.00
Incentives	$250	$25	$8,530	$28,510	$4,020	$1,500	$560	$790	$12,350	$69	$11	$165	$960	$500	$1,004
Tax Credits	$0	$0	$2,340	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0	$0
Participant Cost after Incentives and Tax Credits	$0	$0	$0	$19,010	$3,821	$1,500	$1,686	$780	$12,358	$34	$23	$0	$2,040	$0	$0

Table 79. Program Cost Effectiveness Results

Program number:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
B/C Ratio (Cost Based - Normal Weather)	C&I Peak Reduction	Res Peak Reduction	Renewables & Demonstration	C&I Incentives	C&I Rebates	C&I Retro Comm. Lite	C&I HVAC Optimization	C&I Audit	C&I New Construction	Res Whole House	Res Rebates	Res Appliance Recycle	Res New Construction	Res Solar Siting	Res Low & Moderate Income
Utility Test	5.80	3.86	0.08	1.23	2.89	3.43	4.08	1.24	2.25	2.46	2.76	1.37	2.45	1.24	0.65
TRC Test	8.28	4.59	0.08	1.09	1.90	2.13	1.90	1.04	1.66	2.32	1.54	1.57	1.46	1.24	0.65
RIM Test	2.65	1.92	0.08	0.58	0.78	0.74	0.76	0.56	0.80	0.64	0.65	0.50	0.81	0.68	0.37
Societal Test	9.92	5.52	0.12	1.26	2.47	2.34	2.11	1.13	2.58	2.69	1.67	1.65	2.41	2.16	0.79
Participant Test	9.67	2.60	1.56	2.24	1.84	2.97	2.59	3.15	1.80	4.45	2.67	3.57	1.36	2.87	2.73
Recommended Program? (0=No / 1=Yes)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1

PROGRAM EVALUATION

Program evaluation has to be scaled to meet the size of the programs to be evaluated and the information needs of the company, the Commission, and of other parties likely to be interested in program results. Duke Energy Kentucky might want to consider a continuing collaborative or stakeholder advisory group to follow program implementation and to receive and discuss ongoing evaluation reports. Such groups help surface issues prior to formal regulatory review of evaluation results and can help structure a stable transition along the DSM cycle from program planning through program implementation and evaluation, and then back through program planning and a new cycle of DSM and DR programs.

Across the US today, there are currently very different perspectives on the appropriate level of effort for DSM process evaluation and DSM impact evaluation. Process evaluation documents program implementation, conformance of the program as actually implemented with the program plan, barriers to implementation that are encountered (and how they are dealt with), and tells the story of program delivery. It can also provide intelligence that is useful in modifying a program to move it forward towards its goals. Impact evaluation provides quantitative assessment of results in terms of conserved kWh, conserved therms, and reduced demand (kW). Some, generally east of the Mississippi, now say that evaluation effort should be 80 percent on impact and 20 percent on process evaluation, retaining the "hard results" emphasis of the 1980s and early 1990s DSM. Some argue that these percentages should be reversed, moving towards development of "soft" intelligence to advanced the programs. These different perspectives are linked to two paradigms for understanding DSM/DR programs, and are briefly discussed in this section of the report. However, regardless of the merits of the two perspectives, we recommend for Kentucky that a focus on impact evaluation is more appropriate for this first (start-up) DSM cycle.

As a first DSM cycle is begun, impact evaluation must be given a priority over process evaluation so that quantitative results are available on a timely basis to document energy and demand achievements, provide the necessary basis for calculating actual cost-effectiveness of programs, and demonstrate the soundness of program effort and results to justify full cost recovery. At the same time, process evaluation can also be quite useful for early detection of variance of program operation from program plans, for documentation of barriers encountered by programs, and for providing both early warning of problems and the ability to respond quickly to fix problems before they become major.

Approaches to Program Evaluation

Throughout the 1980's DSM program evaluation was fairly simple. In the early to mid-1990's DSM evaluation became much more abstract and complex as more emphasis and larger investments were made, especially in expanding methods of impact evaluation and determination of elaborate inputs for assessing free-riders, free-drivers, and net-to-gross ratios. In some respects this elaboration of evaluation can be viewed as an example of over-elaboration and over-spending on evaluation, trying to develop precise answers to questions that might have been better left unasked or simply discussed verbally and stipulated in advance, given the wide variance in results due to underlying assumptions.

When the utility industry largely retreated from serious DSM programs in order to prepare for the years of deregulation, and during the turmoil of cutbacks and restructuring of the deregulation era, evaluation continued to develop in California, the Northeastern states, and the Pacific Northwest where DSM efforts continued. As we return to serious DSM effort across the nation, we come back to a somewhat different context than was left in the older DSM effort (that ended in the emergence of deregulation).

In states such as California, Iowa, and Nevada there has been a recent turn of emphasis toward *gross energy savings* rather than *net energy savings*, as the drivers for DSM have shifted away from the least cost planning paradigm of the 1980s to the "green" and "mitigation of global warming" paradigm of today. Where this movement appears to be going is towards much less concern with free-riders, free-drivers, and net-to-gross ratios. Instead the focus is on attaining physical changes of certain magnitudes (gross, not net energy savings), where the cooperative efforts of the US Environmental Protection Administration, the US Department of Energy, big box stores, state energy offices, and others are seen as welcome leverage toward accomplishment of physical goals rather than (to be netted out) as factors that detract from utility DSM cost recovery. The "green" and "mitigation of global warming" paradigm has an apocalyptic flavor -- the goal is to accomplish definite physical results by certain targets, all sectors of society are expected to cooperate in attainment of the targets, and the effort is more similar to the model of wartime mobilization of production during World War II (think of the War Production Board) than to the economic model of the 1980s California Cost Tests. The vision is wider than the narrow model offered by the Total Resource Cost test (TRC), and in this way of looking at the world, the cost of failure is not reduced cost recovery but editing of societal health, welfare, and survival in a stark Darwinist sense.[44]

It is important to recognize that the leading edge of thought in the area of DSM program design and evaluation is moving on toward the "green" and "mitigation of global warming" paradigm, and to participate in this discussion. However, a first DSM program and evaluation cycle is not the place to vigorously incorporate this paradigm change. By the second or third cycle, parties will be thoroughly familiar with the different perspectives and will have gained a practical sense of program effects -- if the new ("Plan C") paradigm appears relevant and viable at that point in time, it is the likely direction to go at that time.

It is also unlikely that regulators will be ready to move to the new ("Plan C") paradigm quickly.[45] If there is to be a movement in the Midwest toward the new paradigm, it should be done carefully and cooperatively with state commissions and other concerned parties, step by step, as it seems authentic and reasonable to do so. While we need to recognize where leading program design and evaluation thinking are going, the first DSM cycle evaluation

[44] This is the perspective of advocates of the so-called "Plan C."

[45] In Plan C, a carbon adder in the range of $30-$35 would be added to the cost test, and a typical program would be ramped to achieve 70%-80% energy savings. It is likely that government funding would be added to the utility funding mix outside the cost test.

should be guided by the old California Cost Tests, and in particular the Total Resource Cost test (TRC) and the Societal Test.[46]

Evaluation Work Plans

Independent evaluators are generally engaged through issuance of Requests for Proposals (RFPs). The discussion below provides a summary of the recommended DSM Monitoring & Verification (M&V) plans for each DSM Program. These are not complete plans, but they outline the type of M&V commitment that will be required to conservatively demonstrate results with high confidence and to meet industry practice standards using the traditional paradigm of the California Cost Tests and the framework developed for integrated resource planning.

When an evaluation RFP is issued, the bidders will reply with proposals. The proposals are essentially draft evaluation work plans that try to meet the terms of the RFP and the substantive requirements for evaluation. Once an evaluation firm is selected, the typical first billable activity is a "kick-off" meeting with the key utility managers and staff (and the collaborative or stakeholder advisory group, if there is one), followed by a redesign of the evaluation work plan by the evaluation team to take into account information provided by the utility and any changes in program goals, administration, timing, and regulatory direction.

As a practical matter, we recommend that instead of a single initial Work Plan covering the full first program cycle, evaluation planning be approached in a staged manner with certain key decisions made up front about how each program evaluation will be approached over the entire contract period. Detailed planning would be only through the end of the first program year and the evaluation reports based on the first program year evaluation. The reason for this recommendation is that the programs and the policy environment for a first program cycle are still evolving. The evaluation consultant can then, under company (and collaborative, if there is one) direction, make a similar detailed program for each subsequent year.

Evaluation Work Plan Template (for each program)

The following elements should be requested from the selected evaluation team for each program to be evaluated:

(1) Approach -- What is the general evaluation approach for the program (general discussion of evaluation approach, including research objectives, researchable questions, methodological framework, and high-level schedule)?

(2) Verification—In a new DSM effort contractor staff may not be initially up to speed, so a essential responsibility to protect ratepayer dollars will be to insure that the right measures are installed, that they are properly installed, that there are no obvious "lost opportunities" (for example where a door sweep is installed but a broken window is not repaired). While much of this responsibility can be placed on contractors (see point 11 in this list for QA/QC), there is also a key role for the evaluator in inspecting contractor reported installations (for example, if a contractor reports replacing eighty-five ceiling lights in a supermarket, there should be an opportunity for the supermarket to appear in a random sample for which the evaluation verifies the bulb count and insures they are still in place).

(3) Impact evaluation -- How will first year gross energy savings and gross demand reduction values be determined? If a deeming process is proposed for the first year, how will the process be carried out and when will results be available?

[46] These are defined elsewhere in this report.

(4) Free-riders/Drivers and Net-to-Gross -- How will NTG be assessed for this program for the first program year? How will data gathering for NTG be scheduled for the first program year, and when will results be available? Will the evaluation team research and develop deemed values for per unit kWh, therms, and kW for use the first year, or until actual measurements can be completed? Will the evaluation team's plan for development of deemed results include review of regional results from neighboring jurisdictions? If the California DEER database or values used in the Pacific Northwest or the Northeast are used, will they be adjusted, and if so, how? Note that DEER values, while appropriate for California are inherently suspect elsewhere particularly in states that do not have a thirty year record of ever intensifying building codes. DEER values are likely to be too low.

(5) Baseline -- What kind of market baseline will be established for this program? What approach will be used? When will a market baseline be completed?

(6) Metrics -- What are the metrics to be collected for the program?

(7) Tracking System -- When will the program vendor's tracking system be reviewed? When will a report on the program vendor's tracking system for the program be ready?

(8) Budget -- what is the planned evaluation budget for each year? Demonstrate that the total across programs is within the spending cap for the evaluation effort. How does the evaluation budget for this program fit as part of the total evaluation budget, and what criteria are used to allocate evaluation budget among program evaluations?

(9) Jobs -- How will the evaluation track job creation associated with the program? What is the count of jobs created directly by hiring people to work on the program and the evaluation? What is the count on persons from out-of-state who are assigned to a base in the service territory? Which jobs (and percentage of personnel expenditure) will be filled from staff and new hires in Kentucky outside Kentucky? What classification system should be used? When will a report on jobs be available? Note that this is not proposed as a sophisticated or broad based economic impact study.

(10) Program Theory -- What is the program theory for this program? When will a program theory and logic model be available?

(11) QA/QC -- How is quality control and/or quality assurance implemented for this program? When will a report program on QA/QC be available?

(12) Process Evaluation -- What will be the approach to process evaluation for this program? What will be the elements of the process evaluation? When will the process evaluation be completed?

(13) Reporting -- How will monthly or quarterly reporting of work in progress, goals and results, barriers encountered, changes in program and/or evaluation direction be reported? Monthly and/or quarterly evaluation reporting should be uniform across programs.

(14) Year One Details for each program (Note that the details could be in a separate section of the Evaluation Work Plan, or be collected in a separate document).

a. Specific tasks and sub-tasks
b. Detailed schedules
c. Detailed discussion of sampling, data collection, data cleaning, and analysis methods
d. Project and management milestones
e. Identification of staff resources
f. Detailed cost breakdowns
g. Dates of deliverables

(15) Evaluators may see some commonalities and opportunities for evaluation work across certain programs. "Cross-cutting" evaluation work plans should be welcomed if they appear reasonable and workable.

(16) A factor to watch as DSM activity radically increases in the US is the resumes of persons assigned to tasks to insure that key consultant leadership roles are filled by consultant staff with the seasoned program and program evaluation backgrounds desired. If a bid comes in where some of the proposed task leaders do not appear to have the necessary experience, call the bidder and also that those positions be changed out for the consultant's senior staff.

Evaluation Budget

In the recommended program budget for each program, evaluation costs are shown for each year, with the costs quite different from year to year. Generally, it is difficult to get a solid evaluation of a DSM program for under $80,000, though in some cases evaluation costs have been lowered to fit better with number of cases served by a program. Also, evaluation works best if the evaluator is on-board when the programs begin. The pattern in the budget tables permits evaluator involvement beginning as the first program year begins, with two full scale evaluation reports of the five-year program cycle – one towards the middle of the cycle and one at the end. While in the earlier DSM era it was common to select different evaluators for different programs, it is suggested that the RFP for evaluation permit evaluators to propose which programs they will evaluate. This would result in the selection of one or two evaluation teams to cover all programs. This gives the evaluator(s) the ability to work across program evaluation budgets and will yield a more even, efficient, and more capable evaluator involvement.

Program 1. Commercial and Industrial Peak Reduction

Load control programs, particularly direct load control programs are self-documenting every time a load event is called. The basic level evaluation for a Direct Load Control, Demand Reduction (DR), program is an engineering review. Often an engineering review is sufficient. In the engineering review, the evaluation will produce load shape impacts for selected curtailment events, and curtailment events will be interpreted with reference to Duke Energy Kentucky's load duration curve. The evaluation will include reference to the company's internal load control planning and will recommend, if economic, further ramp up in load control programs.

A second level of evaluation is provided by analytic study of customer data using regression analysis. Sometimes this is seen as a detailed engineering review (particularly if the persons conducting both analyses are engineers) and sometimes it is seen as a separate quantitative analysis that goes beyond the engineering review (the second level analysis is often carried out by evaluators who have a background in business analysis, social sciences, or mathematics and statistics). The primary goal of the impact evaluation effort is the estimation of demand reductions during load control events. Depending on the metering options available, this may be based on samples or on complete data. As with all evaluations, it is very important to establish baseline conditions (for this program, the absence of a load event) so that the program produced and "no program" results can be contrasted to demonstrate the quantitative program effect(s).

Typically for evaluation of a DR program, the evaluator will build a dataset of hourly load data for a sample (or all cases, if metering is available) of program participants over a defined monitoring period. This hourly data is combined with hourly weather data to estimate load shapes at different temperatures. Load shapes from typical days are then compared with load shapes from load event days. This data is then analyzed in a regression analysis in which the measured hourly kW load is the dependent variable. The regression controls for weather and other conditions so as to provide a clean contrast of expected customer load at a given hour under the "no program" alternative with the customer load under program conditions when a load event is called. Analysis is on a per customer level, so can be scaled to estimate effects from a sample to a population or to estimate the effects of different levels of increased participation, using assumptions about the remaining portions of the target markets that could be recruited into the program.

Generally, it is reasonable to assume a 100 percent net-to-gross ratio in DR projects because there is no reason for the customer to reduce load at the time of a load event, except that the event is called and the customer is a participant in the program: *there are no free-riders.* Also, spillover may occur, but it is generally more reasonable to consider spillover to be zero for most DR programs (unless the program design is specially oriented to create spillover) than to spend any dollars on evaluation to determine a quantitative value for spillover. The use of free-rider, free-driver, and net-to-gross assumptions of this kind is typically best discussed with and, if possible, cleared by the commission in advance so there is no surprise if a DR evaluation introduces these assumptions in place of spending dollars on a measurement effort to develop estimates of free-riders and free-drivers.

Data gathering for this type of analysis is projected to be based on the use of whole building demand meters or the use of data loggers on specific equipment. The company will have its own preferred equipment, but generically, this is a "smart grid" application. Duke Energy will have to decide whether to use one-way or two-way communications. Due to the importance of load control, programs in this area are expected to be a precursor to eventual system-wide implementation of the technologies.

Because the program is envisioned as built on a "smart grid" approach, both program and evaluation should carefully separate and "bin" all costs and develop a cost-causation analysis. The evaluation should explicitly show all sources of cost coordination/cost-justification for this project so that only the incremental piece due to the direct load control is assigned to the C&I Peak Reduction program. "Smart Grid" applications are cost-justified on the basis of several factors in addition to direct load control, so the cost of metering for the DSM program analysis is *only that portion of technology costs that is not covered by these other factors* (other factors, such as ability to institute several forms of time differentiated rates in addition to direct load control).

Program 2. Residential Peak Reduction

This program is operationally a near-mirror-image of the C&I Peak Reduction Program (Program 1), and the evaluation is carried out in the same manner. Note that while the residential project proposes primarily AC recycling (like the C&I Peak Reduction program), it also contains an electric domestic hot water (DHW) component. The DHW calls are planned to follow the AC load events to partially offset the resumption of AC load.[47] As with the C& I Peak Reduction program, it is reasonable to assume a 100 percent net-to-gross ratio in DR projects because there is no reason for the customer to reduce load at the time of a load event, except that the event is called and the customer is a participant in the program: *there are no free-riders.*

The evaluation should explicitly show all other sources of cost coordination/cost-justification for this project so that only the incremental piece due to the direct load control is assigned to the program. Because the residential "smart

[47] This is not necessary for the C&I Peak Reduction program (Program) since the end of the business day will generally mean no need to offset AC units coming back on line following an event.

grid" applications are cost-justified on the basis of several factors in addition to direct load control, the cost of metering for the DSM program analysis is *only that portion of technology costs that is not covered by these other factors* (for example, other factors such as automatic turn on/turn off for student accounts in off-campus housing and for households in areas with consistent billing problems, automatic theft and tampering protection features, and ability to institute "pay in advance" pricing, ability to institute several forms of time differentiated rates in addition to direct load control).

Program 3. Renewable and Demonstration

This program contains four program elements: Solar photovoltaic, solar hot water, ground source heat pumps and the "Go Deep" project. Each of these program elements is currently non-cost-effective and together, the set is not cost-effective. The first three of these are usually classed as renewable energy projects rather than DSM, while the fourth is an advanced DSM program design.

The renewable technologies are included because the DSM/DR paradigm is shifting from the traditional model of the 1980s to a "green" and "mitigate global warming" paradigm which deploys both traditional DSM and DR measures and renewable technologies. From the perspective of this paradigm, large scale deployment of renewable technologies is an essential part of DSM -- the larger DSM goals implied by the paradigm cannot be accomplished without rapid deployment and expansion of green technologies. Currently, the authorization for renewable technology projects comes separately from authorization for traditional DSM and is not subject to the same cost tests used in the 1980s least cost planning framework.

In most states, renewable technologies are championed by the governor or by key legislators. Also, most states provide limited demonstration programs rather than full scale programs. This is expected to change with the recent extension of federal tax credits for renewable projects, the removal of the residential cap on tax credits, and the provision for utility benefit from tax credits. However, for this first program cycle, a small number of demonstrations is projected for each year, split among these renewable technologies and the "Go Deep" advanced DSM research and demonstration projects.

For the current effort, these projects are covered under marketing, promotion, and communication of DSM to the extent that they cannot be cost-justified under the California Cost Tests or by other independent authorizations.

Since this program is directed to demonstration programs, it will have an integrated process and impact evaluation centered on description of experience with each project. For the solar projects, part of the impact evaluation will be a documentation of site adequacy for solar installation. Direct pre and post metering will also be used to demonstrate the effects of the technology demonstrations. The process evaluation will look for any unintended side effects as well as the expected direct effect, assess perceptions of the demonstration using a mini-survey approach, and document any problems with the installation. The process evaluation will also address problems of ongoing maintenance and care for the equipment. For the "Go Deep" demonstration homes, evaluation will track with current and ongoing assessments of "Go Deep" as sponsored by other utilities, and the attempt to document attainment of effective and efficient approaches to achieve 80 percent savings in the residential sector.

Program 4. Commercial and Industrial Incentives

This program targets only commercial and industrial accounts. The program is a totally custom program, designed to develop exceptionally productive energy savings opportunities in cooperation with the customer. Each project will be specially designed as will each impact evaluation.

Site-specific project evaluation will combine engineering calculations with limited short-term data logging or spot metering. Evaluation for this program will have to be kept simple, but adequate to satisfy needs the customer, plus the company's and the Commission's need for defensible evaluation results. Typically in these contexts, measurement is direct and short so as not to interfere with production. For each project selected for verification, a verification plan will be developed for the site, depending in part on the measures (EEM complexity, technologies, anticipated interactive effects), the project estimated value of energy conserved, and site review including site-specific and institutional constraints.

For each project site selected, there will be a pre-installation site review, a site-specific plan detailing how measurements will be taken (with assumptions), any pre-installation M&V effort as required by the plan (to establish the baseline), post-installation M&V (with post-installation metering), and development of a post-installation M&V report.

Analysis will follow the International Performance Measurement and Verification Protocols (IPMVP) under options A (Partially Measured Retrofit Isolation), B (Retrofit Isolation), C (Whole Facility), and D (Calibrated Simulation) as suitable under IPMVP to the specific measures installed at specific sites. In cases in which preferred IPMVP options might require high cost and in cases in which IPVMP options are not possible due to production constraints, practical engineering analysis satisfactory to the facility management and the utility may be substituted. A major force operative in these projects is the need not to interfere with production and limitations imposed by facility management. While these factors can limit measurement options, they also insure conservative design and projects that are virtually certain to perform as planned.

The process evaluation will be a short "story of the program experience," citing encounter with program barriers and incremental learning from the different projects. The overall program evaluation will summarize results over the sites and characterize the savings due to the program. Spot or short-term metering is expected to determine baseline and post-installation energy use.

Free-riders, spillover, and net-to-gross considerations will be addressed by a short survey approach for all projects, complemented by a small set of in-depth interviews for each project (since the number of projects for this program is expected to be small). If the number of projects expands, a stratified sampling approach may be used.

For custom projects, the documentation developed by the program implementer (company staff or a program vendor of ESCO) is extremely important. Documentation of characteristics of any equipment removed as well as new equipment installed is essential, along with date and time of all activity. As with all impact evaluations, quantitative documentation of the base case ("No Program") condition is essential to enable direct comparison with the program condition. This means that the evaluator must work alongside the program implementer because the base case will no longer be available for measurement after the installation is carried out. Based on experience, facility management generally requires the least intrusive, but adequate for practical purposes, approach to measurement, which is often direct "before and after" assessment. Typically measurement for these kinds of projects is best performed by a seasoned engineer with industry experience.

Program 5. Commercial and Industrial Rebates

This program targets non-residential customers eligible for prescriptive measures. These will include commercial and industrial customers. For profit, non-profit and public agencies (such as schools) will be included. The rebate program will require elements of both process and impact evaluation. The primary impact evaluation method will be engineering review of the gross savings as projected by the program vendor. For each project selected for verification, a verification plan will be developed for the site, depending in part on the measures (EEM complexity, technologies, anticipated interactive effects), the project estimated value of energy conserved, and site review. For each project selected, there will be a pre-installation site review, a site-specific plan detailing how measurements will be taken (with assumptions), any pre-installation M&V effort as required by the plan (to establish the baseline), post-installation M&V (with post-installation metering), and development of a post-installation M&V report. Analysis will follow the International Performance Measurement and Verification Protocols (IPMVP) under options A (Partially Measured Retrofit Isolation), B (Retrofit Isolation), C (Whole Facility), and D (Calibrated Simulation) as suitable under IPMVP to the specific measures installed at specific sites. The IPMVP procedures provide for a range of measurement options. For example, most lighting measures can be assessed by means of direct engineering analysis using inputs such as operating hours, the characteristics of new lighting equipment and of the equipment replaced. However, other technologies may require pre/post direct metering and/or statistical regression analysis. The final Evaluation report will summarize results over the sites and characterize the yearly savings due to the program. Spot or short-term metering is expected to determine baseline and post-installation energy use in most cases.

Evaluation of retro-commissioning will look particularly at savings claims and test the duration of energy savings. For the most part, evaluation in this area involves an engineering review. However, for selected sites where measurement is possible an evaluation approach with baseline, post treatment, and subsequent year measurement may be employed. The case pre-screening will also be included in the evaluation. It is likely that retro-commissioning will be evaluated using building modeling in Easy-Sim™.

Free-rider, free-driver, and net-to-gross considerations will be based on short surveys, backed up by a small number of interviews at selected sites. Analysis may be based on a stratified random selection of cases or on all cases.

Program 6. Commercial and Industrial Retro-Commissioning Lite

This program is planned to make use of a method of detecting outliers that would be likely candidates for retro-commissioning. Retro-Commissioning Lite is planned to involve inspection of systems for optimization of setting of controls. Evaluation of retro-commissioning will look particularly at savings claims and test the duration of energy savings. For the most part, evaluation in this area involves an engineering review. However, for selected sites where measurement is possible an evaluation approach with baseline, post treatment, and subsequent year measurement may be employed. The case pre-screening will also be included in the evaluation. It is likely that retro-commissioning will be evaluated using building modeling in Easy-Sim™.

Free-rider, free-driver, and net-to-gross considerations will be based on short surveys, backed up by a small number of interviews at selected sites. Analysis may be based on a stratified random selection of cases or on all cases.

Program 7. Commercial and Industrial HVAC Optimization

This program involves inspection and adjustment of existing HVAC equipment. For example, out of twelve rooftop units on a building, perhaps two are far out of adjustment. If possible, both operation under baseline conditions and operation of the optimized equipment should be monitored through spot metering and careful documentation of any fixes should be recorded. The overall performance of HVAC equipment should take into account normal variation of internal loads and also variations due to weather. The evaluator should propose the length and type of monitoring required and specify the type of monitoring equipment to be used. It is expected that evaluation will minimize intrusion on building operations by relying primarily on a calibrated hourly building simulation model. The model will be calibrated either to baseline conditions or to customer billing records. Inputs to the analysis are expected to also include spot power and outdoor temperature readings and interval end-use metering data (to the extent available). Results will be based on a traditional "pre/post" design and calculated using a statistically adjusted engineering model.

Free-rider, free-driver, and net-to-gross considerations will be based on short surveys, backed up by a small number of interviews at selected sites.

Program 8. Commercial and Industrial Audit

This program is limited to food service facilities and grocery store/supermarkets. It consists of refrigeration improvements, improvements to refrigeration to reduce load, and restaurant commissioning audits (designed to optimize controls and limit energy losses in food service facilities). Evaluation will consist of engineering reviews contrasting before and after conditions, and supplemented by spot measurements. Modeling (simulation) software may be employed.

It is reasonable to assume zero free-riders for this type of program since in the absence of a program, since inefficient use of energy in food service facilities typically continues for years. Free-rider, free-driver, and net-to-gross considerations will be based on short surveys, backed up by a small number of interviews at selected sites.

Program 9. Commercial and Industrial New Construction

This program targets new commercial and industrial construction. New construction presents a problem for the usual evaluation methods because there is no base case available for direct measurement. For this reason, the evaluation approach typically taken is building simulation modeling. The "as-built" program buildings are compared using a simulation program to the imaginary buildings that would have been constructed in the "No Program" situation. Gross energy savings results are developed as difference between the "as-built" and "No Program" model runs. Model runs generally involve many iterations until final models are developed. This is International Performance Measurement and Verification Protocol (IPMVP) Option D (Calibrated Computer Simulations), assisted by information from the DOE website, on-site survey and verification of selected buildings, and the possibility of limited data logger monitoring. The evaluation plan will provide the specifics of the instrumentation for the datalogger, calculation methods, and assumptions.

Free-rider, spillover, and net-to-gross estimates are developed using surveys and interviews.

Program 10. Residential Whole House

This program includes the two residential energy assessment options that are carried out remotely, by mail or Internet and an on-site audit with direct installation of minor measures. The remote audits are available (free) to all customers. The separate on-site audits for electric or gas heat customers only (with a $50 fee that can be credited to installation of recommended measures that are installed subsequent to the on-site audit). The remote audits are envisioned as a feeder to the on-site audits.

For the remote audit program using the Internet and mail-in forms, energy savings claims will be limited to the low-cost measures sent out to accompany audit results. This is an engineering calculation. It will be checked using a mini-survey approach to develop information on installation rates to modify results by developing free-rider, spillover, and the net-to-gross ratio. Energy savings claims will be limited to direct install items.

Evaluation of the on-site audit program element will be based on the audit record, directly installed low-cost measures, and subsequent documentation of rebates for items recommended during the audit. Free-riders, spillover, and the net-to-gross ratio will be developed from survey results and interviews, both based on systematic random samples of participants. The interviews will also be used to develop process evaluation insights. Vendor staff will also be interviewed for the process evaluation. While the remote audit will be open to all customers, evaluation of this program will focus on customers with electric or gas heat. Customers without electric or gas heat will not be sent the kit items but will be direct toward rebate programs.

For homes that receive only low-cost measures with small savings potential, impact evaluation will make use of an engineering analysis. If there are a sufficient number of electrically and/or gas-heated homes for which the on-site audit leads to adoption of major measures, results will be assessed using a Statistically-Adjusted Engineering (SAE) billing analysis approach, or the Princeton Scorekeeping Method (PRISM).

Program 11. Residential Rebates

The Residential Rebates program focuses on rebates for CFLs and for Energy Star Appliances (Clothes Washers).

For lighting measures, the evaluation approach will be to verify the CFL wattage and CFL life of all rebated units according to vendor/brand specifications. Also to verify the typical wattage of incandescent bulbs replaced by CFLs (the basic assumption is that all CFLs will replace an incandescent bulb of equivalent luminosity; other assumptions will be taken from the national Energy Star program, as listed on their website). Results will be quantified according to standard M&V protocols to estimate the annual and lifetime energy savings. The evaluation report will present these results and report the distribution of CFLs by brand, model, and wattage. The program may be required to document light bulbs replaced, for example, through a limited light-bulb exchange, a survey, or direct inspection, or a combination of these approaches.

For appliances, the evaluation approach will be to gather complete technical descriptive information to identify each Energy Star appliance rebated (brand, model, characteristics). Results will be quantified using industry standard M&V calculations for each appliance type. An attempt will be made to gather similar technical information on machines replaced. The evaluation report will summarize this information and calculation results to document energy savings.

The evaluator will review program records and independently check program savings calculations maintained in the program tracking system. It is important to place a directive to the program vendor to document the specific technical features of equipment replaced and equipment rebated as a standard program procedure.

Program 12. Residential Appliance Recycling

For the residential appliance recycling program element within this program (for refrigerators, freezers and room air conditioners), the program vendor will be required to maintain a tracking database containing all of inputs required to develop gross energy savings. There are two primary national vendors for this program element and both have the required expertise with relevant tracking databases. Since the equipment is recycled, it is possible to gather complete information on all required technical data. The evaluator will also examine and report on safe equipment disassembly and recycling of components. The free-rider, spillover, and net-to-gross information for this program element will be developed from participant surveys and interviews, both based on random samples of program participants.

Program 13. Residential New Construction

For the "Beyond Energy Star" program element, the primary method of evaluation will be an engineering review of program records, since Energy Star qualification will be certified by the program. Savings calculations will follow the International Performance Measurement and Verification Protocol (IPMVP) Option D (Calibrated Computer Simulations), assisted by information from the DOE website, on-site survey and verification of a few selected homes, and limited data logger monitoring. An evaluation plan will provide the specifics of the instrumentation for the datalogger, calculation methods, and assumptions. An equivalent comparison group will also be used to provide a meaningful contrast from which to develop program impacts.

Program 14. Residential Solar Siting

For solar orientation and review of construction to include simple elements of workable passive solar design, it may be assumed that there are zero free-riders, first because while home builders have some knowledge of passive solar they do not use it in practice, and second because the focus of the program is on codes as well as individual homes. To the extent that the program is successful in modifying codes at a city or county level, or at the state level, all results will be new energy savings. This evaluation will emphasize process evaluation, to document the efforts at working to establish better codes, and will also require review of selected sites to insure solar orientation and elements of simple passive design were properly developed. It is important to verify that expertise in solar siting and a background in wider passive solar experience has been present in the siting of each house – if done correctly, the program will produce significant energy savings and comfort, if not sited correctly (with minimum passive design included) the home may be too hot in summer.

Program 15. Residential Low and Moderate Income Weatherization

This is a whole house weatherization retrofit program for low and moderate income homes with electric or gas heat. There are two program elements, one for homes to and including 150 percent of poverty to match the Kentucky Weatherization Assistance Program, and the other for homes from 150 percent of poverty to 80 percent of Kentucky median household income. The two programs are identical. They will be separately evaluated. M&V will follow a traditional non-equivalent control group design using utility energy usage and billing records and either PRISM™ or regression modeling, with an equal number of treated and similar untreated homes.

Other Considerations in Support of Program Evaluation

Three other areas should be developed to support program evaluation. These are a protocol for monthly program reporting, customer satisfaction metrics, and standardization of net-to-gross methods.

Protocol for Monthly Program Reporting

To assist in the company's management of programs and to provide a stream of current information to the evaluation team, the vendor for each program should be required to submit a monthly report to the Program Manager for each program containing the following information[48]:

(1) Month, date, program name, name of person responsible for the report.
(2) Brief description of the program, including program goals and objectives (this will repeat each month unless the program is changed). If there is a change in program description, goals, objectives, program elements or measures, please call attention to the changes and describe them clearly and completely.
(3) Program budget and expenditures (see table below):

Budget and Expenditures	Actual Monthly Expenditures	Cumulative Expenditures To Date	Total Budget	(Over) Under	Variance $	Variance %
Total						
Admin						
Marketing						
Program Implementation						

(4) Program energy and demand impacts. These will be based on program assumptions (see table below):

Energy Demand Impacts	Projected Monthly Goals	Actual Monthly Goals Achieved	% of Goals Achieved	Projected Total Program Goals	Cumulative Program Goals Achieved To Date	% of Goals Achieve
Coincident Pk kW						
Annual kWh						
Annual Therms						
Lifecycle kWh						
Lifecycle Therms						

(5) Describe and discuss whether the program is reaching its projected performance goals as stated in the program work plan. Discuss separately for program administration activities, program marketing/promotion/communication activities, and program implementation activities accomplishments as compared with projected goals and objectives established for program related activities for the report period. Where possible describe work activities in both quantitative and qualitative terms. In particular, please describe all barriers encountered and if project goals have not been met, explain the reasons why and what steps have been taken to ensure that the project is back on schedule, and will be completed by target date.
(6) Describe all customer disputes or complaints and how they have been resolved.
(7) Describe any staff or subcontractor/consultant changes.

[48] This list is slightly modified from current California monthly program reporting requirements.

Customer Satisfaction Metrics

Customer satisfaction for each program is best assessed using a system of continuous mini-surveys. Mini-surveys are "mini" in three ways:

- First, they typically have no more than ten or twelve questions (and may have less) so they are easy to answer and not a burden for the customer.
- Second, all of the questions (or almost all) are answerable with a "yes/no," "0/1," or a percentage type response. This permits use of small sample theory.
- Third, the sample sizes are small, perhaps 30-60 completed satisfaction survey forms in each survey wave for a program.

However, they typically repeated every quarter so that a time series tracking record of responses to the individual satisfaction question can be developed and graphed. This provides an easy to deploy method of assessing customer satisfaction on a continuous basis that is able to detect changes that might require management response. Since the tracking is continuous, the feedback is in the form of a periodic management report with graphs.

Typically, customer satisfaction is best surveyed by an independent third party such as a marketing firm or an independent evaluator. Surveys may be conducted by phone or mail, or a combination. Because the response format for the questions is constrained, small sample theory can be used and the sample sizes will be small for each survey wave, but the waves will be repeated quarterly. The survey questions will be tailored separated for each program. A comparison group, not participating in programs, may also be employed.

For each survey wave (and with the exception of programs with a small number of customers) the goal will be a completed sample size of at least 30-60 (not more than 60). By repeating the same survey with new customers each quarter, the customer satisfaction results will cumulate to much larger samples over a year and over the five-year horizon developed in the plan, so statistical confidence, significance, and power are all addressed over time. Also, by keeping a few common questions across all surveys, a general assessment of customer satisfaction in the whole DSM effort is possible. Where the number of units completed per quarter is less than 30, it is reasonable to attempt to survey all treated units.

Standardization

Different evaluation contractors may have different preferences for the approaches taken to develop information for determining free-riders, spillover, and net-to-gross information. The approaches chosen can produce widely differing results. It will be important for Duke Energy to standardize these approaches across programs, until such time as the Kentucky Commission establishes guidelines for this area. Final determination of methods in this area is likely a commission decision, but commissions tend to ask for a record to be established, demonstrated, and fully discussed before arriving at a result.

APPENDIX A. METHODOLOGY

Choice of Methodology

At the root of most DSM analysis there is some form of energy usage model. The model often used in larger multi-utility DSM planning, synthesizes estimates from demographics applied to engineering prototypes. This approach is easy to apply to individual measures and to small groups of measures where the result of all the measures is small relative to the total energy sales. But this simple synthesis approach becomes unstable where a large or comprehensive technical potential is contemplated because the simple sum may not include measure interactions, and can result in inflated savings estimates. Also demographic information and market penetration information are more accurate applied to large regions, but lack precision when applied to smaller regions. Under this circumstance, the cumulative errors due to lack of precision can compound into large errors. The simple synthesis approach has also been criticized for not including all possible measures that may contribute to the full technical potential.

Therefore, in this case, where a technical potential will be derived from a maximum application of a wide variety of interacting measures and applied to a relatively small region, we have opted to approach the estimate with a "calibrated engineering model". With this approach we will true the models to the current actual energy sales by fitting a relatively simple algebraic model to the recorded energy use (and hourly load) and the associated average monthly temperatures. This approach has the strong advantage of starting the analysis from a verifiable energy use situation. Another significant advantage of this approach is that it is somewhat empirical, and the data fitting process will reveal large unusual energy use situations, if they exist. Finally, it is particularly important to be able to establish a reasonably bounded estimate of the aggregate energy under conditions representing the full technical potential, which requires the explicit treatment of measure interactions afforded by the engineering modeling approach.

Within conditioned spaces, heating and cooling energy will be influenced by lighting and other internal gains and by large scale refrigeration. This results in an interaction of energy savings measures. Another form of measure interaction is related to changes in thermal conversion efficiency. Whenever there is a load reduction measure, the net realized energy savings will also be dependent on an assumed thermal conversion efficiency. Where a thermal conversion efficiency is changed at the same time as a load reduction, the result is interactive, and it is important to consider the effect of both measures simultaneously. In this case, where a wide range of efficiency and load reduction measures will be applied, it is particularly important to be able to deal with measure interactions in an orderly way.

Overview of Model Structure

The overall utility energy model has two principal components: the energy model, and the demand model. The output from energy model drives the demand model. The energy model estimates the average daily energy use, kWh/day or therms/day for each end-use and for each month. The demand model will use the average daily energy use for each end-use and for each month, and distribute it among the twenty-four hours of the day.

The principal function of the energy model is to separate the energy for each month or day into its primary end-uses. The largest and most important fundamental end-uses are Heating, Cooling, and Baseload. In this utility analysis, the baseload is subdivided further into DHW, lighting, internal loads (cooking plugs etc), and external loads. These six end-uses are the ones that will be considered here.

Both the energy and the demand models are "trued up" to actual temperature and recorded energy sales and load information. In this case the energy model is trued up to 2007 monthly energy sales and temperature data established by sampling in excess of 1000 accounts in each of the seventeen energy use sectors subject to this analysis. The model is also trued up on an hourly basis to available load shape information for 2007 loads. For this analysis, energy and demand are modeled for seventeen primary electric energy use segments: four residential and thirteen commercial and industrial as described in the market assessment section. Gas energy is also modeled for the same defined seventeen energy use segments. Gas energy has no load shape information for "true-up".

Both the gas and electric models serve essentially the same physical population which allows better modeling resolution in both models. In particular, the building internal gains, which are readily evident in the electric data, are used in the gas models because the gas space heat needs are directly influenced by internal gain. The gas data shows very clearly the nature of the hot water heating loads and the space heat loads and these are used in the electric model which cannot resolve these loads very clearly because of the low use of electricity for these end-use loads. This simultaneous modeling of both electric and gas energy use for essentially the same population reveals interactions between electric and gas energy savings. In particular the reductions in internal electric energy use, as from lighting efficiencies, will create an unavoidable increase in fuel use as the gas heating systems compensate for the reduced internal gain. This exported heat load is significant enough to increase gas consumption by of the order of 5 to 10 percent, but it is not commonly considered in technical potential studies of electric energy only. In this study, with the co-modeling of gas and electricity, the interaction is fully captured and it works to lower the apparent technical potential for the gas utility.

The model has been devised and structured with explicit variables to express in physical or engineering terms, the measures and treatments involved in attaining the full technical potential. This includes variables for conversion efficiency, load reductions and thermal and electrical solar energy measures. The model will also estimate the changes in peak demand associated with the applied efficiency measures and temperature changes. The following discussion will be in two parts: the first part discusses the electric and gas energy models, and the second part discusses the electric demand model.

Energy Model

Nature of the Data

A brief graphical review of the energy sales and the associated average monthly temperature is illustrated in Figure 32 which shows that the daily average residential gas energy use generally has a clear variation with temperature.

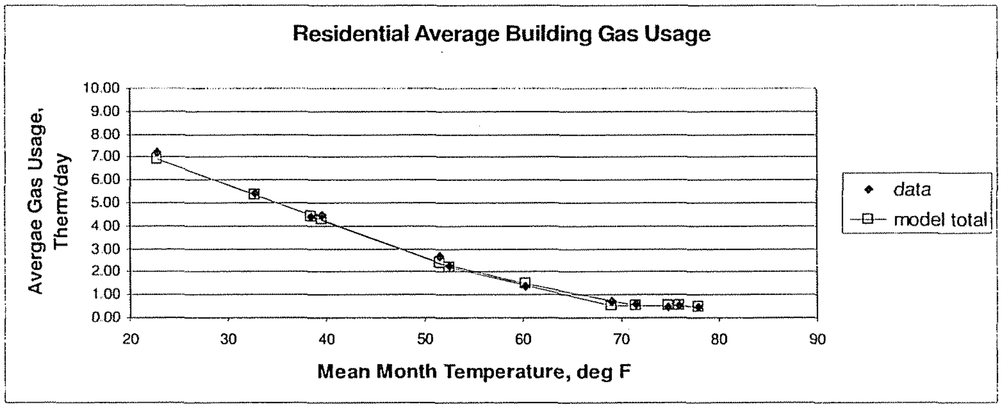


Figure 32. Aggregated Residential Single Family Gas Energy Use

Note that the average daily energy use increases the cold winter months with average monthly temperatures of about 30 deg F. The model fitted to this data is also shown.

Figure 33 shows the average energy use versus average temperature for restaurant customers, and Figure 34 shows an orderly temperature pattern for grocery customers.

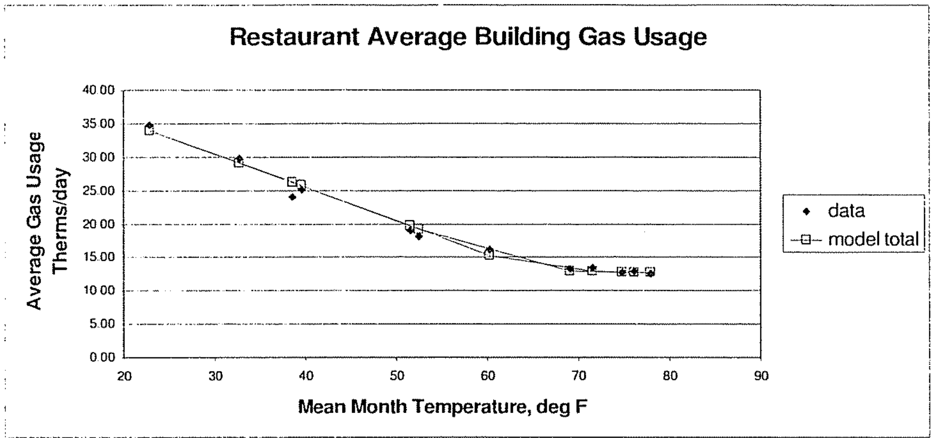


Figure 33. Restaurant Average Gas Energy Use

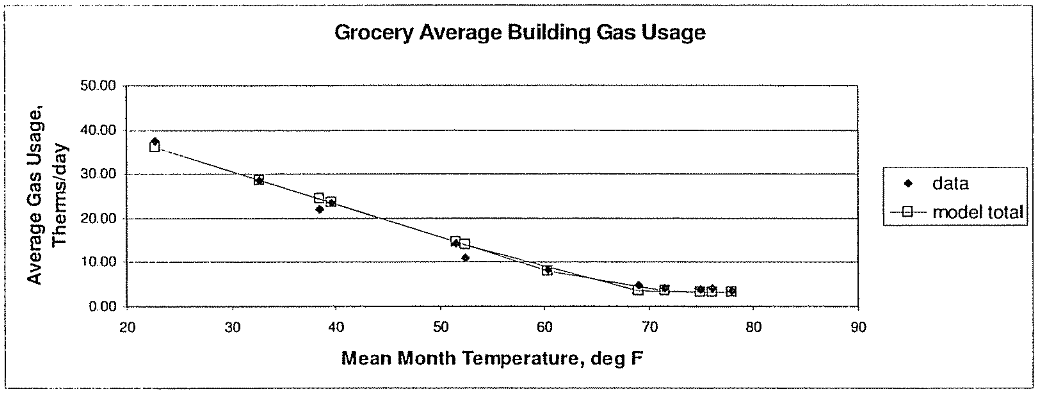


Figure 34. Grocery Average Gas Energy Use

Figure 35 through Figure 37 show the common patterns found for electric energy use.

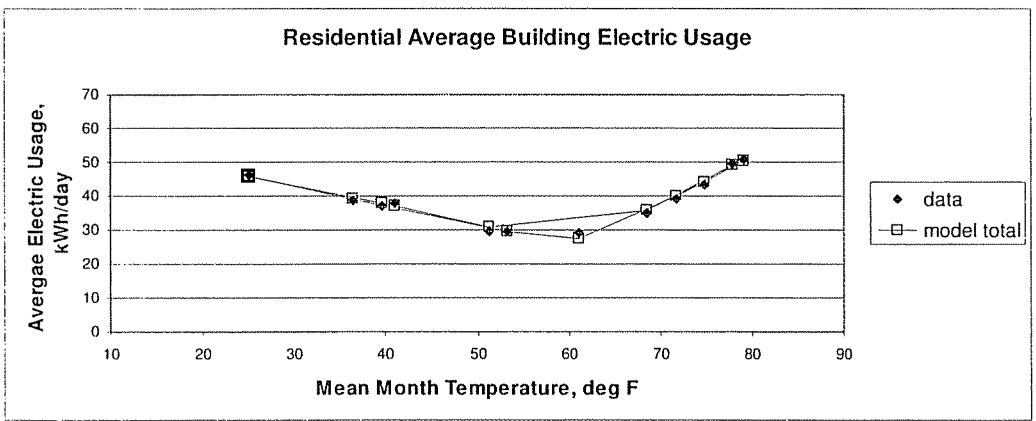


Figure 35. Aggregated Residential Single Family Electric Energy Use

This figure shows the average residential energy use for single family residential customers in residences older than 4 years served for the 12 months of 2007. Note that the average daily energy use increases for the warm summer months with average monthly temperatures of about 80 deg F, and for the cold winter months with average monthly temperatures of about 30 deg F. The model fitted to this data is also shown. This model is for a sample where the major space heat fuel is gas; had the sample been predominantly heated with electricity, the slope with low temperatures would be much steeper.

Figure 36 shows the average energy use versus average temperature for the average restaurant customers, and Figure 37 shows the energy versus temperature pattern for the average grocery customers.

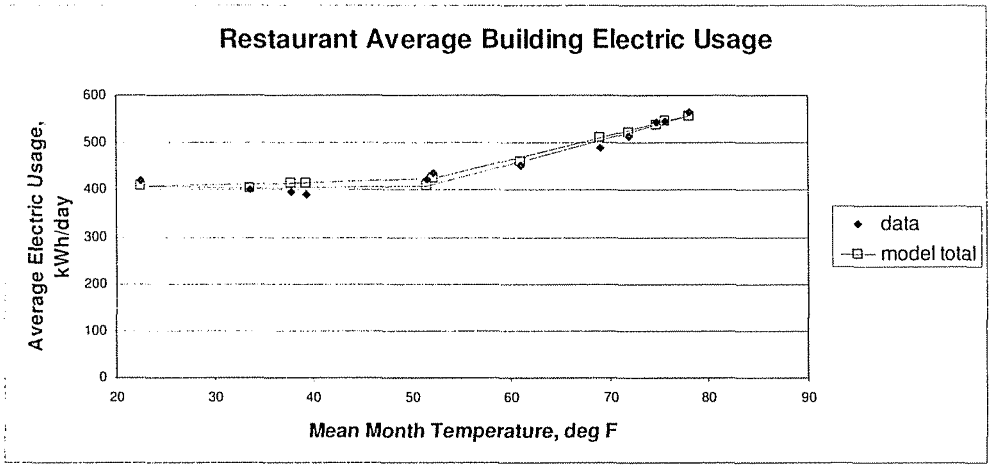


Figure 36. Restaurant Average Electric Energy Use

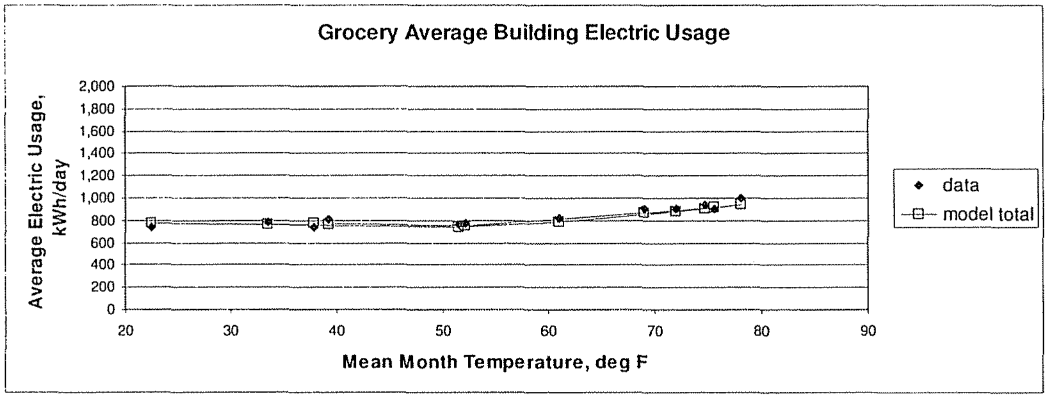


Figure 37. Grocery Average Electric Energy Use

These figures show that, for both electricity and gas, the energy versus temperature relationship will vary from sector to sector, but there is a very clear temperature relationship characterizing each sector. It is this temperature relationship that is the primary empirical basis for the energy model of each sector. There is a similar figure for each of the seventeen energy use sectors, that have been separately modeled. Note that Figure 32 through Figure 34 show energy expressed as therms/day as a convenience in developing a perspective; in the energy model the calculations are done with all energy, gas and electric, expressed in kWh.

In general, these models of average energy versus temperature fit the data quite closely, usually with an R-square in excess of 90 percent. But goodness of fit alone is not a sufficient criterion of truth, and the model will need to be consistent with other empirical information as discussed below.

It is important to note that these models are expressed in terms of average daily temperature rather than heating and cooling degree days as is more commonly done. This is primarily a matter of convenience since the degree day format depends on a base temperature that may vary with building stock. However, there is an important physical distinction between average monthly temperatures and monthly degree days for the mid range average monthly temperatures in the range of 50-65 deg F. At these mid-range temperatures, an average monthly temperature, for example 63 deg F, will have tangible amounts of both heating and cooling degree days that cannot be inferred from the average temperature alone. This distinction is recognized in the modeling process.

Energy Model Structure

For energy modeling purposes, both the electric and gas customers were subdivided into the seventeen segments as described in the Market Assessment section of this report. A simple engineering model of energy versus temperature including terms for appliance and end-use saturation levels and other physical parameters is fitted to the energy sales data for each sector analyzed. The models applied in each of the sectors are all similar and represent six very fundamental end-uses:

- Heating
- Cooling
- Hot Water
- Lighting
- Internal Uses, Plugs, Cooking, Dishwasher
- External Uses, Outdoor Lights, Washer, Dryer

Note that the fundamental end-uses distinguish between internal and external electric and gas energy use. This is for the purpose of estimating measure interactions between the heating and cooling end-uses and the electrical energy use within the conditioned space. Lighting, cooking, and internal uses are assumed to occur within the conditioned envelope.

Model Inputs

Some of these end-uses are dependent on weather variables. The heating and cooling end-uses depend on average monthly temperature; the hot water end-use depends on the average monthly inlet water temperature, and lighting depends slightly on calendar month and day length. The thermal and electrical solar energy benefits depend on the average monthly solar. The other end-uses are assumed constant from month to month. For weather dependent inputs, the models use the inputs shown in Table 80.

Table 80. Weather Inputs to Modeling

End-Use	Inputs
Heating	Monthly average temperatures and long-term average month temperatures
Cooling	Monthly average temperatures and long-term average month temperatures
Hot Water	Monthly long-term average Inlet water temperatures
Lighting	Seasonal lighting usage factors

Beyond the weather inputs are the inputs pertaining to the distribution and operation of the energy using systems. These are the variables that are changed in the process of fitting a model to the data. It is noteworthy that the relatively few systems inputs are sufficient to fit a model so closely to the data, but that lies in statistically favorable nature of fitting to data that averages thousands or hundreds of thousands of sites.

This model is very simple in an attempt to be reasonably transparent and reviewable. It admittedly does not include many well known second order effects, such as variation of heating COP with temperature. However, the simple treatment of energy use in terms of first order effects is sufficient to the principal purposes here, which are: 1) to be able to true-up the model to the current energy use, and 2) to be able to estimate a physically reasonable energy use assuming the conditions of full technical potential.

The model uses performance inputs that are intended to be the key descriptive physical parameters for energy using systems. It is certainly possible to postulate a model using different or more detailed parameters, and such a model (and a variety of others) can be made to fit the data very well. The performance inputs chosen for the model used here were selected because they can directly express significant portions of the energy use that will be subject to changes under the conditions of full technical potential. The parameter set is also intended to be small enough to be manageable, but complete enough to support a true-up to the aggregate energy use data of record.

It should also be noted that the independent physical variable in the energy model is temperature, and that there are many important energy using processes that are not temperature dependent. This temperature dependent model can empirically derive the principle peak driving end-uses, heating and cooling, but it cannot mathematically distinguish from one another the end-uses of non-temperature dependent loads such as cooking, lighting , motors, electronics, hot water etc. Loads of this type are either explicitly estimated as in the case of hot water, or included as part of an aggregate baseload. In a key part of the modeling process, the magnitude and hourly profile of the total baseload can be derived from hourly load data as described below. That empirically derived total baseload is then further separated into the other end-uses using EIA regional or national energy end-use ratios.

Table 81 shows the parameters used to describe the energy use in each analyzed sector.

Table 81. Energy Systems Performance Inputs

DHW saturation	Lights saturation
DHW gal/day	Internal loads kWh/day
Tank loss btu/deghr	Internal penetration
DHW set temp	External Loads
DHW efficiency	External penetration
Space Saturation	Cool saturation
Space efficiency	Cool set temp
Space set temp	Cool slope BTU/deg hr
Space slope btu/deghr	Cool efficiency
Lights kWh/day	Cooling fraction

Ultimately, the sum of the energy models for each of the sectors modeled must add up to the total energy sales of record for the test year, and they must true-up at the monthly level as well. This energy true-up is accomplished by varying the physical parameters until the total monthly energy use from the models matches the sales of record and maintains a good fit of model to data.

Usage Normalization

The energy models express the energy use as a function of temperature, and this allows the energy use to be estimated for different temperatures than prevailed during the test year, which in general will differ from the long term normal year. For planning purposes, usage data is normalized to the average 30-year temperatures for the service area. Figure 38 shows the actual temperatures in the test year and the long term average temperatures.

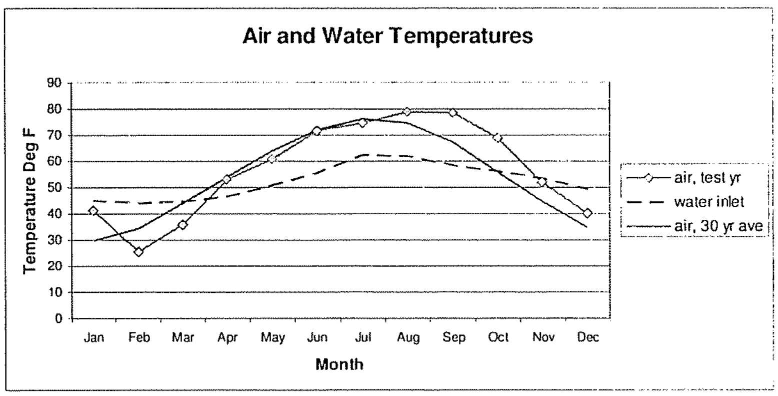


Figure 38. Air and Water Temperatures

In Figure 38, it is evident that the 2007 test year, green, is close to the 30-year average, red, differing in a warmer summer and a much colder February. The water inlet temperature in Figure 38 refers to the ground water temperature which is used in the end-use models for hot water heating energy. In this case, the estimate of the groundwater temperature is assumed the same for the test year.

Separation into End-Uses

For both electricity and gas, the total energy use is partitioned into the six fundamental end-uses by a combination of empirical discovery and engineering calculation, however simple.

The heating and cooling end-uses are empirically derived through the fitting of the model to the energy versus temperature slopes shown in the usage versus temperature graphs, using an empirically derived estimate of baseload.

The hot water end-use is explicitly calculated from water usage, inlet water temperature, and storage loss assumptions and market share information. The fit of the gas data to the model is used to refine the water use assumptions for both the electric and gas models. Likewise the fit of the gas data to the model is used to refine the thermal sensitivity of the building stock for both the electric and gas models.

During weather neutral months such as April and October, these models empirically show the total building baseload with a small amount of heating and cooling. By carefully analyzing the hourly load data for each analyzed sector for these months, an empirically derived minimum load can be identified that describes the baseload absent heating or cooling. This baseload identified by a fitting process described below must be established in order to attain a reasonable fit for the heating and cooling end-uses. In electric utilities this special examination of baseload is necessary in order to properly account for the heating and cooling that occurs in swing months. For gas utilities only heating is present and this examination of the electric baseload is necessary to establish the internal gain of the gas-heated building.

Further Separation of Baseload into End-Uses

With regard to baseload, the models cannot go further and separate that total baseload into its constituent end-uses: hot water, cooking, cloths dryers, and process loads. The further separation of end-uses is done by removing the explicitly calculated hot water end-use and partitioning the remaining baseload on the basis of US regional energy end-use splits. For the residential sector as a whole and for most of the commercial analysis categories, there are published end-use splits on the average energy use for a full range of end-uses. For this analysis, appropriate items from the full range of end-uses are aggregated into the three fundamental baseload end-uses used in this analysis: hot water heat, cooking and internal uses, and external uses.

For the electric models, two end-use ratios are developed from the EIA data: internal usage/lighting and external usage/lighting. These two ratios are then used in the electric models to maintain the appropriate relationships between lighting, internal uses, and external uses.

For the gas models two end-use ratios are developed from the EIA data: internal usage/hot water heat and external usage/hot water heat. These two ratios are then used in the gas models to maintain the appropriate relationships between hot water heating, internal uses, and external uses.

Demand Model

Available Load Data

The demand model applies only to the electric energy model, and it is used here ultimately to estimate time of day demand or load reductions associated with the energy savings. These electric load reductions have a very tangible value in the cost effectiveness considerations. The behavioral time of day information derived from the electric demand model has also been used in the gas model to estimate time of day gas usage even though time of day gas usage plays no role in this analysis.

This load analysis first derives the residential, commercial, and industrial peak load profiles for each hour of the peak day for each month for the analysis period, 2007, as shown in Figure 39 for residential loads in Kentucky. These monthly coincident peak days are the benchmarks to which the demand model is trued up.

This load data was reasonably complete for the residential sector, but the commercial and industrial load data straddled some of the commercial and industrial sectors and was prorated. The residential loads are the largest and most volatile and the available data was sufficient to support the most important portions of the true-up process.

It is important to recognize that the model developed here estimates the average site hourly demand for each month. The average demand from this model is quite different than the peak day loads that will be used for the true-up comparison. They are almost as different as apples and oranges because the peak day load is born of the extreme monthly temperature conditions that drive utility peaks, and also the site demand must be corrected to include applicable transmission and distribution losses. Ultimately, this analysis process will derive the shape of the end-use load activity through a structured comparison and adjustment to the peak day load curves shown in Figure 39.

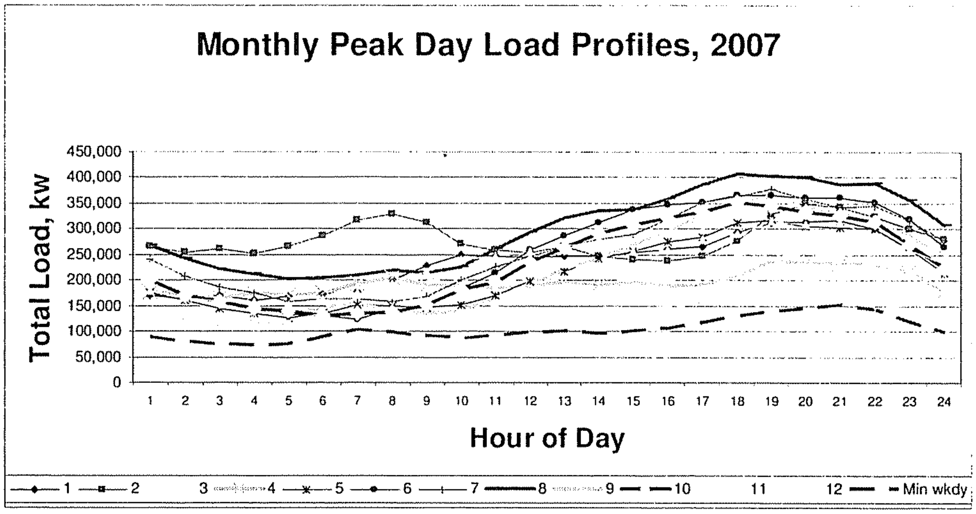


Figure 39. Kentucky Monthly Residential Peak Day Loads

Note in Figure 39 that the peak day loads are only for residential sales, and do not show the full system peak. The true-up to this load data required recognizing that the loads were measured at the distribution tie in and therefore include distribution losses.

Demand Model Overview

The demand model is driven by the energy model. For each end-use and for each month, the energy model has estimated the average daily energy use, kWh/day. The demand model then takes the estimated daily energy use and distributes it among the twenty four hours of the day.

The objective of this demand model is to estimate the average distributed hourly demand for a large number of customers. The concept of distributed demand assumes that thousands of the same device, (stove water heater, computer, etc) will be turning on and off according to use at random times within the hour of interest. The contribution of any one of these devices is the full load power*duty cycle for the hour. For example, if a 1400 watt toaster is on for one-tenth of the hour, the distributed demand is 1400 watts times 0.1 hours, or 140 watts. In essence, the distributed demand is the energy used in the hour.

The distribution from daily energy use to hourly is done by means of "demand distribution functions". The demand distribution function consists of twenty-four hourly demand factors that specify the fraction of the daily energy use that occurs in each hour. The hourly demand factors empirically derived from this analysis and applicable to the residential customers are shown in Figure 40 and Figure 41. These end-use demand factors should not be confused with load curves. For all end-uses, the individual hourly demand factor is much less than 1.0, and it is only used to distribute the daily end-use energy by hours. The hourly end-use load curve results when the hourly end-use demand factor has been multiplied by the associated daily end-use energy to give the portion of the daily end-use energy used in that hour. The aggregate hourly load curve is then the sum of the various hourly end-use load curves for each hour. In the full utility demand model, there is a different set of hourly demand factors for each of the six end-uses for each of the primary sectors, residential, commercial, and industrial.

Residential Hourly Demand Factors

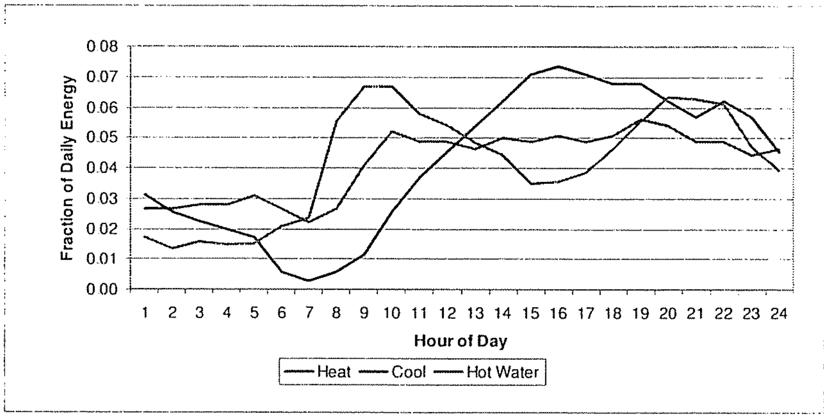


Figure 40. Residential Hourly Demand Factors for Heat Cool, Hot Water

Notice in Figure 40 that the cooling demand factor is greatest at about 4-5 PM when the cooling energy for each hour reaches about 0.074*daily average cooling energy. Similarly, the hourly demand factor for heating appears to be maximum at 7 PM when the hourly demand factor is 0.056 and the hourly heating energy is 0.056*daily average heating energy. Hot water demand is known to be bi-modal occurring in the morning and late evening. In the model there are separate demand factor curves for each month for heating and cooling in the residential and commercial sectors because the distribution of heating and cooling throughout the day varies somewhat from month to month as the temperature of the earth and the structures varies seasonally.

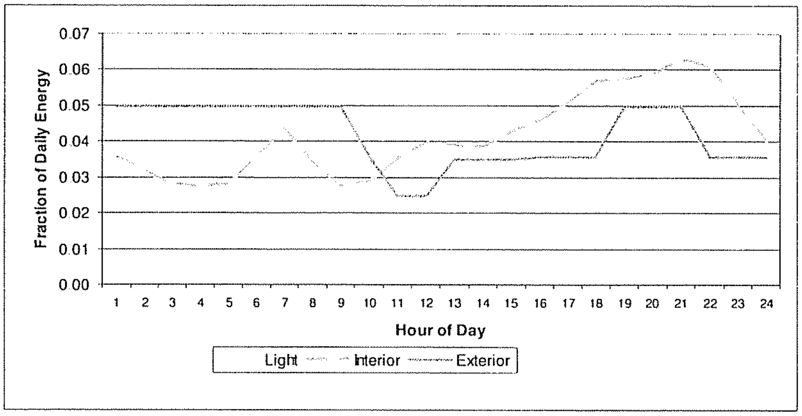


Figure 41. Residential Hourly Demand Factors for Lighting, Interior, and Exterior Loads

Notice in Figure 41 that the interior loads and lighting work toward a daily peak at about 10 PM. The exterior load here consists of washer and dryer activity and some exterior lighting. Washers and dryers are considered here to be external loads because most of the energy is discharged outside as in the case of dryers, or because the load may occur in an attached space such as a basement or wash porch that is not directly part of the conditioned space, as in the case of washers. Note also that the hourly demand factors for lighting and other interior loads are here assumed to be the same.

Commercial Hourly Demand Factors

In principal there are quite a lot of unique demand specifics. But in practice the hourly demand factors for the different commercial sectors are taken to be the same because the load data is not detailed enough to distinguish one commercial load from another. Therefore, there is a set of hourly demand factors for each of the six end-uses, and these are used in all of the commercial analysis categories. The commercial hourly demand factors are shown in Figure 42 and Figure 43.

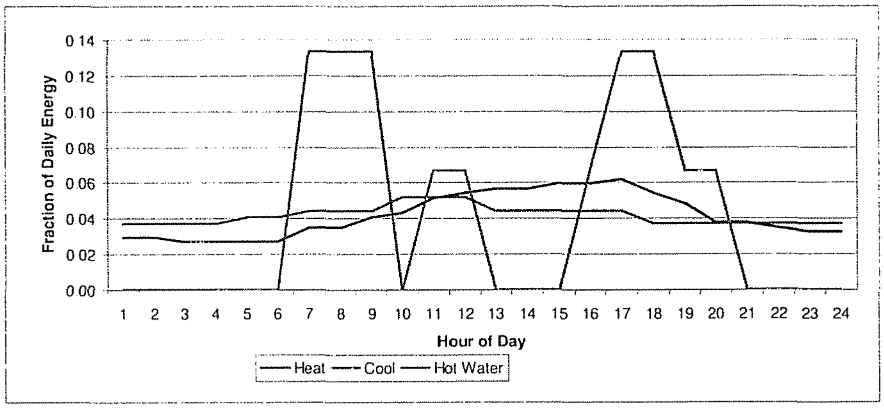


Figure 42. Commercial Hourly Demand Factors for Heating, Cooling, and Hot Water

There is very little electric heating or water heating in the commercial sector, and the demand factors for these end-uses find minimal use. In Figure 42 the demand factors for cooling are by far the most important.

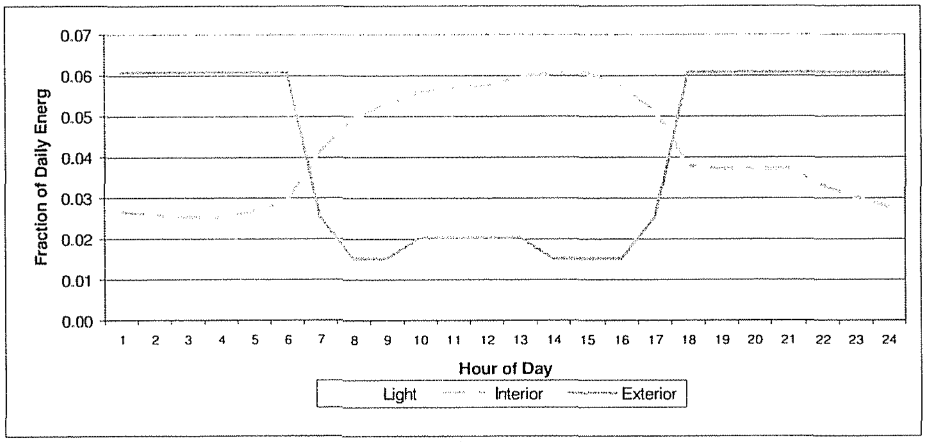


Figure 43. Commercial Hourly Demand Factors for Lighting, Internal and External Loads

In Figure 43, the hourly demand factors for the exterior loads express the fact that these loads are principally exterior lighting which is on at night. The hourly load factors here of principal importance are those for the lighting and interior loads which are taken as the same shape.

Truing the Demand Model

The demand model is ultimately trued against the monthly coincident peak days. And ultimately, the truing process requires a temperature adjustment in the energy model to simulate peak day temperatures instead of average temperatures. The true-up process is done in terms of aggregated site demand, requiring that the comparison load information be de-rated by correcting for applicable transmission and distribution losses.

The first step in the demand true-up is to adjust the non-weather end-uses, lighting, internal loads, external loads, and hot water. The adjustment consists of modifying the hourly demand factors for these end-uses until the modeled sum of the non-weather end-uses is close to that observed from the load study. This comparison is done when heating and cooling are at a minimum. The minimum load, unaffected by heating and cooling, is referred to here as the non weather load, and is empirically drawn from the hourly load data.

This is key empirical information because it establishes the ratio of baseload energy to total annual energy which is an important input to the energy model for establishing an accurate partition of baseload and heating/cooling energy. This ratio for the aggregated residential customers is 0.69, that is 69 percent of residential energy is baseload, not heating /cooling. There is a similar adjustment of demand factors for the residential, commercial, and industrial loads.

Once the hourly demand factors are so adjusted they are then used to represent the non-weather load throughout the year and especially in the heating and cooling seasons. Figure 44 shows a close comparison between the residential demand estimated by the model and the demand from the load study for the sum of the non-weather load.

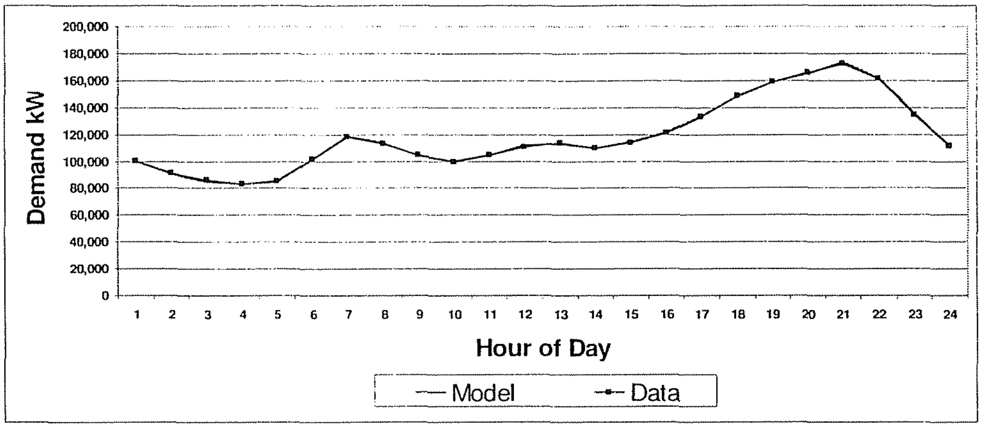


Figure 44. Baseload True-Up – Residential, October

The next step in the true-up is for cooling. In this case the model is compared to the monthly coincident peak cooling days and the hourly load factors for each of the cooling months are adjusted for best fit between the model and load study. It has been found necessary to derive a different load factor curve for each cooling month because the actual dynamics of the cooling vary from month to month. For example cooling in May never carries over into the small hours of the morning as does cooling in July and August.

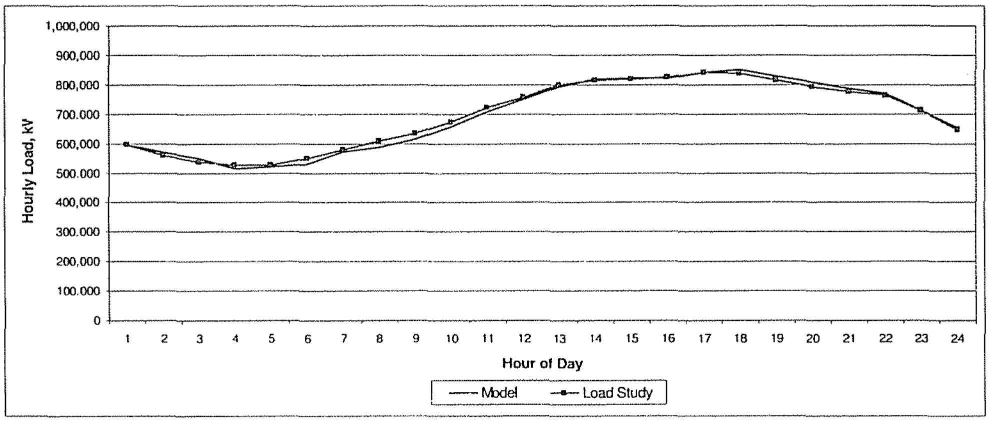


Figure 45. Cooling True-Up All Customers, August Peak

Figure 45 shows a close comparison between the demand estimated by the model and the demand from the load study after this cooling true-up step.

The final demand true-up step is for heating. In this case the model is compared to the monthly coincident peak heating days and a separate heating load factor curve is derived for each month from the best fit between the model and load study.

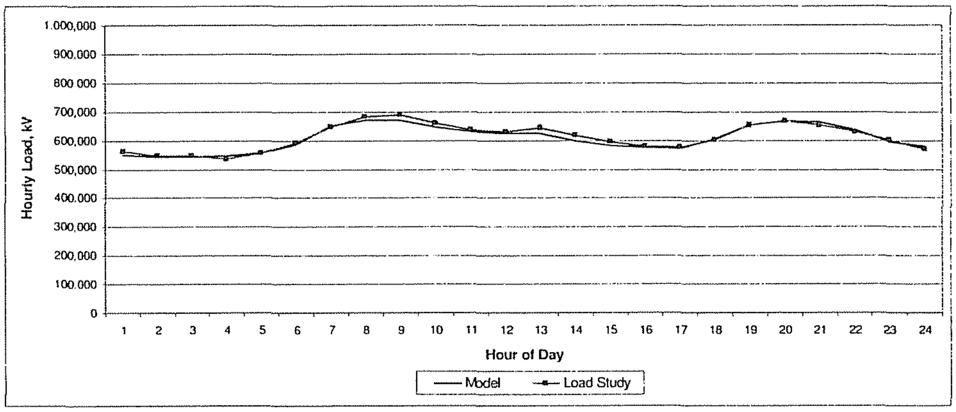


Figure 46. Heating True-Up All Customers, February Peak

Figure 46 shows a close comparison between the demand estimated by the model and the demand from the load study after this heating true-up step. Through these true-up steps, the most significant hourly demand factors are empirically derived, and the demand model can now estimate the average daily or peak demand versus hour for each month.

Estimating the Coincident Peak Day Load

There is a strong temperature relationship between the coincident peak day load versus hour and the average day demand versus hour produced by this model. To estimate the coincident peak load, the energy model is driven by peak monthly temperatures instead of average monthly temperatures.

This model will estimate the change in average hourly demand for each month simulating any group of efficiency measures or all the measures used to express full technical potential. This month by month change in hourly average demand is the hourly demand impact.

Estimating the Technical Potential for Load Savings

The final estimate of technical potential is for the system load impact which is the demand impact increased to account for transmission and distribution losses.

This model will thus estimate the change in average hourly Load for each month corresponding to any group of efficiency measures or all the measures used to express full technical potential.

Estimating the Coincident Peak Day Load and Technical Potential Load Offset

To estimate the coincident peak day load, the energy model is driven by peak monthly temperatures instead of average monthly temperatures to estimate the peak day aggregate demand, then the applicable transmission and distribution losses are applied.

Ultimately this model will be used to estimate the change in average (or peak) hourly load for each month simulating any group of efficiency measures in a particular program or all the efficiency measures used to express full technical potential.

APPENDIX B. COST EFFECTIVENESS METHOLOGY

Cost effectiveness analysis refers to the systematic comparison of program benefits and costs using standardized measures of economic performance. In this report, cost effectiveness is discussed at both the technology level and the program level. The assumptions and approach used to calculate technology and program cost effectiveness are presented in this appendix. Much of the material in this section is taken from the *California Standard Practice Manual: Economic Analysis of Demand Side Management Programs and Projects, October 2001* (SPM 2001),[49] which has broad industry acceptance.

Technology Cost Effectiveness

It is desirable to consider some measure of a technology's cost effectiveness in the preliminary stages of program design. This allows program planners to subjectively tradeoff cost and other attributes of energy efficiency measures (EEM) when considering possible program designs. Cost effectiveness analysis is less precise at the technology screening stage because estimates of energy savings and costs at the measure level are subject to a great deal of variance due to interaction with other measures and actual program implementation. Still, measure cost effectiveness provides a useful metric for consideration along with the many other factors outlined in the Program Plans section of this report.

What is needed at the technology or measure level is a simple measure of cost effectiveness that does not require assumptions of avoided resource cost, rebates, program delivery cost and other program level details. Levelized Cost (LC) provides such a measure by expressing the cost of a measure in annual terms per unit of energy saved. This allows an easy way to compare and rank order the cost effectiveness of measures. The formula used for the LC calculations in this report is presented below:

LC=DCosts / DSavings

$$DCost = \sum_{t=1}^{N} \frac{IC_t + OM_t}{(1+d)^{t-1}} \qquad DSavings = \sum_{t=1}^{n} [(\Delta EN_t) \div (1+d)^{t-1}]$$

where:

LC	=	Levelized cost per unit of the total cost of the resource (dollars per kWh)
IC	=	Incremental cost of the measure or technology
OM	=	Annual operation and maintenance cost
DCost	=	Total discounted costs
DSavings	=	Total discounted load impacts
ΔENit	=	Reduction in net energy use in year t
N	=	Life of measure
d	=	Discount rate

Although not suited for fuel substitution and load building programs, LC provides an easily calculated way of comparing measures. Measure cost, savings, useful life, and discount rate are the only assumptions required for calculating LC. Real levelized cost refers to LC expressed in constant dollars (i.e., without inflation).

The formula used in Microsoft Excel to approximate LC is as follows:

LC = (OM-PMT(d,N,IC))/EN

where PMT is the payment function in Excel and the other terms are defined as above.

[49] Prepared by the California Public Utilities Commission (CPUC) and the California Energy Commission (CEC). All formulas and discussion are based on the SPM 2001. Formulas have been modified to remove peak savings, multiple costing periods, and otherwise adapted to be relevant for use with this project.

For example, using a real discount rate of 6.6 percent, a measure life of 18, an incremental cost of $200, and annual savings of 100 kWh with no annual O&M, results in real levelized costs of $0.1931.[50]

Program Cost Effectiveness

The discussion of program cost effectiveness is meant to provide a general overview of the standard tests consistent with the calculations in the SPM (2001). Actual cost effectiveness analysis was run using DSMore software from Integral Analytics. DSMore returns benefit-cost rations and other results for the perspectives represented in the standard tests. Contact Integral Analytics (http://www.integralanalytics.com/) for information and documentation regarding DSMore software.

Many additional assumptions over and above those required for calculating EEM cost effectiveness must be made when calculating program cost effectiveness. Cost effectiveness of energy efficiency programs involves describing the economic impact of the program from the perspective of various groups. This analysis required detailed program budgets and design elements such as rebate levels and other program features. Perspectives, also called tests, presented in this report are listed in the table below along with the primary benefits and costs used to compute cost effectiveness.

Table 82. Benefits and Costs by Cost Effectiveness Test

Cost Effectiveness Test	Benefits	Costs
Utility Cost (also known as Administrator Cost)	Avoided energy costs (net)	Program expenses paid by utility including incentives
Participant	Reduced energy bill Incentive payments Tax credits Decreased O&M costs	EEM installation Increased O&M costs
Ratepayer Impact	Avoided energy costs (net)	Lost revenue (net) Program expenses
Total Resource Cost (TRC)	Avoided energy costs (net) Tax credits Decreased O&M costs	EEM installation Program expenses Increased O&M costs
Societal (variant of TRC)	TRC benefits plus non-energy benefits less tax credits	TRC costs plus non-energy costs

Reference to "net" indicates that the load used to measure the benefit or cost is net of free-riders. EEM installation includes all incremental costs to acquire and install an EEM. Program expenses include all costs related to delivery of the program and include staffing and overhead, advertising, incentive payments, administration fees, and monitoring and evaluation expenses.

Various measures of the economic impact are available for each perspective. The two primary measures we will use in this report are listed below:

- Net Present Value
- Benefit-Cost Ratio

In addition to the economic criteria listed above, other criteria may be unique to a given perspective. For example, simple payback of investment is often cited as an important criterion from the participant perspective. Each of the perspectives is discussed in detail below including the assumptions and formulas required to calculate the measures of economic impact. Each of the cost effectiveness tests are discussed below.

[50] The values used in the example are not meant to represent actual assumptions. See the Energy Efficiency Measure Assessment section for specific assumptions, including the discount rate.

Utility Cost Test (also known as Administrator Cost Test)

The Utility Cost Test measures the cost of acquired energy savings considering only the costs paid by the utility. Benefits are similar to the TRC Test but costs are more narrowly defined. Its primary purpose is for assessing resource acquisition from the perspective of the utility. In this sense, it is similar to the Participant Test in that the test provides a measure of cost effectiveness from a single perspective that does not include all costs.

Benefits included in the calculation are the avoided cost of energy supply. Net loads are used for the purpose of calculating avoided cost of energy benefits. The costs include all program expenses including incentive payments for EEM installation.

Participant Test

This test compares the reduction in energy bills resulting from the program with any costs that might have been incurred by participants. Other benefits included in this test include incentive payments and tax credits. When calculating benefits, gross energy savings are used rather than reducing savings for free-riders.

The main value of the Participant Test is that it provides insight into how the program might be received by energy consumers. The incentive level required to achieve some minimum level of cost effectiveness, for example, can be useful in program design efforts. It should be noted, however, that consumer decision making is far more complex than reflected by the Participant Test. For this reason, the test should be used as one consideration of likely program acceptance and not an absolute indicator.

Ratepayer Impact Measure Test

The Ratepayer Impact Measure (RIM) Test measures the impacts to customer bills and rates due to changes in utility revenues and operating costs caused by the program. Rates will go down if the change in revenues from the program is greater than the change in utility costs. Conversely, rates will go up if revenues collected after program implementation is less than the total costs incurred by the utility for implementing the program. This test indicates the direction and relative magnitude of the expected change in customer rate levels.

The benefits calculated in the RIM Test are the savings from avoided supply costs. These avoided costs include the reduction in commodity and distribution costs over the life of the program.

The costs for this test are the lost revenues from reduced sales and all program costs incurred by the utility, including incentives paid to the participant. The program costs include initial and annual costs, such as the cost of equipment (either total cost for a new installation or net cost if done as a replacement), operation and maintenance, installation, program administration, and customer dropout and removal of equipment (less salvage value). The decreases in supply costs and lost revenues should be calculated using net savings.

Total Resource Cost Test

The Total Resource Cost Test measures the net costs of a demand-side management program as a resource option based on the total costs of the program, including both the participants' and the utility's costs. Of all the tests, the TRC is the broadest measure of program cost effectiveness from the standpoint of energy acquisition. This makes the TRC Test useful for comparing supply and demand side resources.

The primary benefit in the TRC Test is the avoided cost of energy. Loads used in the avoided cost calculation are net of free-riders. Tax credits and reductions in annual O&M costs, if applicable, are also treated as a program benefit (or a reduction in costs). Costs used in the TRC calculations include all EEM installation costs, program related costs and any increased O&M costs no matter who pays them. Incentive payments are viewed as transfers between participants and ratepayers and are excluded from the TRC Test.

Societal Test

The Societal Test is the broadest of all of the perspectives and is considered a variant of the TRC. The primary difference between the two tests is that the Societal includes non-energy benefits and costs that are not part of the TRC. Another difference is the treatment of tax credits. While tax credits are counted as a benefit in the TRC test, they are considered a transfer payment between members of society and, hence, excluded from the Societal test.

APPENDIX C. RESIDENTIAL ELECTRIC EEM DOCUMENTATION

The purpose of this appendix is to provide documentation of the assumptions used to screen the residential Energy Efficiency Measures (EEM) identified for consideration in this report. Our assumptions are based on references cited throughout this section as well as the direct experience of our team with technologies in the field and actual DSM program evaluations. While not all of the field and DSM program experience can be cited in published works, published references are used to establish a reasonable range of assumptions. The point estimate used within that range is based on our professional opinion. The mapping of EEM to residential DSM programs is shown in the table below.

Table 83. Mapping of Electric EEM to Residential DSM Programs

Program #			**10**	**11**	**12**	**13**	**14**	**15**
End-Uses	**EEM Description**	**EEM Ref #**	**Res Whole House**	**Res Rebates**	**Res Appl Recycle**	**Res New Constr**	**Res Solar Siting**	**Res Low/Mod Income Weath**
Customer-Sited Generation	Solar Photovoltaic	RE-1						
Residential Space Conditioning	Resist to SEER 13 Heat Pump	RE-2						
	Resist to SEER 13 Heat Pump	RE-3						
	SEER 8 to SEER 13 CAC	RE-4						
	SEER 8 to SEER 13 CAC	RE-5						
	Refrig Charge/Duct Tune-Up	RE-6	0.005					0.08
	Refrig Charge/Duct Tune-Up	RE-7						
	SEER 13 to SEER 15 Heat Pump	RE-8						
	SEER 13 to SEER 15 Heat Pump	RE-9						
	SEER 13 to SEER 15 CAC	RE-10						
	SEER 13 to SEER 15 CAC	RE-11						
	Efficient Window AC	RE-12						
	Cool Roofs	RE-13						
	EE Windows	RE-14						
	Programmable Thermostats	RE-15	0.006					0.08
	Ceiling Insulation (R6 to R30)	RE-16	0.004					0.06
	Ceiling Insulation (R6 to R30)	RE-17						
	House Sealing using Blower Door	RE-18	0.005					0.08
	House Sealing using Blower Door	RE-19						
	Ground Source Heat Pump	RE-20						
	Wall Insulation (R3 to R11)	RE-21	0.004					0.05
	Wall Insulation (R3 to R11)	RE-22						
	Solar Siting/Passive Design	RE-23					0.1	
	Energy Star Manufactured Home	RE-24						
	Energy Star Construction	RE-25				0.1		
Load Management	Eliminate Old Refrigerators	RE-26			1.0			
	Set Back HVAC	RE-27						
Residential Appliances	Energy Star Clothes Washers	RE-28		0.02				
	Energy Star Dish Washers	RE-29						
	Energy Star Refrigerators	RE-30						
	Pool Pumps	RE-31						
Residential Lighting	Compact Fluorescent	RE-32	1.000	0.98				1.00
	Daylighting Design	RE-33						
	Occupancy Controlled Outdoor	RE-34						
Water Heating	Tank/Pipe Wrap and Water Temp Setpoint	RE-35	0.005					0.06
	Low Flow Fixtures	RE-36	0.400					0.24
	Heat Pump Water Heaters	RE-37						
	Tankless Water Heaters	RE-38						
	Solar Water Heaters	RE-39						
	Efficient Plumbing	RE-40						
Emerging Technologies	Combined Heat/Power, Micro CHP	RE-41						
	Residential LED Lighting	RE-42						

Solar Photovoltaic (RE-1)

This technology consists of a roof or ground mounted solar electric array with a full sun output of 2 kW. Such an array has an area of 200-300 square feet. Electricity from the array is converted to AC by an inverter and the power is immediately used on-site with excess fed into the grid. This technology needs full solar exposure and shadows can significantly restrict output. This technology is fully mature, but local builders and building officials are still unfamiliar with it.

Measure Applicability

No local studies have estimated the percentage of housing stock with suitable exposure; for this analysis it is assumed that 35 percent of residential buildings are suitable sites.

Incremental Cost

A system installation usually requires an electrical inspection to verify appropriate wire sizing, disconnects, and grounding. Costs are quite site specific, with most of the costs associated with solar electric panels. In the current supply-constrained 2007 market, costs are $5.00-$7.00/watt peak for the solar cells alone. Installation and balance of system can be expected to add $3.00/watt. For the 2.5 kW array considered here, the total cost will be taken as $20,000[51] or $8.00/watt.

Average Annual Expected Savings

The electrical output for this technology is directly related to the solar intensity. Monitoring studies in this region of the US have shown that 1 kW of installed capacity can yield in excess of 1,100 kWh/yr. For the 2.5 kW array considered here, the annual savings for the DEK service territories is estimated to be 3,300 kWh/yr.

Expected Useful Life

This equipment demonstrated long trouble free service in severe applications such as remote communications, navigation lighting, and road signage. The long-term output of the cells is assumed to decrease with time, but the rate of decrease for current technology is not known. The crystalline and semi-crystalline forms of the technology have already demonstrated degradation of less than 20 percent in 20 years. But earlier thin film forms of the technology have showed shorter lifetimes. The lifetime of new thin film technologies is expected to be of the order of 25 years but it is not known. For these purposes, the expected useful life (EUL) is taken as 25 years.[52]

Resistance Electric Furnace to SEER 13 Heat Pump (RE-2, RE-3)

This measure is designed to save heating energy and cooling energy by replacing an existing central air conditioner/electric furnace by a modern heat pump. Most of the savings proceed from replacing resistance heating by a heat pump at more than twice the thermal efficiency. This measure has significant savings, but also significant costs because it involves replacing the whole heating and cooling system, not including ducts.

Measure Applicability

This measure is applicable to residential customers that heat with an electric (resistance) furnace.

Incremental Cost

This measure requires replacing the whole heating/cooling system not including ducts. The cost of such a replacement is quite site specific, but can be expected to be a first cost of $10,000 or more. There are two contexts for such a replacement: 1) early retirement in order to achieve large heating savings, and 2) where the central AC needs to be replaced anyway, the most prudent thing would be to replace with a heat pump because of its significant heating savings. The upgrade to a heat pump can be expected to cost about $5,500-$6,500 more than the AC replacement alone. For this analysis we assume $10,000 as the incremental cost.

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[51] The C&RD Database lists the incremental capital cost as $6,000 per kW, which would be comparable for an installed 2-3 kW system.

[52] The Conservation and Renewables Database lists a measure life of 20 years for standard technology solar PV.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the size of the residence. Based on DEK specific simulations we find savings in the range of 6,000 kWh/yr for a single family residence and 4,800 kWh/yr in the multifamily application.

Expected Useful Life

The physical life of this measure is about 20 years, but for the purposes of this analysis we will take 10 years as the useful life of this measure to reflect the application of this measure in an early retirement context.

SEER 8 to SEER 13 Central Air Conditioner (RE-4, RE-5)

This measure is designed to save cooling energy by preemptively replacing an inefficient old central air conditioner by a modern efficient one. This measure is applied to a gas-heated residence.

Measure Applicability

This measure is applicable to existing residential customers with central air conditioners.

Incremental Cost

This measure physically involves replacing the entire air conditioning unit but not the ducts. The cost would be $3,500 at a minimum.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the size of the residence. Based on DEK specific simulations we find average cooling of 1,400 kWh for single family residence and 1,200 for a multifamily residence.

Expected Useful Life

The physical life of this measure is about 20 years, but for the purposes of this analysis we will take 10 years as the useful life of this measure to reflect the application of this measure in an early retirement context.

Refrigeration Charge and Duct Tune-Up (RE-6, RE-7)

This measure is designed to save electric energy by increasing the operating efficiency of the refrigerant system by insuring that it is properly charged. It is common in residential cooling or heat pump systems to have an incorrect amount of refrigerant charge because these systems are usually charged on-site during installation. This measure also leads to savings from finding and sealing duct leaks which increases the system distribution efficiency.[53]

Measure Applicability

This measure is applicable to most of the residential stock. Notably even new installations can benefit from this measure.

Incremental Cost

The incremental cost of this measure pays for a visit by a specially trained HVAC technician. For this analysis this cost is taken as $350.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the size of the residence. Based on DEK specific simulations we find savings of 1,200 kWh/yr for a heat pump (electric-heated residence) and 300 kWh/yr on a gas-heated residence with AC only.

[53] While these measures are theoretically handled by different trades, in practice they are implemented by a specially trained HVAC technician. This combination is efficient from a cooling system perspective and also typically cost effective.

Expected Useful Life

This is essentially a tune-up measure and is considered here to have a useful life of 13 years.

Upgrade Heat Pump Efficiency from SEER 13 to SEER 15 (RE-8, RE-9)

This measure is designed to encourage the installation of more efficient heat pump equipment. Rather than installing a heat pump with a SEER of 13, the homeowner is encouraged to install a more efficient heat pump with a SEER of 15.

Measure Applicability

This measure is applicable to new or replacement heat pump installations. In recent years the rate of heat pump installations has increased. For this study, we will take this measure as applicable to 25 percent of the new electrically heated residential stock.

Incremental Cost

The incremental cost of $1,000 used in this analysis is very similar to the value of $1,062 given in DEER for this measure.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the size of the residence. Based on DEK specific simulations, we will take savings of 800 kWh/yr for single family sites and 700 kWh/yr for multifamily.

Expected Useful Life

The DEER uses an expected useful life of 15 years; however, for other heat pump measures the DEER uses 18 years which is similar to the 20 years used in this analysis.

Upgrade Central Air Conditioner from SEER 13 to SEER 15 (RE-10, RE-11)

This measure is designed to encourage the installation of more efficient central air conditioning equipment. Rather than installing a central air conditioner with a SEER of 13 the homeowner is encouraged to install a more efficient central air conditioner which has a SEER of 15.

Measure Applicability

This measure is applicable to new or replacement central air conditioner installations. In this study we assume that the replacements in the next ten years are applicable to about 20 percent of residential customers and that efficient central air conditioners are applicable to about 60 percent of new residential construction.

Incremental Cost

The incremental cost of $800 used in this analysis is comparable to DEER's $970 for this measure.

Average Annual Expected Savings

The average annual expected savings from this measure depend significantly on the size of the residence and the thermal integrity of the shell. Based on simulations of savings using DEK specific information, we will use 400 kWh/yr for single family residences and 350 kWh/yr for multifamily.

Expected Useful Life

The DEER lists an expected useful life of 18 years, which is similar to the 20 years used in this analysis.

Efficient Window AC (RE-12)

An efficient window or room air conditioner saves energy by slightly more efficient operation, and often by use of an internal timer to restrict operation to occupied periods. An equally important consideration in the selection of a room air conditioner is to avoid over-sizing the unit, in which case additional spaces may be unintentionally cooled.

Measure Applicability

This measure is applicable in the residential and small commercial sector where central air conditioning is not used.

Incremental Cost

The incremental cost of the more efficient unit will vary with the size of the unit. For this study we will take the average incremental cost to be $150.

Average Annual Expected Savings

The energy savings from this measure will vary considerably with the size of the unit and the particular application. In this study we assume an application where the room air conditioner is used as the primary means of cooling a space that is used throughout the cooling season. In the DEK service area the average cooling energy for a small residence is about 2,000 kWh/yr. A properly sized efficient window air conditioner can be expected to save 10 percent of this cooling energy or 200 kWh/yr.

Expected Useful Life

In this study we assume the expected useful life to be 13 years.

Cool Roofs (RE-13)

This measure is intended to save cooling energy by reducing the temperature in the attic through attic ventilation and through the use or optically reflective roofs. Recent improvements in roofing have led to roofing in attractive architectural colors that can reflect solar gain almost as well as white or reflective roofs. This reflection of solar gain along with adequate attic ventilation can lower attic temperatures significantly thereby reducing heat gain to the home and also improving the distribution efficiency of any ductwork or distribution fans that are located in the attic space. Attic cooling lowers the thermal gain to the residence below, and it also improves the distribution efficiency of any attic duct work. At least half the cooling savings attributable to this measure proceed from the improved distribution efficiency, and therefore this measure is intended for application where there are attic ducts or distribution fans. This is essentially a site-built measure including the installation of roof vents and the installation of several hundred square feet of reflective material to the inside of the roof rafters.

Measure Applicability

This measure is considered applicable to all new roofing applications. It is especially effective for central air conditioning applications with distribution ductwork in the attic.

Incremental Cost

The incremental cost for this measure is taken to be the incremental cost of the Energy Star Qualified roofing which is reported to be currently $0.20/square foot, but which is expected eventually to be zero. All other roofing costs and required are ventilation assumed to be unchanged by this measure. For this study we will take the incremental cost to be an average of $0.10/square foot over the five-year planning period. For the average residence, $158.

Average Annual Expected Savings

The savings from this measure proceed from lowered cooling energy by reducing ceiling heat gain. According to DOE, ceiling heat gain accounts for 15-25 percent of the residential cooling load. The radiant barrier has been observed to reduce ceiling heat gain by 16-42 percent. The cool attic strategy also improves cooling distribution efficiency if the cooling ducts or fan unit is in the attic. For this study we will take the average annual savings to be 560 kWh/yr. Savings larger than these will be found in the extreme cases with poorly insulated air conditioning distribution located in the attic spaces.

Expected Useful Life

This measure consists of reasonably durable material installed in an attic. The useful life is assumed to be 12 years.

EE Windows (RE-14)

This measure involves increasing window insulation from a U value of 1.1 BTU/sqft/hr deg F to a U value of 0.45. This measure saves both heating and cooling energy. In the case of gas-heated residences, the electric savings are for cooling only and are much less than the heating savings. So the cost effective application of this measure is to electric heated residences only.

Measure Applicability

This measure is considered applicable to a portion of the residential customers that heat with electricity.

Incremental Cost

We assume a cost of $25/square foot of window area. DEER uses a value of $28/square foot of window area, and C&RD uses a value of $16/square foot. For the average residence considered here with 100 square feet of window upgraded, the cost would be $2,500.

Average Annual Expected Savings

Savings from this measure are strongly dependent on the efficiency of the electric heat source and the square feet of windows replaced. The stock to which this measure is applied consists primarily of electric furnaces. Therefore the simulations assume the displacement of resistance heat. Based on simulations from DEK specific data, the annual savings will be taken as 1,334 kWh/yr for electric heated residences.

Expected Useful Life

This analysis uses an effective useful life of 25 years, the DEER uses 20 years.

Programmable Thermostats (RE-15)

Programmable thermostats save energy by lowering the average daily temperature of the inside of a building. Most of the energy savings is heating energy because that heating thermal load is much larger than the cooling load, but some energy savings in cooling energy will also be realized. Programmable thermostats are commonly sold for self-installation. But the installation has the following four important issues that need to be considered.

- Some thermostats are line voltage thermostats, and there is some shock hazard to the unaware.
- The first step in programming a thermostat is the system specification. Here the installer tells the thermostat what kind of a system it is controlling. The system type is selected from a list of about 30-50 different system types. This is a non-obvious choice.
- For system controls there are standard colored wires, but often hookups use non-standard wire. For the mechanically inclined this process is okay but for others it is daunting.
- Then, after it is installed successfully there is the issue of controlling it to get satisfactory results. Sometimes this needs a guiding hand.

The US DOE is planning to phase out programmable thermostats from the Energy Star program. The planned phase out is apparently related to recent evaluation studies that found insufficient savings to warrant the Energy Star designation. Proper installation and operation appear to be at the root of the lack of energy savings. We have chosen to leave these devices in our mix of EEMs and feel that with proper installation and setup the technology is sound. Our incremental cost includes the cost of installation over-and-above the off-the-shelf cost of programmable thermostats. Even with proper installation, there is an ongoing need for a design that is more user-friendly and easier to operate.

Measure Applicability

For this analysis one-half the electric heating situations are taken as good candidates for a new programmable thermostat.

Incremental Cost

Programmable thermostats cost retail in the range of $50-$100. A utility program may be able to purchase in bulk. It may be necessary to have a range of options which include at least line voltage and low voltage. For these purposes we take $70 as the melded cost of the thermostats.[54] It is assumed here that thermostats will be installed as part of a site visit in a broader program with $50 allocated for installation labor. In total, the installed cost will be taken as $120 per thermostat.[55] Some sites with line voltage thermostats may require more than one thermostat.

Average Annual Expected Savings

Thermostat savings are best realized when the set back interval is of the order of 8 hours or longer, and the amount of savings depends on the number of degrees the thermostat is set back. The rule of thumb is 1 percent heating savings for every degree the thermostat is set back for at least 8 hours. For this estimate a five degree thermostat set back is assumed, leading to heating savings in the average electric-heated home of 500 kWh/yr.

Expected Useful Life

In principal, these thermostats can last for in excess of 20 years, but the backup batteries have a finite life and the programming can be changed or confused. In this case, the effective lifetime will be taken as 10 years.[56]

Ceiling Insulation R6-R30 (RE-16, RE-17)

This measure involves increasing ceiling insulation from R6 to the R30 level. This measure saves both heating and cooling energy. In the case of gas-heated residences, the electric savings are for cooling only and are much less than the heating savings. So the cost effective application of this measure is to electric heated residences only.

Measure Applicability

This measure is considered applicable to a portion the residential customers that heat with electricity.

Incremental Cost

We assume a cost of $0.75/square foot of wall area and 1,000 square feet of wall space for a total cost of $750. DEER uses a value of $0.757/square foot of wall area. This job includes the cost of providing for adequate attic venting.

Average Annual Expected Savings

Savings from this measure are strongly dependent on the efficiency of the electric heat source. The stock to which this measure is applied consists primarily of electric furnaces. Therefore the simulations assume the displacement of resistance heat. Based on simulations from DEK specific data, the annual savings is assumed to be 1,800 kWh/yr for electric-heated residences and 300 kWh/yr for gas-heated residences.

Expected Useful Life

This analysis uses an effective useful life of 25 years. The DEER uses 20 years.

House Sealing Using Blower Door (RE-18, RE-19)

This measure applies to residential electric-heated properties. It involves using blower door technology to pressurize the home. Once the house is pressurized, the air leaks are identified and sealed with appropriate materials to decrease heat loss from the building envelope.

Measure Applicability

This measure is applicable to most of the residential stock.

[54] DEER lists the incremental cost as $56.30 and the installed cost as $73.33 per unit.
[55] DEER lists the incremental cost as $73.33 of which $56.37 is equipment cost and $16.96 is labor. This analysis uses $50 for the labor cost which accounts for some of the difference in the costs.
[56] DEER list the EUL as 12 years.

Incremental Cost

The incremental cost of sending a technician to a home and performing a Blower Door test and sealing the identified leaks is assumed here to be $500. The C&RD database lists $0.16 per 0.1 air change per square foot which translates to $500 per house with 0.2 air changes per square foot.

Average Annual Expected Savings

An electric-heated home will achieve 1,000 kWh in annual savings according to our modeling, and a gas home will save 200 kWh annually.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used especially for the gaskets for the windows and doors. DEER lists 13 years and C&RD lists 20. We feel 20 years is too optimistic and have chosen a conservative value of 10 years.

Ground Source Heat Pump (RE-20)

The ground source heat pump uses the ground as the energy source/sink in a heat pump cycle. This allows the ground source heat pump to operate with about twice the efficiency of a conventional air source heat pump. Because the ground is at a much more stable temperature than the air, resistance backup heat can be avoided. And it also simplifies the operation of the heat pump because defrost is not an issue.

Measure Applicability

This measure is applicable to new electrically heated residential construction and to existing DEK heat pump customers that have suitable sites. The total pool of candidate customers will be taken as 10 percent of residential customers, and we will assume that only 30 percent of these have suitable sites. Overall measure applicability is taken as 3 percent of the residential sector.

Incremental Cost

The ground source heat pump is essentially a standard heat pump except that the outdoor unit is replaced by a trenched pipe as a ground heat exchanger a few hundred feet long. The burying of the pipe is highly site specific. In this study the incremental cost will be taken as the cost of the ground heat exchanger only and the remainder of the system will be considered similar in cost to a conventional heat pump. Although the site costs are highly site specific we will take $7,000 as the incremental cost.

Average Annual Expected Savings

This measure saves on both heating and cooling relative to the base case which is a standard heat pump. Using DEK specific weather conditions, the savings relative to a heat pump are 5,382 kWh/yr.

Expected Useful Life

This measure is considered to have a useful life of 25 years.

Wall Insulation (RE-21, RE-22)

This measure involves increasing wall insulation from R3 and adding insulation to the R11 level. This measure saves both heating and cooling energy. In the case of gas-heated residences, the electric savings are for cooling only and are much less than the heating savings. Therefore the cost effective application of this measure is for electric-heated residences only.

Measure Applicability

This measure is considered applicable to a portion of the residential customers that heat with electricity.

Incremental Cost

This measure contemplates adding wall insulation to a 2x4 stud wall where there is none. We assume a cost of $1.25 per square foot of wall area. DEER uses a value of $1.32/square foot of wall area. The DEER values are based on going from an R0 to an R13; the equipment costs are given as $0.15 for equipment and $1.17 for labor resulting in the overall cost of $1.32. Our estimate is more conservative; the total installed cost for the home modeled is $1,400.

Average Annual Expected Savings

Savings from this measure are strongly dependent on the efficiency of the electric heat source. The stock to which this measure is applied consists primarily of electric furnaces. Therefore the simulations assume the displacement of resistance heat. Based on simulations from DEK specific data, the annual savings will be taken as 2,100 kWh/yr for electric-heated residences and 400 kWh/yr for gas-heated residences.

Expected Useful Life

This analysis uses an effective useful life of 25 years, the DEER uses 20 years.

Solar Siting Passive Design (RE-23)

This measure applies to new construction that can be designed and sited to capture solar gain through windows in order to displace space heating. In a new building, the cost of proper orientation and of solar design is small to non-existent if the orientation and design decisions are made before construction starts.

It is well known that if a new residence is tightly designed thermally, and oriented so that about 75-100 feet of glazing is near south facing, then its heating requirements can be reduced by about 30 percent. Much larger heating reductions have been demonstrated, but then the designs need to become more extreme with respect to south glass and with respect to protection from unwanted summer sun. This measure is intended to represent a "minimum graceful design", yielding the maximum savings with the least departure from a normal residential appearance. Physically, this measure consists of reorienting and redistributing glazing that would have been used anyway, and in using proper overhang to provide some summer shade. In passive solar design, the south glazing should usually have a high solar heat gain factor. This is an unusual glazing specification for current residential applications because most residential glazing is intended to reject solar gain for cooling purposes. Passive solar design also includes increasing the thermal mass, such as floor tile, adjacent to south facing glazing. The thermal mass of the existing sheetrock and furniture, etc, in a building also plays a role in thermal storage. Building codes generally try to discourage excessive glazing and solar gain, but they allow for exceptions where thermal design has been explicitly considered and documented.

Measure Applicability

This measure is applicable to new electrically heated construction with suitable solar exposure. In this study the measure will be applied to the 40 percent of new residential construction that will potentially use heat pumps, and of these 50 percent are assumed to have a suitable solar exposure. The overall applicability of this measure is taken as 20 percent of the residential sector.

Incremental Cost

This measure is considered a minimum passive design, and it essentially consists of a redistribution or reorientation of materials that would have been used anyway. The cost of this measure is taken as the cost for the information or advice necessary to "tune the design to the sun". The cost for this measure is taken here as $500 per building. Not very much needs to be done to capture these minimal passive solar heating savings, especially if it is done at the outset. The context for this incremental cost is assumed to be to a developer for some extra consideration in overall site planning.

In many reported cases of solar design, the cost is many times this and the building is usually much more expensive as well, but these costs are the common costs associated with personalized new construction, not particularly related to solar design.

Average Annual Expected Savings

The annual savings for this measure are considered only for electric-heated residences, though this measure is well suited to gas-heated sites as well. For this analysis, the savings are taken at approximately one-third of the electric energy used in typical heat pump-heated residences in DEK territory, 1,500 kWh/yr. These savings have been referenced to a heat pump as base case because it is unlikely that a new electric-heated residence would be built with electric resistance heat. However, relative to the rare case of a new resistance heated building, the savings would be much larger, about 3,000 kWh/yr.

Expected Useful Life

This measure will last the life of the building which can easily be 50 years or more. For this analysis the measure life is taken as the maximum life used in this analysis, 50 years.

Energy Star Manufactured Home (RE-24)

An Energy Star qualified new manufactured home is required to be 15 percent more efficient than a similar home that meets the 2004 International Energy Conservation Code, IECC. The mechanism for estimating Energy Star compliance is through the use of a HERS (Home Energy Rating System) score calculated from a brief estimate of annual energy use. The savings proceed principally from heating, cooling, lighting and water heating savings.

Measure Applicability

This measure is applicable to all new manufactured home construction. But for the purposes of this study the measure is restricted to new residential manufactured all electric construction.

Incremental Cost

The incremental cost for this measure consists of the increased cost of building components such as insulation, windows, lighting and appliances. This cost is site specific, but for the DEK service areas, the cost is taken as $2,600 which includes the cost of upgrading from resistance heating to heat pump heating. Generally the incremental measure cost for manufactured housing is less than noted for Energy Star site-built construction because it is derived from the manufacturing environment where the costs increment is at the original equipment manufacturer level. But in this case, the total incremental cost is greater than for Energy Star site-built because it includes the cost of an upgrade from resistance space heat to heat pump space heat.

Average Annual Expected Savings

The savings for this measure are specifically modeled based on an assumed upgrade from resistance heat to a heat pump because this building stock is predominantly sited where there is no gas service and electric energy is the primary source of space heating. Savings estimates for an Energy Star manufactured home including an upgrade to a heat pump are in the range of 4,500 to 6,000 kWh/yr. For this study, savings is assumed to be 5,000 kWh/yr.

Expected Useful Life

This measure has a useful life comparable to that of manufactured new construction and, for this study, is taken as 25 years.

Energy Star Construction (RE-25)

An Energy Star qualified new home is required to be 15 percent more efficient than a similar home that meets the 2004 International Energy Conservation Code, IECC. The mechanism for estimating Energy Star compliance is through the use of a Home Energy Rating System (HERS) score calculated from a brief estimate of annual energy use. The savings proceed principally from heating, cooling, lighting and water heating savings.

Measure Applicability

This measure is applicable to all new residential construction.

Incremental Cost

The incremental cost for this measure consists of the increased cost of building components such as insulation, windows, lighting and appliances. This cost is site specific, and there is some choice in selecting the package of measures. An initial cost effectiveness screening of this measure showed that the maximum cost effective cost is $3,000. This requires composing a package of only the most cost effective measures. Therefore this package includes the strongly cost effective measures of flow efficient showerheads and inspection of heat pump that are not commonly part of the Energy Star package (but should be). Based on the choice of the most cost effective measures, the cost used for this study is $3,000.

Average Annual Expected Savings

The savings from this measure are variable depending on the particular site treatment chosen, but estimates for this region are in the range of 3,000 to 4,500 kWh/yr. For this study, the savings is assumed to be 4,223 kWh/yr.

Expected Useful Life

This measure has a useful life comparable to that of new construction and, for this study, is taken as 50 years.

Package Detail New Residential Energy Star Plus

Program planning for an assumed package of Energy Star Plus treatments has used a model of a prototypical all electric participant. Using this model the full package of measures is examined to estimate the energy savings for the individual measures in the package.

The Energy Star new residential achieves energy savings principally through improvements to the building shell and reductions in interior appliance energy use.

As perspective consider an all electric single-story residence of about 1,900 square feet. This residence is heated and cooled by a SEER 13 heat pump which is the current standard.

The Energy Star package consists of three common sense building steps: First the thermal conductivity of the envelope is reduced by small coordinated improvements to the building shell, better glazing, selective increase to insulation levels, and by attention to air sealing and framing details. Then, the performance of the heating cooling systems is improved by duct insulation and testing. Finally, the internal energy use is reduced by using efficient lighting, appliances, and showerheads. None of these improvements is extreme, but taken together these small improvements can result in an approximate 20 percent reduction in annual energy use. This is the core of the Energy Star Plus savings.

Another 5 percent reduction in energy use is possible if the residence is oriented to use solar gain to offset winter heating. And a further 5-plus percent reduction in energy use can be achieved through the use of a SEER 15 rated heat pump. Another 10 percent savings is possible through the use of solar hot water heating, and another 10 percent reduction is possible by applying a modest solar PV array. These further reductions are all beyond the core Energy Star package, and only the first, the solar siting, is cost effective currently. The further enhancements from a more efficient heat pump and other solar applications are quite reliable and effective, but beyond the current cost effectiveness horizon.

In practice each building is unique, and slightly different packages of improvements to shell and appliances are selected based on specific circumstances, but the savings will break down approximately as in Table 84. In this example the annual energy use for an all electric residence has been reduced from about 19,400 kWh/yr to about 15,600 kWh/yr, about a 20 percent reduction by core Energy Star measures alone and another 5 percent through solar siting.

Table 84. Energy Star Plus Residential Savings Example

Efficiency Category	Annual Savings (kWh/yr)	How Achieved
Shell Improvements	1,600	20% reduction in thermal loss, shell and infiltration
Hot Water improvements	700	2.0 gpm showerhead
Duct Improvements	585	Insulation and leak testing
Efficient Appliances	945	Efficient light, washer, dishwasher, an average 20% reduction in internal loads
Solar Siting	1,050	Enhanced south glazing

The Energy Star Plus package consists of the efficiency measures noted in Table 85.

Table 85. Energy Star Plus Savings Measures

Shell insulation
Duct insulation and leak testing
Three energy star appliance including efficient lighting and an energy star clothes washer
A 2.0 gpm rated shower head(s) and faucet aerators
Whole house air sealing details

In the case of a residence with gas heat and hot water heating, the efficient appliance and cooling savings are the same with the shell and hot water improvements resulting in gas savings.

Eliminate Old Refrigerators (RE-26)

This measure involves creating electric energy savings by collecting and dismantling underused older refrigerators. Ideally only operating or operable refrigerators would be eligible for removal.

Measure Applicability

This measure is applicable to residential customers with more than one refrigerator. Of these only 50 percent are assumed to have an interest in removing a refrigerator.

Incremental Cost

The incremental cost of this measure will be taken as the cost of acquiring and recycling the unit. For this study that cost will be assumed to be $165.

Average Annual Expected Savings

Savings from this measure are dependent on the age of the refrigerator and the location where it is used. Savings estimates for this measure also need to include the zero effects of including operable but not operating refrigerators. Reported savings estimates vary widely from an astonishing 1,900 kWh/yr for C&RD to 413 kWh/yr observed in the Connecticut Appliance Turn-In program. For this program, the savings will be assumed to take the middle road, 1,150 kWh/yr.

Expected Useful Life

The useful life of this measure is the length of time the removed refrigerator would have continued to be used absent the program. There is no reliable research on this and for this program the useful life will be taken as 5 years.

HVAC Set Back (RE-27)

This measure is a voluntary set back of both the heating and cooling set points by 3 deg F. This is the average set back for the whole day not just the night set back. This type of set back could lead to slight behavior changes such as different clothing when lounging around or sedentary. The heating and cooling savings from such a simple change can be large, of the order of 2,000 kWh/yr. The savings will be greatest in houses heated by resistance heat, but they will be significant in heat pump houses as well.

Measure Applicability

This measure is applicable throughout the residential sector. But the greatest savings will be where the measure is applied to electric-heated homes.

Incremental Cost

This measure has essentially no cost. As a token cost, we assume $5.

Average Annual Expected Savings

The savings for this measure depend strongly on the amount of set back and the heating type. Based on DEK specific weather, low savings would be about 500 kWh/yr for a mild set back to a good heat pump, and high savings would be about 2,000 kWh/yr for a five degree set back to an electric furnace. For this study, we will assume 1,000 kWh/yr as the savings.

Expected Useful Life

This is a temporary measure; the set back strategy may only work for one or two seasons. Accordingly, the useful life is taken as 2 years.

Energy Star Clothes Washers (RE-28)

This measure involves obtaining an Energy Star clothes washer which is a more efficient clothes washer than a standard clothes washer. This measure has significant water and detergent savings in addition to the electric savings. According to the Environmental Protection Agency, horizontal-axis washing machines can use about 40 percent less water and 50 percent less energy than conventional washers, cause less wear and tear on clothes, and can accommodate large items that won't fit in a top-loader. A typical top-loading washer uses about 40 gallons of water per full load. In contrast, a full-size horizontal axis clothes washer uses between 20 and 25 gallons.

Measure Applicability

This measure applies only to customers who do not currently have a high efficiency clothes washer.

Incremental Cost

The incremental cost for clothes washers vary significantly depending on the features. The value used in this analysis is $400; DEER lists a value of $565.82 while C&RD lists $245.26. Due to the wide variety of costs for Energy Star clothes washers, $400 is a good mid-range value for the purposes of this analysis.

Average Annual Expected Savings

The kWh savings from a clothes washer depend to a significant extent on the source of the water heating and dryer's energy source. If the water heater is a gas water heater the kWh savings are insignificant but if the source is an electric water heater the savings can be substantial. Savings also depend on whether the clothes washer has a built-in heat source which some do have. DEER lists 199 kWh and C&RD lists a range from 54 to 509 kWh depending on the model chosen. Savings is assumed to be 400 kWh because the program will be limited to customers with electric water heat and electric dryers.

Expected Useful Life

The expected useful life used in the analysis is 18 years; however, both DEER and C&RD list 14 years.

Energy Star Dishwashers (RE-29)

This measure is defined as the purchase of a new Energy Star dishwasher. By definition Energy Star dishwashers are more efficient than a comparable standard new dishwasher. This measure applies strictly to the improved level of performance, Energy Star versus Standard. An Energy Star qualified dishwasher uses at least 41 percent less energy than the federal minimum standard for energy consumption, which was set in 1994. In this measure the dishwasher being replaced has an EF of 0.46 and is being replaced by a 0.58 EF dishwasher, and has an average usage of 215 washes.

Measure Applicability

For this study, we will take the applicability of these units to be 60 percent of the existing residential sector and all of the new residential sector. In fact, Energy Star dishwashers are a required item in Energy Star new construction.

Incremental Cost

The incremental retail cost for dishwashers varies depending on the features present in the model chosen. The value used in this analysis is $50, DEER uses a value of $133 and the C&RD lists $6 as the incremental cost, this analysis has incorporated an intermediate value.

Average Annual Expected Savings

The savings from this measure are primarily due to decreased hot water usage. The C&RD lists 119 kWh/yr and DEER lists 72 kWh/yr. This analysis uses 75 kWh/year.

Expected Useful Life

The expected useful life used in the analysis is 10 years. However DEER lists 13 years and C&RD lists 9 years.

Energy Star Refrigerators (RE-30)

This measure is defined as the purchase of a new Energy Star refrigerator which is slightly more efficient than a comparable standard new refrigerator. This measure applies strictly to the improved level of performance, Energy Star versus Standard.

It should be noted here that this measure definition will under-count the real savings because the current stock of new refrigerators is much more efficient than the older stock more than 10 years old, and significant savings will result when an old refrigerator is replaced by a new one, even a non-Energy Star one. These savings are a natural part of the background residential usage changes in response to the current standard market and are considered savings that would have happened absent any particular measure. For this particular measure, the measure savings used in program cost effectiveness are only for the Energy Star increment, but the technical potential estimate inherently captures the full replacement savings.

Measure Applicability

This measure is assumed to apply to 90 percent of the residential sector, essentially all of the residential sector for which an Energy Star model is available.

Incremental Cost

The incremental retail cost for refrigerators, vary significantly depending on the features present in the model chosen. The value used in this analysis is $200, DEER uses a value of $135.75 and the C&RD does not list a value due to the variability in the possible costs. Due to the wide variety of costs for Energy Star refrigerator, $200 is a good mid-range value for the purposes of this analysis.

Average Annual Expected Savings

Savings vary by type of refrigerator/freezer configuration and by size. The range is 80-100 kWh/yr. Savings for this analysis will be taken as 100 kWh/yr. These savings are relative to the energy use of a new but non-Energy Star refrigerator. In fact a significant portion of the new refrigerator purchases are to replace old refrigerators, and even a non-Energy Star refrigerator will save about 300 kWh/yr relative to the old refrigerator it replaces.

Expected Useful Life

The expected useful life used in the analysis is 18 years and both DEER and C&RD also use 18 years.

Pool Pumps (RE-31)

This measure saves energy by employing a 2 speed pool pump motor. At the lower speed the pump is still doing a good job of filtering, but it uses about 75 percent less energy. This is typical of the savings from slowing down pumps or fans. While these savings are significant it should be noted that the slower pumping rate can adversely affect pool accessories such as a solar pool heater.

Measure Applicability

This measure is applicable to in-ground pools only and is expected to be applicable in less than 5 percent of the residential sector.

Incremental Cost

The incremental cost for this measure consists of the increased cost of a 2 speed pump ($180) and the increased labor to install it. In a retrofit case the labor is of the order of $300, but in a new installation there is no increased labor. For this study we will take $180 as the incremental cost.

Average Annual Expected Savings

The savings from this measure depend on the degree of flow reduction and the number of hours of reduced flow. A typical power reduction to be expected is 500 watts, and in a full season the duration of reduced flow is 1,000-1,500 hours. For this study we will take the annual savings as 648 kWh/yr.

Expected Useful Life

The expected useful life of this measure is assumed to be 10 years.

Compact Fluorescent (RE-32)

This measure consists of substituting compact fluorescent lighting for incandescent lighting. At each socket treated, such a substitution will reduce lighting power by about 80 percent. A full application of this measure consists of converting all the most used lighting fixtures from incandescent to compact fluorescent. Housing audits taken over the last 10 years show that an average house has about 25-45 lighting sockets with an aggregate connected incandescent lighting load of about 2,700 watts. But of this load, only about 10-15 sockets are used for about an average of 5 hours/day, the rest are infrequently used. So it is the ten-fifteen most frequently used sockets that are the primary targets for a whole house lighting conversion. A satisfactory conversion of these most important sockets may require recourse to a variety of bulb styles, powers, and even adapters (such as lamp harps) to facilitate accommodating the CFL to these 12 best locations.

Measure Applicability

This measure is applicable in 100 percent of the residential sector, but to allow for some existing use of compact fluorescents this study will use 95 percent as the applicability factor for this measure.

Incremental Cost

The cost for this technology continues to decrease, and there are various sales or promotions where the cost may be as low as $1.50/bulb. But for the purpose of this program planning we will assume $2.00/average bulb to cover the costs of larger or outdoor-rated bulbs, and another $5.00/bulb for installation or adaptation labor. Full application of this measure, assuming treatment of the 12 most important fixtures in a residence is taken here as costing $24. The C&RD lists $5.73 for the incremental cost and the DEER lists $8.03 for the incremental installed cost, but these sources are out of date.

Average Annual Expected Savings

It is assumed here that the 15 treated sockets reduce the connected load by 750 watts, and that the average on time for these sockets is 3 hours/day, leading to energy savings of 2.25 kWh/day. This equates to 55 kWh/yr/bulb. The savings listed in DEER range from 20 to 59 kWh/yr/bulb, depending on which CFL is replacing which incandescent bulb. For these purposes, the various applications of this measure are assumed to save 55 kWh/yr per bulb, and a total of 660 kWh/yr for replacing 12 bulbs at a single site.

Expected Useful Life

Compact fluorescent bulbs have a lifetime of 10,000 hours, about 7-10 times as long as the incandescent bulbs they replace. Assuming the average compact fluorescent bulb is used 2,000 hours/yr (5-plus hours/day) gives a conservative estimate of useful life of 5 years. The useful life for the energy savings from this measure will cease in the time frame of 2015-2020 as the new federal lighting standards diffuse into the market.

Daylighting Design (RE-33)

This measure is intended to reduce the lighting energy in new residential construction. Daylight has the highest lumens/watt of any light source. A little bit of daylight can go a long way toward lighting a space without introducing as much heat as other light sources. Physically daylighting takes the form of small skylights or clearstories, and high small windows coordinated with light colored interior wall and ceiling surfaces. In practice, good daylighting design involves the avoidance of glare and over lighting as well.

Measure Applicability

This measure is applicable to 100 percent of the residential new construction.

Incremental Cost

This measure is being applied in new residential construction where lighting is a natural consequence of window placement. In this context daylighting design is considered in the distribution of the windows and skylights to make light distribution more uniform and to avoid glare. These design impacts will have minimal cost if they are brought in at the planning stage. For this study the incremental cost is assumed to be $500.

Average Annual Expected Savings

Properly designed daylighting can save almost all the lighting energy used during daylight hours, but not all residences are used during the day. The EIA Residential End Use Survey finds 1,500 to 1,800 kWh/yr for lighting in the average residence. The savings will wary widely from site-to-site, but for this study we will take 40 percent lighting savings, 750 kWh/yr.

Expected Useful Life

Daylighting features integrated into a house during construction will last the life of the house. For these purposes the lifetime will be taken as 25 years.

Occupancy Controlled Outdoor Lighting (RE-34)

This measure is designed to save lighting energy by turning on selected outdoor lighting only when occupancy or movement is detected. This measure has a strong security context, but it also is very convenient at entrances, garages, etc, where light switches can only be accessed from inside and lighting is left on for long periods of time in order to provide light for the short time it is actually needed.

Measure Applicability

This measure is applicable through out the existing residential stock.

Incremental Cost

This measure physically involves replacing two frequently used outdoor lights by occupancy controlled lights. It is assumed that a single occupancy controller and light costs $50, and that a full installation consisting of two lights would cost $100.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the type of light that is being controlled. The preferred type of light to control is a compact fluorescent spot light because of its lower power use and long life. But in colder outdoor applications these lights can take from 30 seconds to a minute to come to full brightness which may be unacceptable in some cases. For this analysis, we will assume that 150 watts is being controlled, and that a savings of 5 hours/day is achieved. Annual savings for these purposes is taken as 250 kWh/yr.

Expected Useful Life

For the purposes of this analysis, we will use 10 years as the useful life of this measure.

Tank Wrap, Pipe Wrap, and Water Temperature Setpoint (RE-35)

This technology consists of adding insulation around the water heater, checking and resetting the tank thermostat, and replacing leaky shower flow diverters. These measures are principally tank-centric, and can be self-installed or by a site visit if the package is part of a broader program. Resetting the tank thermostat is also a safety issue because it can reduce scaling and burns due to too high a set temperature.

Measure Applicability

The applicability for measures of this type is discussed under Low Flow Fixtures. In DEK service territory, electric water heat accounts for about 40 percent of water heating, 2/3 of that 40 percent would be eligible for this measure because in some cases the tank cannot be accessed to install a blanket or one has already been installed. As a result the applicability is taken as 25 percent.

Incremental Cost

The cost of this treatment breaks down as $30 for materials and $20 for installation labor. For these purposes the measure cost is taken as $50 because these measures will typically be part of a larger program.

Average Annual Expected Savings

The dwelling savings for these measures is discussed under Low Flow Fixtures. Based on prior experience and evaluation work on other programs it is estimated that the savings would be about 1 kWh/day.[57] For this program we use the conservative value of 200 kWh/yr savings.

Expected Useful Life

The lifetime of these measures is potentially quite long. For practical purposes the lifetime will be considered limited by the expected remaining lifetime of the hot water tank, 6 years.[58]

Low Flow Fixtures (RE-36)

This technology consists of a new showerhead rated at 2.0 gallons/minute (gpm) at 80 pounds/square inch (psi) and a swivel aerator for the kitchen faucet and fixed aerators for the lavatory faucets. The current US standard for showerheads is 2.5 gpm. Measurements of the existing shower flows in building stock show a range of 2.75 to 3.75 gpm with frequent individual cases in excess of 5 gpm. Evaluations have shown that programs that replace with 2.0 gpm heads have greater savings than programs that replace with the standard 2.5 gpm shower heads. Program shower heads should be 2.0 gpm at 80 psi and with a lifetime scaling and clogging warranty. It is important also to be cautious about the use of "pressure compensating" showerheads. These are more prone to clogging and can lead to unintentional increases in flow rate in low pressure situations such as well water systems or older systems with occluded piping. Customer acceptability is an important component in a showerhead program. Customers will remove new low flow showerheads if the quality of the showering experience declines with the new showerhead. Therefore it is important to research and test the showerhead chosen for the program carefully. In addition, the old showerhead must be removed from the premises to decrease the likelihood of having it reinstalled.

Measure Applicability

This measure is applicable to the 40 percent of the residential sector that heat water with electricity.

Incremental Cost

Low flow fixture costs vary widely, and depend on whether the fixtures are purchased retail or in bulk. The costs for a bulk purchase for a showerhead and three aerators also have a wide range, about $8.00-$15.00/set. The most important feature of these fixtures is the long-term acceptability and durability because these factors have a direct impact on the lifetime savings. With a long enough lifetime, this is such a cost effective measure that all prices in the range are quite cost effective. Because the cost of the showerhead varies significantly and quality is so important for this program, it is essential to test, choose and pay the price for a high quality showerhead. This measure is so cost effective that even with a more expensive showerhead the program will still remain cost effective and a quality showerhead will ensure measure persistence. The installed cost will be taken as $25/residence.[59]

Average Annual Expected Savings

Field monitoring studies can demonstrate the flow savings, but ultimately the overall savings will be a combination of flow savings and the duration of use. The flow of the showerhead used has a significant impact on savings. This program is designed around a 2.0 gpm showerhead as compared to a 2.5 gpm showerhead. Therefore the savings

[57] Khawaja S. PhD, and Reichmuth, H. PE., 1997. Impact Evaluation of PacifiCorp's Ebcons Multifamily Program. Pacificorp.

[58] DEER says 15 years for pipe insulation, 9 years for faucet aerators, and 15 years for an efficient water heater, so 6 years is conservative. The C&RD lists 10 years for a water heater with a minimum warranty of 10 years.

[59] The DEER Database lists measure costs as $22.946 per unit and $37.946 installed cost.

will be more than the 120–133 kWh per unit listed in DEER. In addition the climate is different and the inlet water temperature is lower so the savings in this DEK program will be greater. Several studies have measured final savings in terms of electric input to the tank, but usually these studies have included savings from comprehensive treatments including other measures including tank and pipe insulation, kitchen and bath lavatory aerators, tank thermostat set back, and leaky diverter replacement. Savings can vary from program to program depending strongly on the choice of showerhead. Savings can also diminish with "takeback" in the event that the new showering experience is longer than the original. Actual savings observed in the comprehensive cases include these takeback effects, and are in the range of 650 to 950 kWh/yr. The savings from a showerhead and aerator change are taken as 500 kWh/yr.

Expected Useful Life

The lifetime of this equipment is the key to its cost effectiveness. If an adequate, even pleasant, shower can be provided through lifetime warranted equipment, then the practical lifetime of the equipment is the length of time until the equipment is replaced in the course of renovation. For these purposes, lifetime is taken as 10 years.[60] Normally showerheads will last longer but with renovations and changes in ownership a 10-year expected useful life is a good planning number.

Heat Pump Water Heaters (RE-37)

Water heating is one of the largest energy uses in the home. In the case of electrically heated water, the annual water heating energy is about 4,800 kWh/yr. The heat pump water heater is essentially a small heat pump drawing heat from the air by cooling and de-humidifying it and injecting this heat into a storage tank. Physically, this measure consists of a small, self-contained heat pump and a water storage tank and associated pumps and controls.

Measure Applicability

This measure is applicable to the 40 percent of the residential sector with electric water heat. Of these, 50 percent are assumed to have a suitable location for the unit. Overall measure applicability is assumed to be 20 percent of the residential sector.

Incremental Cost

The incremental cost of this measure consists of the cost of the heat pump water heater, water storage tank and installation plumbing and general construction labor. The siting of such a unit is important; it should never be sited in an attic and freezing situations should also be avoided. Therefore, some special site adaptation and plumbing may be necessary. For this study we will take $2,500 as the cost; others report lower costs but we do not think these take adequate account of special site costs.

Average Annual Expected Savings

For this study it is assumed that the heat pump water heater will perform with a coefficient of performance of 2, leading to annual savings of 2,000 kWh/yr.

Expected Useful Life

The useful life of this measure is assumed to be that of a similar appliance, a window air conditioner, 18 years.

Tankless Water Heaters (RE-38)

Water heating is one of the largest energy uses in the home. In the case of electrically heated water, the annual water heating energy is about 4,800 kWh/yr. This measure saves energy by eliminating the standby energy losses attributable to a hot water storage tank. However these relatively small energy savings are at the cost of a significant demand increase. In the case of gas water heating, this type of measure has greater energy savings and no troublesome demand savings, and the measure makes sense. In the context of a switch from an electric tank to an electric tankless heater, this measure makes no sense.

[60] DEER Database, 2005

Measure Applicability

This measure is applicable in the residential sector only where space is a premium.

Incremental Cost

The incremental installed cost for this measure is $1,500.

Average Annual Expected Savings

The expected savings are 400 kWh per year. But it should be recognized that this type of appliance has a negative demand impact.

Expected Useful Life

This measure's expected useful life is 18 years.

Solar Water Heaters (RE-39)

Water heating is one of the largest energy uses in the home. In the case of electrically heated water, the annual water heating energy is about 4,800 kWh/yr. Countless demonstration cases have shown that solar energy can supply all or a portion of this heating. The portion of the water heating load assumed by a solar water heater depends on the size of the solar water heater in relation to the size of the load. Field experience has shown that the best combination of system size to load favors the more moderately sized systems that can fully meet the summer water heat load, but that only meet about 40-50 percent of the non-summer load. In physical terms, this is a system consisting of about 40-65 square feet of solar collector and an additional 80 gallon heated water storage tank and appropriate pumps and controls.

Measure Applicability

This measure is intended to apply to the 40 percent of residential customers with electrically heated hot water. Of these electric hot water customers, only 50 percent are assumed to have an adequate solar exposure and an adequate roof mounting site. Overall measure applicability is assumed to be 20 percent of the residential sector.

Incremental Cost

The installation of a solar water heating system involves a mix of building skills including plumbing, electrical, roofing and general carpentry. In the general market, a turn-key installation for one of these systems is in the range of $5,000 to $7,000. For this study we will take the cost to be $6,000.

Average Annual Expected Savings

The savings from solar water heaters depend on site specifics, principally solar radiation, air temperature, incoming water temperature, and hot water usage rate. Considering these dependencies for the DEK service area, leads to average annual savings for an appropriately sized system of 2,600 kWh/yr.

Expected Useful Life

Solar water heating systems are essentially plumbing fixtures that are certified products (SRCC) and are often inspected by local building officials. A well designed system will have a lifetime in excess of 25 years, even though the system will take some intermediate maintenance such as inspecting the pump and fluid level. This study will take 25 years as the useful life.

Efficient Plumbing (RE-40)

This measure saves hot water heating energy by leaving less hot water in the pipes to cool during periods of non-use. Conspicuously, the primary motive for this measure is the amenity benefit of limiting the waiting time for usable hot water at the tap or showerhead; waiting times can be reduced from a significant fraction of a minute to only a few seconds. Physically this measure involves the use of smaller diameter continuous PEX water pipes with no elbows or Tees and the use of carefully sized pipe manifolds. While this measure is tested and viable it involves the use of small diameter piping in a context that is not familiar to the plumbing trade or to building officials. It is therefore considered an emerging technology and will not be included in program recommendations.

Measure Applicability

This measure is applicable to 100 percent of the residential new construction.

Incremental Cost

In large scale use, this measure offers the possibility of actually lowering the cost of hot water plumbing because smaller diameter less expensive pipe is used. But specialized manifolds and system planning are required. Therefore for this study an incremental cost of $500 is assumed.

Average Annual Expected Savings

The savings from this measure have not been widely measured but savings of 10 percent of the hot water end-use are reasonable. For this analysis, savings is assumed to be 500 kWh/yr.

Expected Useful Life

This is a very long-lived measure and an expected useful life of 25 years can be assumed.

Micro Combined Heat and Power (RE-41)

This measure is a form of site generation. There are two general classes of combined heat and power. The first class is applied to large steady thermal loads, usually at an industrial scale. This first class has a high load factor and is very rare in a residential context. The second class of combined heat and power has a low load factor, typical of the highly seasonal heating load in the residential sector. This second class, referred to here as "micro CHP", is considered here as a residential measure. In this context it is intended to apply to existing residential space heat and water heat loads. Electricity generated by CHP applied to an existing gas thermal load has a unique efficiency opportunity in terms of fuel use and in terms of carbon offset because the fuel use associated with the generated electricity is only the marginal increase in gas use. The CHP resource is strongly favored from the perspective of carbon calculations, and it also has significant benefit as summer capacity, and as local backup power. Notably, this resource is based on ultra clean and quiet combustion in sterling cycle engines or fuel cells, and it can potentially be readily sited anywhere in the service territory and used to balance distribution. System sizes range from about 1 kW to 8kW electrical output. For this estimate of technical potential an electrical output of 4 kW is assumed.

Measure Applicability

This measure is applicable to residences with gas space and water heat.

Incremental Cost

This measure is not currently a mature market item and costs reflect the demonstration nature of the resource. For these purposes we will take the cost as $2,500/kW, $10,000 for the installation assumed here.

Average Annual Expected Savings

The savings from this measure have not been widely measured but based on the available space and water heating load an electrical output of 5,000 kWh/yr is assumed. A greater annual output could easily be achieved, but only by generation with no useful thermal load which would be much less fuel efficient.

Expected Useful Life

This measure is assumed to have an expected useful life of 20 years.

Residential LED Lighting (RE-42)

LED lighting applications use much less energy than incandescent or metal halide lighting applications. At the present the color of "white" LED light is somewhat blue tinted and not always suitable for general interior applications. But this color is often suitable for specialty applications such as back lighting of flat panel displays, and outdoor applications. It is probable that LED lighting will find its place ultimately in many applications. The application considered here is an LED outdoor light, often referred to as a "cobra light" which is used to illuminate parking lots and outdoor areas.

Measure Applicability

This measure is still evolving but will likely be applicable to a large percentage of the residential sector.

Incremental Cost

The incremental cost for an outdoor LED light of this type is taken here to be $500, and is expected to decrease as the market matures. A significant and favorable cost impact for this measure is its long life, leading to maintenance savings in cases where the light is difficult to access.

Average Annual Expected Savings

Measure savings proceed from the replacement of a 250 watt light by a 19 watt LED assembly. The annual savings for a light used all night and all year are taken here as 1,000 kWh/yr.

Expected Useful Life

The expected useful life for this measure is 20 years.

Sources

DEER: 2004-05 Database for Energy Efficient Resources (DEER) Version 2.01 October 26, 2005 developed by the California Public Utility Commission and the California Energy Commission.

C&RD: Northwest Power and Conservation Council's Conservation Resource Comments Database, which is continually updated as new information becomes available.

APPENDIX D. NON-RESIDENTIAL ELECTRIC EEM DOCUMENTATION

The purpose of this appendix is to provide documentation of the assumptions used to screen the Commercial Energy Efficiency Measures identified for consideration in this report. Our assumptions are based on references cited throughout this section as well as the direct experience of our team with technologies in the field and actual DSM program evaluations. While not all of the field and DSM program experience can be cited in published works, published references are used to establish a reasonable range of assumptions. The point estimate used within that range is based on our professional opinion. The mapping of EEM to non-residential DSM programs is shown in the table below.

Table 86. Mapping of Electric EEM to Non-Residential DSM Programs

Program #			**5**	**6**	**7**	**8**	**9**
End-Uses	**EEM Description**	**EEM Ref #**	**C&I Rebates**	**C&I Peak Retro-Com Lite**	**C&I HVAC Opt**	**C&I Audit**	**C&I New Constr**
Customer-Sited Generation	Solar Photovoltaic	CE-1					
C&I Space Conditioning	Small HVAC Optimization and Repair	CE-2			1.0		
	Commissioning - New	CE-3					
	Re/Retro-Commissioning Lite	CE-4		1.0			
	Low-E Windows 1500 ft2 New	CE-5					
	Low-E Windows 1500 ft2 Replace	CE-6					
	Premium New HVAC Equipment	CE-7					
	Large HVAC Optimization and Repair	CE-8					
Design (new)	Integrated Building Design (new)	CE-9					1.0
	Efficient Package Refrigeration (new)	CE-10	0.02				
Motors and Drives	Electrically Commutated Motors	CE-11	0.03				
	Premium Motors	CE-12	0.03				
	Variable Speed Drives, Controls and Motor Applications Tune-Up	CE-13					
Power Distribution	Energy Star Transformers (new)	CE-14	0.01				
	Efficient AC/DC Power	CE-15					
Data Processing	Network Computer Power Management	CE-16					
Lighting	New Efficient Lighting Equipment	CE-17	0.10				
	Retrofit Efficient Lighting Equipment	CE-18	0.75				
	LED Exit Signs	CE-19	0.25				
	LED Traffic Lights (10)	CE-20	0.03				
	Perimeter Daylighting	CE-21					
Water Heating	Low Flow Fixtures	CE-22					
	Solar Water Heaters	CE-23					
	Heat Pump Water Heaters	CE-24					
Cooking and Laundry	Energy Star Hot Food Holding Cabinet	CE-25					
	Energy Star Electric Steam Cooker	CE-26					
	Pre-Rinse Spray Wash	CE-27					
	Restaurant Commissioning Audit	CE-28				0.48	
Refrigeration	Grocery Refrigeration Tune-Up and Improvements	CE-29				0.12	
	Refrigeration Casework Improvements	CE-30				0.12	
Other	VendingMiser®	CE-31					
	LED Outdoor Lighting	CE-32	0.20				

Solar Photovoltaic (CE-1)

This technology consists of a roof or ground mounted solar electric array with a full sun output of 40 kW. Such an array has an area of 4,000-6,000 square feet. Electricity from the array is converted to AC by an inverter and the power is immediately used on-site with excess fed into the grid. This technology needs full solar exposure and shadows can significantly restrict output. In the commercial context, this technology can be an architectural enhancement.

Measure Applicability

This measure is applicable wherever there is sufficient space and solar exposure. For this study we assume applicability to 25 percent of large buildings.

Incremental Cost

A system installation usually requires an electrical inspection to verify appropriate wire sizing, disconnects, and grounding. Costs are quite site-specific, with most of the costs associated with the solar electric panels. In the current supply constrained 2007 market, costs are $5.00-$7.00/watt peak for the solar cells alone. Installation and balance of system can be expected to add $3.00/watt. For the 11 kW array considered here, the total cost will be taken as $90,000[61], or $8.25/watt.

Average Annual Expected Savings

The electrical output for this technology is directly related to the solar intensity. Monitoring studies in this region of the US have shown that 1 kW of installed capacity can yield in excess of 1,100 kWh/yr. For the 11 kW array considered here the annual savings will be taken as 12,000 kWh/yr.

Expected Useful Life

This equipment demonstrated long trouble free service in severe applications such as remote communications, navigation lighting, and road signage. The long-term output of the cells is assumed to decrease with time, but the rate of decrease for current technology is not known. The crystalline and semi-crystalline forms of the technology have already demonstrated degradation of less than 20 percent in 20 years. But earlier thin film forms of the technology have shown shorter lifetimes. The lifetime of new thin film technologies is expected to be of the order of 25 years but it is not known. For these purposes the lifetime is taken as 25 years.[62]

Small HVAC Optimization and Repair (CE-2)

This measure applies to packaged rooftop units. These units are the predominant means of conditioning for small-to-medium scale commercial buildings. The savings proceed from improved compressor performance, better run time control, and fresh air cooling. These rooftop units are a homogenous pool of equipment that has been identified as underperforming. Typically, the refrigerant charge is out of specification, the economizers perform poorly if at all, and the airflow is too low for proper operation. Many utilities (eg, SCE, PG&E, National Grid) are offering programs employing a structured diagnosis and repair protocol. Often these programs use trade named processes such as Proctor Engineering "check me", or PECI "aircare plus" etc. Candidates for this measure are rooftop units found in a wide range of sizes with output capacities of from 4 to 50 tons with the most predominant capacity being 5 tons.

Measure Applicability

This measure is applicable in 70 percent of the large building commercial sector.

Incremental Cost

The cost for this technology includes site visits and diagnostics with simple repairs performed immediately without need for a second site visit. The costs will naturally vary with the specifics of the repair. Planning estimates for

[61] The C&RD Database lists the incremental capital cost as $6,000 per kW, which is somewhat lower for an installed 11 kW system.
[62] The Conservation and Renewables Database lists a measure life of 20 years for standard technology solar PV.

this diverse mix of treatments, made by the Northwest Power and Conservation Council (NWPCC), use $0.20/first year kWh savings. In the average large commercial building considered here, the cost will be $1,123/site treated.

Average Annual Expected Savings

Savings vary from unit to unit, but in the cases where there have been significant corrections to the refrigerant charge or to economizer operation savings on the order of 2,500 kWh/unit have been observed. In the average commercial large building considered here, we will assume 5,617 kWh/yr as the whole building savings where 2-3 units have been improved. These units usually supply gas heating as well, and the economizer and control improvements will result in gas savings. For this analysis, we will assume gas savings of 238 therms/yr.

Expected Useful Life

There are inherent limitations to the lifetime of the treatment provided by this measure. The improvements may be superseded by operational changes, and the remaining lifetime of the treated unit may be limited. The effective life of this measure is taken as 5 years.

Commissioning New and Retro (CE-3, CE-4)

Commissioning is a systematic step by step process of identifying and correcting problems and ensuring system functionality. Commissioning seeks first to verify that the system design intent is properly executed, and it goes further by comparing actual building energy performance to appropriate bench marks to validate building performance as a whole. The best candidates for this measure are buildings larger than about 100,000 square feet. While commissioning in general can become quite complex, often the greatest savings proceed from a simple review of building operations to assure that the building is not being unnecessarily used during non-occupied times. New Commissioning (CE-3) should be done as part of the construction contract, and most contractors will claim that this is normal business. But the performance of even new buildings is often erratic for a year or two while unnoticed problems come to light. This new commissioning is a detailed process of initial calibration and control sequence testing or verification. The initial process is usually not done well, but even so, the initial commissioning is inherently limited because usually it takes about a year of building operation to see how the building actually operates as a whole. By contrast, Re/Retro-Commissioning (CE-4) seeks to tune a building that is already operating and has a track record of a year or two at least. The Retro-Commissioning process starts with an analysis of the utility bills for all fuels, which to a trained eye will show the larger general operational problems which are then followed up with a limited scope site visit. Retro-Commissioning is usually necessary even for buildings that have been initially commissioned. There will be the occasional building which after years of operation will have its controls so mixed up that it will need a comprehensive new commissioning CE-3. In practice the New Commissioning is the larger more complicated job, while Retro-Commissioning is more superficial and focused on finding and fixing major problems only.

Measure Applicability

In this analysis New Commissioning is assumed to take place on 100 percent of new commercial stock as a matter of proper business. Retro-Commissioning is applicable in 75 percent of the existing commercial sector, and after a few years, to all of the new commercial buildings.

Incremental Cost

The cost for this technology is quite site-specific, based on NWPCC estimates new commissioning costs about $0.37/kWh/yr, which for a typical large commercial building of 100,000 square feet, would be about $37,000. For this study we are assuming a brief version of retrofit commissioning. Retro-Commissioning, or "commissioning lite", that prescreens buildings on the basis of billing data and follows it with a site visit. This lighter commissioning is assumed to cost $3,000/site. In this analysis, all program-related commissioning is the Retro Commissioning and the New Commissioning is assumed to be part of the construction process.

Average Annual Expected Savings

Savings from this measure can vary widely. For New Commissioning, it is assumed here that the building electric energy use can be reduced by on average 20 percent, leading to energy savings of 40,630 kWh/yr for an average large commercial building. For Retro-Commissioning electric savings of 15,236 kWh/yr for the average large building are assumed. A significant portion of the energy savings due to both of these measures is associated with the heating fuel, usually gas. In estimates of program cost effectiveness for electric utilities are usually not valued which often underrates the cost effectiveness of this measure.

Expected Useful Life

There are inherent limitations to the lifetime of the treatment provided by this measure. The improvements may be superseded by operational changes, and the remaining lifetime of the treated unit may be limited. The effective life of this measure is taken as 5 years.

Low-E Windows New and Replace (CE-5, CE-6)

This measure saves energy by reducing the thermal losses and gains through windows. This measure assumes that the efficient window has a heat loss rate of 0.45 BTU/deg F hr, representing the performance of a quality, double glazed argon filled low-e window. The original window is assumed to have a heat loss rate of 0.75 BTU/deg F hr, representing the average losses from a mix of single and double glazed windows.

Measure Applicability

This measure is applicable in 100 percent of new commercial buildings and 30 percent of existing commercial stock.

Incremental Cost

The incremental cost for this technology depends strongly on the context of use. If the efficient windows are used in a replacement context, then the full cost of $20/sqft is applicable which leads to a total cost of $30,000 for the average building considered here. But if the efficient windows are used as an upgrade in new construction then an incremental cost of only $3.00/sqft is used, leading to a total cost of $4,500 for the average building in this study.

Average Annual Expected Savings

It is assumed here based on DEK specific simulations that 1,500 square feet of high efficiency window replacement will have savings of 14,979 kWh/yr for an electric-heated building.

Expected Useful Life

This is a very long-lived measure with an assumed life of 25 years.

Premium New HVAC Equipment (CE-7)

Premium new HVAC equipment employs more efficient motors/pumps and larger heat exchangers and pipes to lower operating energy requirements. Premium equipment is often designated with and energy star rating or by CEE as tier I or tier II, or it may not have an official rating, but it does deliver slightly improved performance and is usually sold as such. Premium HVAC equipment is a very broad category including efficient variable speed fans, and efficient chillers, efficient ice makers, and efficient packaged roof top units. It should be noted that rooftop units serve more than half the commercial space, and they have therefore been the subject of an ongoing efficiency improvement campaign by CEE and the industry.

Measure Applicability

This measure is applicable in 100 percent of new commercial construction.

Incremental Cost

The incremental cost for this technology will be very diverse and quite site specific. Based on NWPCC estimates, the premium upgrade costs about $0.46/kWh/yr. For the average building considered here that cost would be $2,603/site.

Average Annual Expected Savings

Savings attributable to this measure are generally fairly small because they represent only an incremental improvement in performance on equipment that is already required to be reasonably efficient. It is assumed here that the savings in new construction will be 3 percent of total energy use, in the average building considered here that is 5,617 kWh/yr.

Expected Useful Life

The premium upgrades can be expected to last the life of the equipment, taken here as 15 years.

Large HVAC Optimization and Repair (CE-8)

This measure refers to restoring large HVAC equipment to its nominal operating performance. This measure needs to be distinguished from commissioning which is used to refine the controls of large HVAC which generally leads to large savings. By contrast this measure applies to the operation of the equipment and includes chiller and condensing tower cleaning, filter maintenance and tune-up etc. It also includes the optimization of economizer operation by verifying that the enthalpy sensors and economizer controls are functioning properly.

Measure Applicability

This measure is applicable in 20 percent of the commercial sector with large HVAC systems.

Incremental Cost

The incremental cost for this technology will be very diverse and quite site specific. Based on NWPCC estimates, the premium upgrade costs about $0.34/kWh/yr. For the average building considered here that cost would be $2,066/site.

Average Annual Expected Savings

Savings attributable to this measure are generally fairly small because they claim only the savings due to restoring equipment to its original operation. For this study these savings are assumed to be 3 percent of building energy use. On the average building, savings will be 6,042 kWh/yr.

Expected Useful Life

There are inherent limitations to the lifetime of the treatment provided by this measure. The improvements may be superseded by operational changes, and the remaining lifetime of the treated unit may be limited. The effective life of this measure is taken as 5 years.

Integrated Building Design (CE-9)

This measure applies to new construction where careful design and specific engineering can get beyond the rules of thumb, leading to the use of smaller equipment more carefully matched to load. Integrated design refers to an approach commonly used to design energy efficient new commercial buildings. Essentially, the design process lowers building loads, then carefully matches HVAC equipment to the lowered load. In practice the most significant characteristic of efficient new commercial buildings is significantly reduced lighting loads and often reduced plug loads. The other important characteristic is enhanced building shell performance through improved insulation and solar shading. Taken together these improvements result in significantly altered heating and cooling loads. Typically, the cooling loads will be significantly reduced, while the changes to the heating loads are more complex. The reduced internal gain from lighting etc will actually increase the gross heating loads, which the shell improvements may reduce somewhat through insulation or solar gain.

The altered heating and cooling loads will usually not conform to established equipment sizing rules of thumb, which generally result in oversized equipment. A primary objective in integrated design is to down size the equipment leading to more efficient operation, and often leading to installation cost savings. It is notable that the shell improvements will usually result in more stable and comfortable interior wall and glazing surface temperatures that permit alternative and reduced means of heating and cooling distribution which can lead in turn to reduced fan or pump energy, leading to significantly more efficient heating and cooling distribution strategies. This reduction in distribution can also result in reduced installation costs. The integrated design process usually employs building modeling, but as more efficient new commercial building experience develops, a few basic strategies are emerging which can be used without recourse to costly building modeling. (cf New Buildings Institute, Core Performance Guide).

Measure Applicability

This measure is applicable in 100 percent of new commercial construction, but in national chain or franchise designs, the integrated design may already have been done at the corporate level, or getting to a level of integrated design may require interaction at the corporate design level that may not be possible at the local level.

Incremental Cost

The incremental cost for this technology will be very diverse and quite site specific. The incremental costs of efficient new commercial buildings developed through integrated design are quite building specific, and may range widely from about $3.50/square foot to negative incremental cost. But in general, the incremental cost will be the net of some increased costs for various building elements (such as lighting, external shading elements, insulation, more efficient equipment, more sophisticated controls, etc), and some decreased costs resulting from reduced equipment sizes and simplified distribution strategies. There are examples of highly efficient new commercial buildings that have negative incremental costs, but a good rule of thumb is to assume that the incremental cost will be of the order of $1.75/square foot, or about $0.35/first year kWh saved.

The particular incremental cost for a real building could be quite complex to estimate. Therefore in order to minimize overhead, utility programs that provide incentives for integrated design will base the incentives on modeled and deemed per square foot estimates of energy savings for principal occupancy types (retail, schools, offices, etc) for various HVAC systems and measure packages.

Based on NWPCC estimates, the premium upgrade costs about $0.34/kWh/yr. For the average building considered here that cost would be $24,708/site.

Average Annual Expected Savings

The savings due to integrated design will include the savings due to efficient lighting, efficient HVAC equipment, and controls. Taken as a package these savings can easily be on the order of 20-40 percent of the standard code compliant design. The current US tax code allows preferred treatment for new buildings that are 50 percent better than code or lighting systems that are 30 percent better than code. For this analysis we consider 20 percent better than code to be an achievable and significant goal. For the average building considered here the savings are taken to be 72,929 kWh/yr.

Expected Useful Life

Integrated design can be expected to last the life of the building, taken here as 50 years.

Efficient Package Refrigeration (CE-10)

This measure consists of an efficient packaged and optimized new refrigeration system.

Measure Applicability

This measure is applicable in portions of the grocery sector and in some restaurants. The applicability is estimated here to be 4 percent of the commercial sector.

Incremental Cost

The incremental cost for this technology will be very diverse and quite site specific. Based on NWPCC estimates, the efficient packaged refrigeration costs about $0.15/kWh/yr. For the average building considered here that cost would be $2,986/site.

Average Annual Expected Savings

It is assumed here that this measure can reduce a building energy use in applicable sites by 10 percent. The average commercial building considered here is assumed to save 20,140 kWh/yr.

Expected Useful Life

Electrically commutated motors are assumed to have a useful life of 15 years.

Electrically Commutated Motors (CE-11)

An electronically commutated motor is a more efficient motor with variable speed control capability. In fan and pump applications it can save energy by operating at a more efficient speed. Refrigeration applications involving case cooling distribution fans are especially favored because the power reduction leads to a lower refrigeration load.

Measure Applicability

This measure is broadly applicable throughout the commercial sector. For this study we assume the measure is applicable in 60 percent of the commercial sector.

Incremental Cost

The incremental cost for this technology will be very diverse and quite site specific. Based on NWPCC estimates, the premium upgrade costs about $0.33/kWh/yr. For the average building considered here that cost would be $1,345/site.

Average Annual Expected Savings

It is assumed here that this measure can reduce a building energy use by 2 percent. The average commercial building considered here is assumed to save 4,028 kWh/yr.

Expected Useful Life

Electrically commutated motors are assumed to have a useful life of 15 years.

Premium Motors (CE-12)

This measure saves energy by reducing energy losses in motors. Motor energy use is preponderant in manufacturing applications where of the order of 40-60 percent of electric energy is used in motors, and these motor applications are frequently full time operation or near full time operation.

Motor efficiency varies with the size of the motor as is illustrated in the figure below.

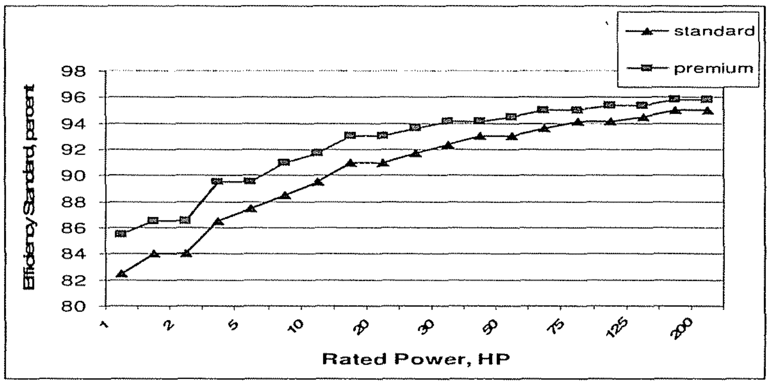

Figure 47. Motor Efficiency Specification NEMA Premium

The figure above shows the efficiency improvement to be gained by using the more efficient motor. While the efficiency gain is only about 2 percent for the smaller motors, it is important because the duty cycle of many motor applications is of the order of 5,000-8,760 hours/year.

In constant speed motor applications, an even greater electric energy savings may be available by properly matching the motor to its load. In particular, the efficiency of smaller motors in the 1-10 horsepower range can vary greatly with the duty load on the motor as illustrated in Figure 48. In this figure it is evident that if a smaller motor is oversized relative to its load, the efficiency can be reduced by of the order of 10 percent.

In motor replacement (and new motor) specifications, it is especially important to consider the fit of the motor to its load in terms of motor horsepower, speed, and starting torque. The greater portion of savings often rests with the proper match of the motor to its load.

A simple one-for-one motor replacement can have unexpected results. An important element in the use of higher efficiency motors is that the equilibrium speed of the higher efficiency motor is often slightly higher than the speed of the lower efficiency motor that was replaced. In fan and pump systems this slight increase in speed will increase the fluid throughput and power. So although a more efficient motor has been used, it may actually lead to an unintended but slight increase in flow and power unless the drive system is adjusted to compensate.

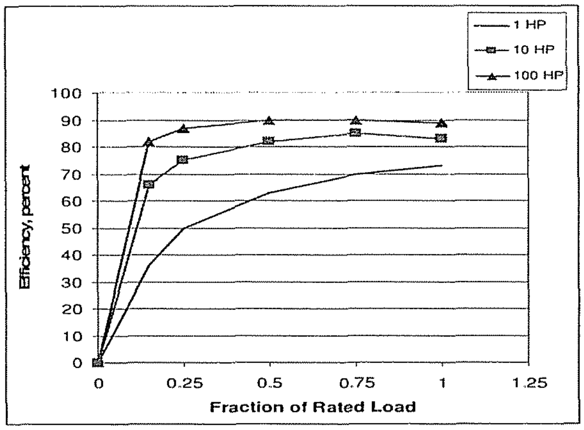

Figure 48. Typical Motor Operating Efficiencies versus Load

Measure Applicability

This measure is applicable in the new commercial and manufacturing sectors, and in suitable retrofit situations. In all, this measure is taken as applicable to 60 percent of the commercial and manufacturing sectors.

Incremental Cost

The incremental cost for this technology will be very diverse, and dependent on the size of the motor. For this study we will take an incremental cost of $412 for the average site.

Average Annual Expected Savings

The savings from an efficient motor must assume that the drive has been adjusted as necessary to give equivalent flow or drive effort, and the savings will then depend strongly on the duty cycle hours/yr. For this average motor we take a duty cycle of 6,000 hours/yr and annual savings of 1,800 kWh/yr. For an average site the savings associated with premium motors is taken as 1 percent of energy use, 3,745 kWh/yr.

Expected Useful Life

This measure is essentially a built-in measure and is assumed to have a useful life of 15 years.

Variable Speed Drives, Controls, and Motor Applications Tune-Up (CE-13)

This measure saves energy by providing an efficient way to match a motor to a varying load. Motor controls commonly referred to as variable speed or variable frequency drives, alter the frequency applied to the motor and thereby permit the motor to run more efficiently at lower outputs. This control capability is particularly important in process applications where a pump or fan is being controlled to maintain a particular and often varying fluid flow. Often the fluid flow is controlled by means of dampers or throttling valves that force the fan or pump motor to operate inefficiently. The savings associated with the proper speed control are most pronounced when the motor is operating at less than its rated capacity. At full capacity there may be little savings.

Situations involving fans or pumps, (which is the most common commercial/industrial application of motors), have a very high energy sensitivity to flow rate; typically the energy varies as the cube of the flow rate. Attention to how the flow is controlled with the use of variable speed controls, and elimination of excess flow can often lead to power reductions of the order of 50 percent with only minor reductions in flow. In this manner, variable speed motor control permits finer tuning and control of pumps, fans, compressors, and conveyers.

There is another genre of motors and controls referred to as brushless permanent magnet torque motors. These are very high torque motors that have no drive and can be very precisely controlled. These have very good positioning capabilities and are used in machining and manufacturing assembly operations.

Measure Applicability

This measure is applicable in the new commercial and manufacturing sectors, and in suitable retrofit situations. In all, this measure is taken as applicable to 30 percent of the commercial and manufacturing sectors.

Incremental Cost

The incremental cost for this technology will be very diverse. Based on NWPPC estimates, an aggregated estimate of the costs of adjustable speed drives is about $0.86/kWh/yr. For the average building considered here that cost would be $17,346 site.

Average Annual Expected Savings

It is assumed here that an application of drive control can save about 10 percent of the total building energy. In the average building considered here this measure can save 20,140 kWh/yr.

Expected Useful Life

This measure is essentially a built-in measure and is assumed to have a useful life of 15 years.

Energy Star Transformers (CE-14)

This measure saves energy by reducing energy losses associated with stepping down from high service voltages to typical service application voltages. In larger buildings and plants it is often more economic to distribute the power at high voltages to various floors and major areas where it is then stepped down to its ultimate application voltage through a transformer. These transformers are typically efficient (>95%) when they are properly loaded, but an oversized or under loaded transformer can operate at a much lower efficiency; therefore, it is important that the transformers be sized properly. However, even when the transformer is properly sized, it is important to use the most efficient transformer because all power passes through it.

Transformer efficiency varies with the size of the transformer as illustrated in the figure below.

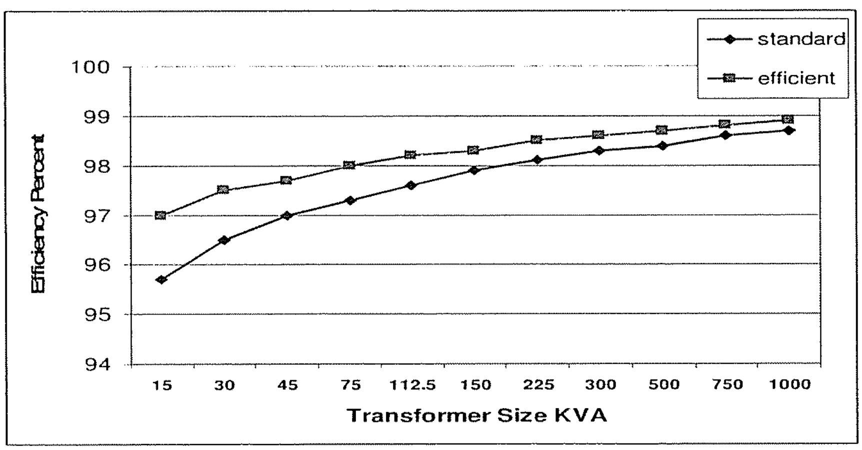

Figure 49. Transformer Efficiency Specification NEMA TP-1

Figure 49 shows the efficiency improvement to be gained by using the more efficient Energy Star labeled transformer. While the efficiency gain is only about 1 percent for the smaller transformers it is important because all power runs through it and the percentage savings will be taken off the top.

Measure Applicability

This measure is applicable in the new commercial and manufacturing sectors, and in suitable retrofit situations. In all, this measure is taken as applicable to 30 percent of the commercial and manufacturing sectors.

Incremental Cost

The incremental cost for this technology will vary with the size of the transformer. For this study, we take a 150 KVA transformer as the average with an incremental cost of $82 for the typical facility considered here.

Average Annual Expected Savings

Transformer savings are based on the size of the transformer, and are based on the power throughput of the transformer as well as standby losses, 8760 hours/year. For this average transformer operating at 60 percent of load, we estimate savings of 10,000 kWh/yr. For the average facility considered here, savings are assumed to be one-half percent of energy, 1,007 kWh/yr.

Expected Useful Life

This measure is essentially a built-in measure and is assumed to have a useful life of 18 years.

Efficient AC/DC Power (CE-15)

A modern office environment has a multitude of electronic appliances, most of which are powered by a small transformer AC/DC converter. Standard transformer based converters are about 30-40 percent efficient. More efficient designs called switching power supplies operate with an efficiency of about 90 percent. The energy savings for this measure proceed from switching to the more efficient power supplies.

Measure Applicability

This measure is applicable in 100 percent of the commercial sector.

Incremental Cost

The incremental cost for this technology will be very diverse. Based on NWPCC estimates, the premium upgrade costs about $0.074/kWh/yr. For the average building considered here, that cost would be $225/site.

Average Annual Expected Savings

Electronics and computers use 12 percent of commercial energy on a US average basis. This equipment is often on 24 hours a day. It is assumed here that doubling the power supply efficiency from 45 to 90 percent would save at least 1.5 percent of the total building energy or 3,021 kWh/yr for the average commercial building considered here.

Expected Useful Life

This measure is assumed to have a useful life of 5 years.

Efficient Network Management (CE-16)

This measure involves powering down unused network functions during unoccupied hours.

Measure Applicability

This measure is technically applicable in 100 percent of the commercial sector, but it is assumed that only 10 percent of the commercial sector will have the networks large enough and staff conversant enough to execute the measure.

Incremental Cost

The incremental cost for this technology will be very diverse. Based on NWPCC estimates, the premium upgrade costs about $0.115/kWh/yr. For the average building considered here, that cost would be $463/site.

Average Annual Expected Savings

Approximately 12 percent of commercial energy is for electronics and computers. It is assumed here that, at an applicable site, 2 percent of energy can be saved by efficient network power management or 4,028 kWh/yr in the average building considered here.

Expected Useful Life

This is a transient measure dependent on the current system configuration. It is assumed to have a useful life of only 2 years.

New and Retrofit Efficient Lighting (CE-17, CE-18)

Lighting efficiency is the major commercial efficiency measure. Lighting accounts for 35 percent of commercial energy, and lighting also accounts for significant cooling energy that is saved when lighting is more efficient. There are literally hundreds of combinations of more efficient lighting elements that can replace less efficient elements. This efficient lighting measure goes beyond the light sources only and includes lighting controls, bi-level switching and occupancy sensors. Taken together it is common to find efficient lighting that can reduce lighting energy by 30 percent from the minimum code required levels (ASHRAE 90.1, 2001). In fact, the 2006 energy legislation offers preferred tax treatment to lighting configurations that can reduce lighting energy by 30 percent.

Measure Applicability

This measure is applicable in 100 percent of the new commercial buildings and in 85 percent of the existing commercial sector.

Incremental Cost

The incremental cost for this technology is essentially the cost of the efficient lighting components. These costs will be will be very diverse and site specific. Based on NWPCC estimates, and averaging the full range of conditions, efficient lighting costs about $0.26/kWh/yr. For the average building considered here that cost would be $5,297/site. For a retrofit application, the cost is increased by 25 percent to $6,621/site to allow for installation constraints.

Average Annual Expected Savings

A comprehensive lighting retrofit or new building lighting can save about 30 percent of the 35 percent lighting end-use, in all 10 percent of building energy. In the commercial building considered here, the average annual expected savings is 20,140 kWh/yr.

Expected Useful Life

The useful life of the wide variety of lighting equipment varies widely from one light source or ballast to another. However, these elements are the replaceable elements in an overall system that is assumed to have a useful life of 18 years.

LED Exit Signs (CE-19)

Typical existing exit signs are incandescent exit signs. This measure is designed to replace these typical exit signs with an Energy Star Light Emitting Diode (LED) Exit Sign which is more efficient than the incandescent versions.

Measure Applicability

In principal, this measure is applicable in the entire commercial sector, and there are no physical constraints to replacing existing exit signs, but to account for already installed LED exit signs the applicability is assumed to be 85 percent of the commercial sector.

Incremental Cost

The incremental cost of an Energy Star LED Exit Sign over an incandescent exit sign is $45. For the average building considered in this analysis, 6 exit signs are assumed, for a full site cost of $270.

Average Annual Expected Savings

The average annual expected saving for this replacement is 245 kWh/year.[63] In the average building considered in this analysis, there are assumed to be 6 exit signs, for a full site savings of 1,470 kWh/yr.

Expected Useful Life

LED exit signs are very long-lived light sources. Accordingly, the useful life is taken as 15 years.

LED Traffic Lights[64] (CE-20)

LED traffic lights save energy because LED light sources are a much more efficient and long-lived light source than the incandescent bulbs they replace. They save energy but they also save in terms of bulb replacement costs. LED traffic lights have a variety of configurations. Each color (red, Green, or yellow), each size (8 inch, or 12 inch) and each type (thru lane, left turn bay, right turn bay, and don't walk large or small) has different incremental cost, savings and effective useful life values.

Measure Applicability

Measure applicability was not estimated due to lack of data on traffic lights in the DEK service territory. But for this analysis, it is assumed that there are 0.2 retrofittable intersections for every commercial building.

Incremental Cost

Depending on the color, size and type, the incremental cost ranges from $110 to $225. For this analysis we consider LED traffic light replacements in groups of 10, approximately the number of lamp replacements necessary to refit an intersection. For this analysis we will assume the average replaced light costs $200 and that the full intersection with 10 replacement lights costs $2,000. This cost compares favorably with the $1,850 cost derived from NWPCC data. These incremental costs do not assume an installation cost. It is assumed that the installation is done by the agency controlling the lights, and that it is more than paid for by the ongoing maintenance savings.

Average Annual Expected Savings

Depending on the color, size and type, the savings range from 111 to 808 kWh/year. For this analysis we consider LED traffic light replacements in groups of 10, approximately the number of lamp replacements necessary to refit an intersection. For this analysis we will assume the average replaced light saves 500 kWh/yr and that the full intersection with 10 replacement lights saves 5,000 kWh/yr.

Expected Useful Life

Depending on the color, size and type, the expected useful life ranges from 3 to 16 years. For this analysis we will use 10 years.

Perimeter Daylighting (CE-21)

This measure saves energy by reducing energy to lighting that is in or adjacent to day lit spaces. Some cooling energy savings are also possible because well controlled day lighting contributes less internal gain to a space. This measure controls lighting based on a well placed day light sensor. This measure also includes design and details to control glare or over lighting.

Measure Applicability

This measure is applicable in the new commercial sector, and in suitable retrofit situations. In all this measure is taken as applicable to 30 percent of the commercial sector.

Incremental Cost

The incremental cost for this technology will be very diverse. Based on NWPCC estimates, perimeter daylighting costs about $0.85/kWh/yr. For the average building considered here that cost would be $5,132/site.

[63] C&RD Database

[64] All values for LED Traffic Lights are available in the C&RD Database.

Average Annual Expected Savings

It is assumed here that a full application of perimeter daylighting can save about 3 percent of the total building energy. In the average building considered here this measure can save 6,042 kWh/yr.

Expected Useful Life

This measure is essentially a built-in measure and is assumed to have a useful life of 18 years.

Low Flow Fixtures (CE-22)

This technology consists of a new showerhead rated at 2.0 gpm at 80 psi and a swivel aerator for any kitchen faucets, and fixed aerators for the lavatory faucets. The current US standard for showerheads is 2.5 gpm. And measurements of the existing shower flows in building stock show a range of 2.75 to 3.75 gpm with frequent individual cases showing in excess of 5 gpm. Evaluations have shown that programs that replace with 2.0 gpm heads have greater savings than programs that replace with the standard 2.5 gpm shower heads. Program shower heads should be 2.0 gpm at 80 psi and with a lifetime scaling and clogging warranty. It is important also to be cautions about the use of "pressure compensating" showerheads. These are more prone to clogging, and can lead to unintentional increases in flow rate in low pressure situations such as well water systems or older systems with occluded piping. Customer acceptability is an important component in a showerhead program. Customers will remove new low flow showerheads if the quality of the showering experience declines with the new showerhead. Therefore it is important to research and test the showerhead chosen for the program carefully. In addition the old showerhead must be removed from the premises to decrease the likelihood of having it reinstalled.

Measure Applicability

This measure is applicable to circumstances where there is showering; such as, schools, hospitality, health clubs, etc. The best application will be a site where the water is heated electrically. For this analysis the applicability is taken as 10 percent of the commercial sector.

Incremental Cost

The incremental cost for this measure is taken as $1,000, reflecting the installation of 15-40 showerheads by appropriately licensed professionals. Because the cost of the showerhead varies significantly and quality is so important for this program, it is essential to test, choose, and pay for a high quality showerhead. This measure is so cost effective that even with a more expensive showerhead the program will still remain cost effective and a quality showerhead will ensure measure persistence.

Average Annual Expected Savings

The average annual savings for this measure are directly related to the daily number of showers taken. For this study the showering load is assumed similar to a residential one and the overall savings are taken as 6,000 kWh/yr, representing the savings from 15-40 showerheads. The flow of the showerhead used has a significant impact on savings. Programs should be designed around a 2.0 gpm showerhead as compared to a 2.5 gpm showerhead. Therefore the savings will be more than the 120–133 kWh per unit listed in DEER. In addition the climate is different and the inlet water temperature is lower so the savings in this DEK program will be greater. Several studies have measured final savings in terms of electric input to the tank, but usually these studies have included savings from comprehensive treatments including other measures including tank and pipe insulation, kitchen and bath lavatory aerators, tank thermostat set back, and leaky diverter replacement. Savings can very from program to program depending strongly on the choice of showerhead. Savings can also diminish with "take back" in the event that the new showering experience is longer than the original. Actual savings observed in the comprehensive cases include these take back effects, and are in the range of 650 to 950 kWh/yr. The savings from a showerhead and aerator change are assumed to be 500 kWh/yr.

Expected Useful Life

The lifetime of this equipment is the key to its cost effectiveness. If an adequate, even pleasant, shower can be provided through lifetime warranted equipment, then the practical lifetime of the equipment is the length of time until the equipment is replaced in the course of renovation. For these purposes, lifetime is taken as 10 years.[65] Normally showerheads will last longer but with renovations and changes in ownership a 10 year expected useful life is a good planning number.

Solar Water Heaters (CE-23)

The water heating end-use in commercial buildings is a smaller end-use than in residences. In the DEK service area large commercial water heating will be done by gas and it will not be a very good candidate for this measure. But the smaller commercial water heating applications will be residential scale in usage and often these smaller applications will be electrically heated. These are the candidate applications for this measure. In the case of electrically heated water, the annual water heating energy is about 4,800 kWh/yr. Countless demonstration cases have shown that solar energy can supply all or a portion of this heating. The portion of the water heating load assumed by a solar water heater depends on the size of the solar water heater in relation to the size of the load. Field experience has shown that the best combination of system size to load favors the more moderately sized systems that can fully meet the summer water heat load, but that only meet about 40-50 percent of the non summer load. In physical terms, this is a system consisting of about 40-65 square feet of solar collector and an additional 80 gallon heated water storage tank and appropriate pumps and controls.

Measure Applicability

This measure is applicable to large commercial buildings with reasonably low hot water use, and the system is sized as if it were residential. This measure is taken as applicable to 25 percent of the commercial sector.

Incremental Cost

The installation of a solar water heating system involves a mix of building skills including plumbing, electrical, roofing and general carpentry. In the general market, a turn-key installation for one of these systems is in the range of $5,000-$7,000. For this study the incremental cost will be $6,000.

Average Annual Expected Savings

The savings from solar water heaters depend on site specifics, principally solar insulation, air temperature, incoming water temperature, and hot water usage rate. Considering these dependencies for the DEK service area, leads to average annual savings for a system sized and designed to be in the cost effective range to be 2,500 kWh/yr.

Expected Useful Life

Solar water heating systems are essentially plumbing fixtures that are certified products (SRCC) and are often inspected by local building officials. A well designed system will have lifetime in excess of 25 years, even though the system will take some intermediate maintenance such as inspecting the pump and fluid level. This study will take 25 years as the useful life.

Heat Pump Water Heaters (CE-24)

The water heating end-use in commercial buildings is a smaller end-use than in residences. In the DEK service area large commercial water heating will be done by gas, and it will not be a very good candidate for this measure. But the smaller commercial water heating applications will be residential scale in usage, and often these smaller applications will be electrically heated. These are the candidate applications for this measure. In the case of electrically heated water, the annual water heating energy is about 4,800 kWh/yr. The heat pump water heater is essentially a small heat pump drawing heat from the air by cooling and de-humidifying it and injecting this heat into a storage tank. Physically, this measure consists of a small, self-contained heat pump and a water storage tank and associated pumps and controls.

Measure Applicability

This measure is applicable to large commercial buildings with reasonably low hot water use, and the system is sized as if it were residential. This measure is taken as applicable 25 percent of the commercial sector.

[65] DEER Database, 2005

Incremental Cost

The incremental cost of this measure consists of the cost of the heat pump water heater, water storage tank and installation plumbing and general construction labor. The siting of such a unit is important; it should never be sited in an attic, and freezing situations should also be avoided. Therefore, some special site adaptation and plumbing may be necessary. For this study we will take $2,500 as the cost; others report lower costs, but we do not think these take adequate account of special site costs.

Average Annual Expected Savings

For this study it is assumed that the heat pump water heater will perform with a coefficient of performance of 2, leading to annual savings of 2,000 kWh/yr.

Expected Useful Life

The useful life of this measure is assumed to be that of a similar appliance, a window air conditioner, which has an expected useful life of 18 years.

Energy Star Hot Food Holding Cabinet (CE-25)

This measure saves energy by keeping prepared food warm more efficiently; they are 60 percent more efficient than standard models. These models have better insulation, and may have magnetic door gaskets, auto-door closers, or Dutch doors.

Measure Applicability

This measure is applicable in portions of the restaurant hospitality and education sectors, and the applicability is estimated here to be 7 percent of the commercial sector.

Incremental Cost

For the average building considered here, the cost would be $1,100/site.

Average Annual Expected Savings

It is assumed here that this measure will save 3 percent at a suitable site or 4,100 kWh/yr[66] in terms of the average building considered here. The DEER Database confirms this value with a value of 4,029.

Expected Useful Life

This measure is assumed to have a useful life of 15 years.

Energy Star Electric Steam Cooker (CE-26)

This measure saves energy by cooking food more efficiently. It also saves water and cooling energy.

Measure Applicability

This measure is applicable in portions of the restaurant hospitality and education sectors. The applicability is estimated here to be 7 percent of the commercial sector.

Incremental Cost

For the average steam cooker considered here, the incremental cost would be $5,000/site.

Average Annual Expected Savings

It is assumed here that this measure will save 1.5 percent at a suitable site or 2,200 kWh/yr in terms of the average building considered here.

[66] Energy Star Website: http://www.energystar.gov/index.cfm?c=hfhc.pr_hfhc

Expected Useful Life

This measure is assumed to have a useful life of 15 years. DEER lists a slightly more conservative value of 12 years.

Pre-Rinse Spray Wash (CE-27)

This measure applies to the commercial sector and provides a low pressure nozzle for pre-washing dishes. Using a low pressure nozzle saves water and heating energy in commercial kitchen settings.

Measure Applicability

This measure is applicable in portions of the restaurant hospitality and education sectors. The applicability is estimated here to be 7 percent of the commercial sector.

Incremental Cost

Based on NWPCC estimates, the pre-rinse spray wash costs about $0.03/kWh/yr. For the average building considered here that cost would be $255/site.

Average Annual Expected Savings

It is assumed here that this measure will save 5 percent at a suitable site or 10,070 kWh/yr in terms of the average building considered here.

Expected Useful Life

This measure is assumed to have a useful life of 15 years.

Restaurant Commissioning Audit (CE-28)

This measure consists of an audit conducted by a restaurant energy professional to identify the potential for efficiency in a commercial kitchen. Savings proceed from small things such as leaky faucets and unnecessary equipment operation to larger things such as major process changes. Since kitchen equipment is energy intensive the audit includes identification of cost effective equipment changes.

Measure Applicability

This measure is applicable to commercial kitchens in the restaurant, hospitality, and education sectors.

Incremental Cost

The incremental cost for this measure is limited to the cost of the audit only. The cost of any major equipment changes is associated with other measures. The cost for the audit is assumed to be $1,486, $.0738/kWh/yr.

Average Annual Expected Savings

It is assumed here this measure can reduce the energy use in an applicable facility by 10 percent, or 20,140 kWh/yr for the average building considered in this analysis.

Expected Useful Life

This measure will have a relatively short life; it is assumed to be 5 years.

Grocery Refrigeration Tune-Up and Improvement (CE-29)

This measure consists of cleaning heat exchangers and assuring proper airflow at the freezer cases and condenser coil. It also involves appropriate belt adjustment and refrigeration charge correction and the addition of a floating head pressure control if appropriate.

Measure Applicability

This measure is applicable in portions of the grocery sector and in some restaurants. The applicability is estimated here to be 4 percent of the commercial sector.

Incremental Cost

Based on NWPCC estimates, the grocery refrigeration tune-up costs about $0.19/kWh/yr. For the average building considered here that cost would be $3,817/site.

Average Annual Expected Savings

It is assumed here that this measure will save 10 percent at a suitable site or 20,140 kWh/yr in terms of the average building considered here.

Expected Useful Life

This measure is assumed to have a useful life of 5 years.

Refrigeration Casework Improvements (CE-30)

This measure refers to improvements to refrigeration casework that can lower the refrigeration load. These include high quality insulated glass doors on the refrigeration case or other transparent refrigeration case covers that limit mixing of the warmer store air with the refrigerated air.

Casework improvements also include attention to two refrigeration case auxiliaries that emit heat into the refrigerated space. The first is the anti-sweat heater made part of the clear refrigeration door to melt frost that could accumulate on the door and obscure the view of the contents. These heaters are commonly on all the time when they are only needed during high humidity episodes with humidity greater than 55 percent. The control improvement is to control the anti-sweat heaters with a humidistat thus allowing operation only to times when it is needed. While this control improvement will depend on the store humidity and the specific heater size, the savings for a typical refrigeration case are estimated here to be 400 kWh/yr.

The second heat emitting auxiliary is the small fans used to distribute the cooled air inside the refrigerated case. These fans typically use a small inefficient motor coupled to an inefficient fan blade. In a typical medium-sized refrigeration case the existing fans may use about 70 watts, with the efficient fans using only about 20 watts, for a savings during 8,760 hours/yr of 50 watts or about 450 kWh/yr/case.

Measure Applicability

This measure is applicable in portions of the grocery sector and in some restaurants. The applicability is estimated here to be 4 percent of the commercial sector.

Incremental Cost

Based on NWPCC estimates, an average refrigeration case upgrade costs about $0.33/kWh/yr. For the average building considered here that cost would be $3,323/site.

Average Annual Expected Savings

It is assumed here that this measure will save 5 percent at a suitable site or 10,070 kWh/yr in terms of the average building considered here.

Expected Useful Life

This measure is assumed to have a useful life of 10 years.

VendingMiser® (CE-31)

The VendingMiser® is a controller placed on vending machines which powers down a vending machine during low use times while maintaining product quality. It cycles the machine to maintain temperature and uses occupancy sensors to control the lighting on the vending machine.

Measure Applicability

This measure is assumed to be applicable in 25 percent of the commercial sector.

Incremental Cost

The incremental cost for a VendingMiser® unit is $179 and installation costs are expected to be $35.50 in labor for a total incremental cost of $215.[67]

Average Annual Expected Savings

Measure savings range from 800 to 1,200 kWh/yr, depending on the vending machine. Large machines with an illuminated front save 1,200 kWh/yr, and small machines or machines without an illuminated front save 800 kWh/yr. For planning purposes, we will assume 1,000 kWh/yr.

Expected Useful Life

The expected useful life for this measure is 10 years.[68]

LED Outdoor Lighting (CE-32)

LED lighting applications use much less energy than incandescent or metal halide lighting applications. At the present the color of "white" LED light is somewhat blue tinted and not always suitable for general interior applications. But this color is often suitable for outdoor applications and it is probable that LED lighting will find its place in many outdoor applications. The application considered here is an LED outdoor light, often referred to as a "cobra light" which is used to illuminate parking lots and outdoor areas.

Measure Applicability

This measure is still evolving but will likely be applicable to a large percentage of the commercial sector.

Incremental Cost

The incremental cost for an outdoor LED light of this type is taken here to be $500, and is expected to decrease as the market matures. A significant and favorable cost impact for this measure is its long life, leading to maintenance savings in cases where the light is difficult to access.

Average Annual Expected Savings

Measure savings proceed from the replacement of a 250 watt light by a 19 watt LED assembly. The annual savings for a light used all night and all year are taken here as 1,000 kWh/yr.

Expected Useful Life

The expected useful life for this measure is 20 years.

Sources

DEER: 2004-05 Database for Energy Efficient Resources (DEER) Version 2.01 October 26, 2005 developed by the California Public Utility Commission and the California Energy Commission.

C&RD: Northwest Power and Conservation Council's Conservation Resource Comments Database, which is continually updated as new information becomes available.

[67] DEER database, 2005
[68] DEER database, 2005

APPENDIX E. RESIDENTIAL GAS EEM DOCUMENTATION

The purpose of this appendix is to provide documentation of the assumptions used to screen the residential Energy Efficiency Measures (EEM) identified for consideration in this report. Our assumptions are based on references cited throughout this section as well as the direct experience of our team with technologies in the field and actual DSM program evaluations. While not all of the field and DSM program experience can be cited in published works, published references are used to establish a reasonable range of assumptions. The point estimate used within that range is based on our professional opinion. The mapping of EEM to residential DSM programs is shown in the table below.

Table 87. Mapping of Gas EEM to Residential DSM Programs

Program #			**10**	**11**	**12**	**13**	**14**	**15**
End-Uses	**EEM Description**	**EEM Ref #**	**Res Whole House**	**Res Rebates**	**Res Appl Recycle**	**Res New Constr**	**Res Solar Siting**	**Res Low/Mod Income Weath**
Appliance Efficiency	Solar Water Heater	RG-1						
	EE Water Heater with EF >= 0.6	RG-2		0.011				
	EE Water Clothes Washer	RG-3						
	Gas Clothes Dryer (Energy Star)	RG-4		0.009				
	Gas Stove/Oven	RG-5						
	Tank/Pipe Wrap	RG-6	0.019					0.24
	Low Flow Fixtures	RG-7	0.600					0.36
	Tankless WH Reqd	RG-8		0.005				
	Tankless Discretionary	RG-9						
Furnace Efficiency	AFUE 65 to 82 SFe	RG-10						
	AFUE 65 to 82 MFe	RG-11						
	AFUE 65 to 92 SFe	RG-12						
	AFUE 65 to 92 MFe	RG-13						
	AFUE 82 to 92 SFe	RG-14		0.013				
	AFUE 82 to 92 MFe	RG-15						
	AFUE 82 to 92 SFn	RG-16						
	AFUE 82 to 92 MFn	RG-17						
	Programmable Thermostats	RG-18	0.026					0.32
	Proper HVAC Sizing	RG-19						
	HVAC Tune-Up	RG-20						
	CO Remediation	RG-21						
Shell Efficiency	EE Windows	RG-22						
	Ceiling Insulation (R11 to R38)	RG-23						
	Ceiling Insulation (R30 to R38)	RG-24						
	Ceiling Insulation (R19 to R38)	RG-25	0.016					0.24
	House Sealing using Blower Door	RG-26	0.019					0.32
	Duct Seal	RG-27	0.019					0.32
	Wall Insulation (R0 to R11)	RG-28	0.016					0.20
	Wall Insulation (R11 to R19)	RG-29						
	Floor/Basement Insulation	RG-30						
	Energy Star Construction	RG-31				0.9		
	Solar Siting	RG-32					0.9	

Solar Water Heaters (RG-1)

Water heating is one of the largest energy uses in the home. In the case of gas-heated water, the annual water heating energy is about 250 therms/yr. Countless demonstration cases have shown that solar energy can supply all or a portion of this heating. The portion of the water heating load assumed by a solar water heater depends on the size of the solar water heater in relation to the size of the load. Field experience has shown that the best combination of system size to load favors the more moderately sized systems that can fully meet the summer water heat load, but that only meet about 40-50 percent of the non-summer load. In physical terms, this is a system consisting of about 40-65 square feet of solar collector and an additional 80 gallon heated water storage tank and appropriate pumps and controls.

Measure Applicability

This measure is intended to apply to residential customers with gas-heated hot water.

Incremental Cost

The installation of a solar water heating system involves a mix of building skills including plumbing, electrical, roofing and general carpentry. In the general market, a turn-key installation for one of these systems is in the range of $5,000 to $7,000. For this study we will take the cost to be $6,000.

Average Annual Expected Savings

The savings from solar water heaters depend on site specifics, principally solar insulation, air temperature, incoming water temperature, and hot water usage rate. Considering these dependencies for the service area, leads to average annual savings for a system sized and designed to be in the cost effective range to be 137 therms/yr.

Expected Useful Life

Solar water heating systems are essentially plumbing fixtures that are certified products (SRCC) and are often inspected by local building officials. A well designed system will have a lifetime in excess of 25 years, even though the system will take some intermediate maintenance such as inspecting the pump and fluid level. This study will assume 25 years as the useful life.

EE Water Heater (RG-2)

This measure applies to residential gas water heating. The more efficient gas water heater will have thicker tank insulation and a slightly more efficient burner system.

Measure Applicability

This measure is applicable to most of the residential stock.

Incremental Cost

An incremental cost of $180 is associated with the more efficient water heater.

Average Annual Expected Savings

A more efficient water heater will achieve 50 therms/yr annual savings according to our modeling.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used. An expected useful life of 15 years is being used.

Energy Star Clothes Washers (RG-3)

This measure involves obtaining an Energy Star clothes washer which is a more efficient clothes washer than a standard clothes washer. This measure has significant water and detergent savings in addition to the water heater and dryer savings.

Measure Applicability

This measure applies to customers who do not currently have a high efficiency clothes washer.

Incremental Cost

The incremental cost for clothes washers vary significantly depending on the features. The value used in this analysis is $500, DEER lists a value of $565.82 and the C&RD lists $245.26. Due to the wide variety of costs for Energy Star clothes washers, $500 is a good mid-range value for the purposes of this analysis.

Average Annual Expected Savings

The kWh savings from a clothes washer depend to a significant extent on the source of the water heating and dryer's energy source. If the water heater is a gas water heater the kWh savings are insignificant but if the source is an electric water heater the savings can be substantial. Savings also depend on whether the clothes washer has a built-in heat source which some do have. This analysis used 400 kWh. DEER lists 199 kWh and C&RD lists a range from 54 to 509 kWh depending on the model chosen. Savings will be assumed to be 30 therms/yr because the program will be limited to customers with gas water heat and gas dryers.

Expected Useful Life

The expected useful life used in the analysis is 15 years; however, both DEER and C&RD list 14 years.

Efficient Gas Clothes Dryer (RG-4)

This measure applies to residential gas clothes dryers. The more efficient gas clothes dryers use more sophisticated controls to avoid over-drying the load resulting in shorter cycles and lower dryer energy use.

Measure Applicability

This measure is applicable to most of the residential stock.

Incremental Cost

The incremental cost of this measure is taken here as $100.

Average Annual Expected Savings

This measure is expected to save 13 therms/yr annually.

Expected Useful Life

An expected useful life of 18 years is being used.

Efficient Gas Stove (RG-5)

This measure applies to residential gas cooking stoves. It involves spark or other ignition of burners and oven thereby saving the gas used in the pilot light. This is a common feature of most new appliances.

Measure Applicability

This measure is applicable to most of the residential stock.

Incremental Cost

The incremental cost of this measure is taken as $100.

Average Annual Expected Savings

This measure will save 5 therms/yr.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used. An expected useful life of 18 years is being used.

Tank/Pipe Wrap and Water Temperature Setpoint (RG-6)

This technology consists of checking and resetting the tank thermostat, and adding insulation to access pipes near the tank. These measures are principally tank-centric, and can be self-installed or by a site visit if the package is part of a broader program. Resetting the tank thermostat is also a safety issue because it can reduce scaling and burns due to too high a set temperature.

Measure Applicability

This measure applies to residential gas water heaters.

Incremental Cost

The cost of this treatment breaks down as $5 for materials and $5 for installation labor. For these purposes the measure cost is taken as $10 because these measures will typically be part of a larger program.

Average Annual Expected Savings

Based on prior experience and evaluation work on other programs it is estimated that the savings would be about 2 therms/yr.[69]

Expected Useful Life

The lifetime of these measures is potentially quite long. For practical purposes the lifetime will be considered limited by the expected remaining lifetime of the hot water tank, 6 years.[70]

Low Flow Fixtures (RG-7)

This technology consists of a new showerhead rated at 2.0 gallons/minute (gpm) at 80 pounds/square inch (psi) and a swivel aerator for the kitchen faucet and fixed aerators for the lavatory faucets. The current US standard for showerheads is 2.5 gpm. Measurements of the existing shower flows in building stock show a range of 2.75 gpm to 3.75 gpm with frequent individual cases in excess of 5 gpm. Evaluations have shown that programs that replace with 2.0 gpm heads have greater savings than programs that replace with the standard 2.5 gpm shower heads. Program shower heads should be 2.0 gpm at 80 psi and with a lifetime scaling and clogging warranty. It is important also to be cautious about the use of "pressure compensating" showerheads. These are more prone to clogging and can lead to unintentional increases in flow rate in low pressure situations such as well water systems or older systems with occluded piping. Customer acceptability is an important component in a showerhead program. Customers will remove new low flow showerheads if the quality of the showering experience declines with the new showerhead. Therefore it is important to research and test the showerhead chosen for the program carefully. In addition, the old showerhead must be removed from the premises to decrease the likelihood of having it reinstalled.

Measure Applicability

This measure is applicable to customers in the residential and small commercial sectors that heat water with gas.

Incremental Cost

Low flow fixture costs vary widely, and depend on whether the fixtures are purchased retail or in bulk. The costs for a bulk purchase for a showerhead and three aerators also have a wide range, about $8.00-$15.00/set. The most important feature of these fixtures is the long term acceptability and durability because these factors have a direct impact on the lifetime savings. With a long enough lifetime, this is such a cost effective measure that all prices in the range are quite cost effective. Because the cost of the showerhead varies significantly and quality is so important for this program, it is essential to test, choose and pay the price for a high quality showerhead. This measure is so cost effective that even with a more expensive showerhead the program will still remain cost

[69] Khawaja S. PhD and Reichmuth, H. PE., 1997. Impact Evaluation of PacifiCorp's Ebcons Multifamily Program. Pacificorp.
[70] DEER says 15 years for pipe insulation, 9 years for faucet aerators, and 15 years for an efficient water heater, so 6 years is conservative. The C&RD lists 10 years for a water heater with a minimum warranty of 10 years.

effective and a quality showerhead will ensure measure persistence. The installed cost will be taken as $25/residence.[71]

Average Annual Expected Savings

Field monitoring studies can demonstrate the flow savings, but ultimately the overall savings will be a combination of flow savings and the duration of use. The flow of the showerhead used has a significant impact on savings. This program is designed around a 2.0 gpm showerhead as compared to a 2.5 gpm showerhead. Therefore the savings will be more than the 120–133 kWh per unit listed in DEER. In addition the climate is different and the inlet water temperature is lower so the savings in this application will be greater. Several studies have measured final savings in terms of electric input to the tank, but usually these studies have included savings from comprehensive treatments including other measures including tank and pipe insulation, kitchen and bath lavatory aerators, tank thermostat set back, and leaky diverter replacement. Savings can very from program to program depending strongly on the choice of showerhead. Savings can also diminish with "takeback" in the event that the new showering experience is longer than the original. Actual savings observed in the comprehensive cases include these takeback effects, and are in the range of 650 to 950 kWh/yr in electric water heat applications. The savings from a showerhead and aerator change are taken as 27 therms/yr.

Expected Useful Life

The lifetime of this equipment is the key to its cost effectiveness. If an adequate, even pleasant, shower can be provided through lifetime warranted equipment, then the practical lifetime of the equipment is the length of time until the equipment is replaced in the course of renovation. For these purposes, lifetime is taken as 10 years.[72] Normally showerheads will last longer but with renovations and changes in ownership a 10 year expected useful life is a good planning number.

Tankless Water Heaters (RG-8, RG-9)

Water heating is one of the largest energy uses in the home. In the case of gas-heated water, the annual water heating energy is about 250 therms/yr. This measure saves energy by eliminating the standby energy losses attributable to a hot water storage tank. This measure with a typical residential sized unit may only heat a limited water flow of the order of 3 gpm. This is sufficient for most residential situations, but it may have difficulty supporting multiple simultaneous showers. In the case of gas water heating, this type of measure has greater energy savings and no troublesome demand savings, and the measure makes sense. In the context of a switch from an electric tank to an electric tankless heater, this measure makes no sense.

Measure Applicability

This measure is applicable in the residential sector only where space is a premium.

Incremental Cost

The incremental installed cost for this measure is $1,100 for a discretionary water heater and $500 for a required water heater.

Average Annual Expected Savings

The expected savings are 75 therms/year.

Expected Useful Life

This measure's expected useful life is 15 years.

Upgrade Furnace Efficiency (RG-10, RG-11, RG-12, RG-13, RG-14, RG-15, RG-16, RG-17)

This measure applies to more efficient gas space heating. Two levels of efficiency improvement are considered. The first level of improvement involves an improved burner system and electronic ignition. These improvements increase the efficiency, AFUE from 65 to 82%, and these are the efficiency improvements required to meet the

[71] The DEER Database lists measure costs as $22.946 per unit and $37.946 installed cost.
[72] DEER Database, 2005

1985 appliance efficiency standards. The next level of efficiency improvement takes the efficiency AFUE to 92% by condensing water vapor in the burner exhaust gas and reclaiming the otherwise vented energy. These eight measures all similarly refer to the replacement of a less efficient gas heater with a more efficient one. The range of options is intended to reflect the broad range of replacement options.

Measure Applicability

This measure is applicable to residential gas space heat.

Incremental Cost

The incremental cost for new gas heaters meeting the 82% AFUE standard is technically zero because that efficiency is the current code standard. But Measures RG-10 and RG-11 refer to a pre-emptive replacement and the full cost, $1,100, of the new code qualifying heater is used. Measures RG-12 and RG-13 refer to the replacement of a failed older heater with the highest efficiency better than code heater with an incremental cost of $750. Measures RG-14 through RG-17 refer to the use of the higher efficiency unit instead of the current standard with an incremental cost of $750.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the size of the residence. Based on simulations on different prototypes representing the most significant residential heating categories, we find gas savings in the range of 27-200 therms/yr as follows:

RG-10 pre-emptive replacement-AFUE 65 to 82-existing single family- savings=156 therms/yr
RG-11 pre-emptive replacement-AFUE 65 to 82-existing multi family- savings=98 therms/yr
RG-12 high efficiency replacement-AFUE 65 to 92-existing single family- savings=200 therms/yr
RG-13 high efficiency replacement-AFUE 65 to 92-existing multi family- savings=106 therms/yr
RG-14 high efficiency replacement-AFUE 82 to 92-new single family- savings=85 therms/yr
RG-15 high efficiency replacement-AFUE 82 to 92-new multi family- savings=55 therms/yr
RG-16 high efficiency replacement-AFUE 82 to 92-new small single family- savings=45 therms/yr
RG-17 high efficiency replacement-AFUE 82 to 92-new small multi family- savings=27 therms/yr

Expected Useful Life

A useful life of 25 years is used in this analysis for Measures RG-12 through RG-17 and 5 years for Measures RG-10 and RG-11.

Programmable Thermostats (RG-18)

Programmable thermostats save energy by lowering the average daily temperature of the inside of a building. Most of the energy savings is heating energy because that heating thermal load is much larger than the cooling load, but some energy savings in cooling energy will also be realized. Programmable thermostats are commonly sold for self-installation. But the installation has the following four important issues that need to be considered.

- Some thermostats are line voltage thermostats, and there is some shock hazard to the unaware.
- The first step in programming a thermostat is the system specification. Here the installer tells the thermostat what kind of a system it is controlling. The system type is selected from a list of about 30-50 different system types. This is a non-obvious choice.
- For system controls there are standard colored wires, but often hookups use non-standard wire. For the mechanically inclined this process is okay but for others it is daunting.
- Then, after it is installed successfully there is the issue of controlling it to get satisfactory results. Sometimes this needs a guiding hand.

The US DOE is planning to phase out programmable thermostats from the Energy Star program. The planned phase out is apparently related to recent evaluation studies that found insufficient savings to warrant the Energy Star designation. Proper installation and operation appear to be at the root of the lack of energy savings. We have chosen to leave these devices in our mix of EEMs and feel that with proper installation and setup the technology is sound. Our incremental cost includes the cost of installation over-and-above the off-the-shelf cost of programmable thermostats. Even with proper installation, there is an ongoing need for a design that is more user-friendly and easier to operate.

Measure Applicability

This measure is applicable to all gas and electric heating installations that do not have a programmable thermostat.

Incremental Cost

Programmable thermostats cost retail in the range of $50-$100. A utility program may be able to purchase in bulk. It may be necessary to have a range of options which include at least line voltage and low voltage. For these purposes we take $70 as the melded cost of the thermostats.[73] It is assumed here that thermostats will be installed as part of a site visit in a broader program with $50 allocated for installation labor. In total the installed cost will be taken as $120 per thermostat.[74] Some sites with line voltage thermostats may require more than one thermostat.

Average Annual Expected Savings

Thermostat savings are best realized when the set back interval is of the order of 8 hours or longer, and the amount of savings depends on the number of degrees the thermostat is set back. The rule of thumb is 1 percent heating savings for every degree the thermostat is set back for at least 8 hours. For this estimate a five degree thermostat set back is assumed, leading to heating savings in the average gas-heated home of 35 therms/yr.

Expected Useful Life

In principal, these thermostats can last for in excess of 13 years, but the backup batteries have a finite life and the programming can be changed or confused. In this case, the effective lifetime will be taken as 10 years.[75]

Proper HVAC Sizing (RG-19)

This measure applies to residential and small commercial gas-heated properties. It involves using rule-of-thumb engineering to avoid over-sizing the gas furnace. Oversized heating equipment can lead to energy losses through higher than necessary duct temperatures and losses and through unnecessary on/off cycling.

Measure Applicability

This measure is applicable to most of the residential stock.

Incremental Cost

The incremental cost of this measure is associated with the extra design consideration which is taken here to be $50. It is possible that the incremental cost is negative in the event that a significant over-sizing is avoided.

Average Annual Expected Savings

A gas-heated home will achieve 49 therms/yr annual savings according to our modeling.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used especially for the gaskets for the windows and doors. An expected useful life of 18 years is being used.

HVAC Tune-Up (RG-20)

This measure applies to residential gas heating. The furnace tune-up is accomplished in a brief visit that checks the filters with replacement, the burner with carbon monoxide (CO) check and combustion air, the controls including the fan delay, and air leaks where the ducts mate with the furnace.

[73] DEER lists the incremental cost as $56.30 and the installed cost as $73.33 per unit.
[74] DEER lists the incremental cost as $73.33 of which $56.37 is equipment cost and $16.96 is labor. This analysis uses $50 for the labor cost which accounts for some of the difference in the costs.
[75] DEER list the EUL as 12 years.

Measure Applicability

This measure is applicable to most of the residential stock.

Incremental Cost

The incremental cost of sending a technician to a home and performing a furnace tune-up is taken here to be $75/site.

Average Annual Expected Savings

Annual savings from the diverse tune-up measures are taken as 40 therms/yr, from weatherization impact analysis.

Expected Useful Life

The life of this measure is taken as 3 years.

Carbon Monoxide Remediation (RG-21)

This measure applies to residential gas heating. Part of a furnace tune-up is a check for carbon monoxide (CO) in the exhaust. Presence of carbon monoxide indicates incomplete combustion which is a significant furnace inefficiency. Carbon monoxide is also a significant health and safety hazard and should be eliminated in all cases. The remedy is usually an adjustment of the primary air to the burner or cleaning the burner. But in some cases the toxic carbon monoxide could find its way from the exhaust stream into the supply air through a cracked heat exchanger. A faulty heat exchanger is an immediate hazard and needs to be replaced immediately.

Measure Applicability

This measure is applicable to gas-heated residential stock.

Incremental Cost

The incremental cost of sending a technician to a home is taken here as $200. This cost does not include the cost of a new heat exchanger when one is indicated. The cost of the energy savings is attributed to the site cost of $200. Other costs are safety related.

Average Annual Expected Savings

Carbon monoxide remediation can have very significant savings in extreme cases, of the order of 250 therms/yr. But for this study we will take 117 therms/yr annual savings for this treatment.

Expected Useful Life

The life of the savings for this measure is taken as 10 years.

EE Windows (RG-22)

This measure involves increasing window insulation from a U value of 1.1 BTU/sqft/hr deg F to a U value of 0.45. This measure saves both heating and cooling energy. In the case of gas-heated residences, the electric savings are for cooling only and are much less than the heating savings. So the cost effective application of this measure is to electric-heated residences only.

Measure Applicability

This measure is considered applicable to a portion of residential customers that heat with gas.

Incremental Cost

We assume a cost of $25 per square foot of window area. DEER uses a value of $28.00/square foot of window area, and C&RD uses $16/square foot. For the average residence considered here with 100 square feet of window upgraded, the cost would be $2,500.

Average Annual Expected Savings

Savings from this measure are strongly dependent on the efficiency of the gas heat source and the square feet of windows replaced. Building simulations from DEK specific data show savings of 98 therms/yr for gas-heated residences and with an additional 400 kWh/yr cooling savings for gas-heated residences.

Expected Useful Life

This analysis uses an effective useful life of 25 years, the DEER uses 20 years.

Ceiling Insulation (RG-23, RG-24, RG-25)

This measure involves increasing ceiling insulation from R6 to the R30 level. This measure saves both heating and cooling energy. In the case of gas-heated residences, the electric savings are for cooling only and are much less than the heating savings. So the cost effective application of this measure is to gas-heated residences only.

Measure Applicability

This measure is considered applicable to all residences heated with gas.

Incremental Cost

DEER uses a value of $0.757/square foot of wall area. This job includes the cost of providing for adequate attic venting. For this analysis three levels of insulation and costs are considered:

Measure RG-23 (R11 to R38 ceiling insulation) is $1,000,
Measure RG-24 (R30 to R38 ceiling insulation) is $500, and
Measure RG-25 (R19 to R38 ceiling insulation) is $750.

Average Annual Expected Savings

Savings from this measure are dependent on the efficiency of the heat source. The stock to which this measure is applied consists primarily of post-1985 furnaces with an assumed AFUE of 85%. Annual energy savings are considered in three levels:

Measure RG-23 (R11 to R38 ceiling insulation) is 105 therms/yr,
Measure RG-24 (R30 to R38 ceiling insulation) is 50 therms/yr, and
Measure RG-25 (R19 to R38 ceiling insulation) is 70 therms/yr.

In addition to gas savings, there are 127 kWh/yr cooling savings.

Expected Useful Life

This analysis uses an effective useful life of 25 years. The DEER uses 20 years.

House Sealing Using Blower Door (RG-26)

This measure applies to residential gas-heated properties. It involves using blower door technology to pressurize the home. Once the house is pressurized, the air leaks are identified and sealed with appropriate materials to decrease heat loss from the building envelope.

Measure Applicability

This measure is applicable to most of the residential stock.

Incremental Cost

The incremental cost of sending a technician to a home and performing a Blower Door test and sealing the identified leaks is assumed here to be $500 per 1,000 square foot home. By comparison, the C&RD database lists $0.16 per 0.1 air change per square foot which translates to $320 per house with 0.2 air changes per square foot.

Average Annual Expected Savings

A gas-heated home will achieve 75 therms/yr annual savings according to our modeling. In addition there will be 127 kWh/yr in cooling electric savings.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used especially for the gaskets for the windows and doors. An expected useful life of 13 years is being used. DEER lists 13 years and C&RD lists 20.

Refrigeration Charge and Duct Tune-Up (RG-27)

This measure is designed to save gas and electric energy by increasing the operating efficiency of distribution system (ducts), and the refrigerant system by insuring that it is properly charged. It is common in residential cooling or heat pump systems to have an incorrect amount of refrigerant charge because these systems are usually charged on-site during installation. But the principal savings, gas and electric, for this measure proceed from finding and sealing duct leaks which increases the system distribution efficiency.

Measure Applicability

This measure is applicable to most of the residential stock. Notably even new installations can benefit from this measure.

Incremental Cost

The incremental cost of this measure pays for a visit by a specially trained HVAC technician. For this analysis this cost is taken as $350.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the size of the residence. Based on simulations we find savings of 50 therms/yr and 295 kWh/yr on a gas-heated residence with central air conditioning.

Expected Useful Life

This is measure is considered here to have a useful life of 13 years.

Wall and Floor Insulation (RG-28, RG-29, RG-30)

This measure involves increasing wall surface insulation. This measure saves both heating and cooling energy. In the case of gas-heated residences, the electric savings are for cooling only and are much less than the heating savings.

Measure Applicability

This measure is considered applicable to a portion of the residential customers that heat with gas.

Incremental Cost

This measure contemplates adding wall insulation to a 2x4 stud wall where there is none. We assume a cost of $1.25/square foot of wall area. DEER uses a value of $1.32/square foot of wall area. The DEER values are based on going from an R0 to an R13, the equipment costs are given as $0.15 for equipment and $1.17 for labor resulting in the overall cost of $1.32. Our cost estimate is considered to apply to three levels of insulation:

Measure RG-28 (R0 to R11 wall insulation) is $1,400,
Measure RG-29 (R11 to R19 wall insulation) is $1,750, and
Measure RG-30 (floor/basement insulation) is $1,000.

Average Annual Expected Savings

Savings from this measure are dependent on the efficiency of the heat source. The savings are differentiated by three levels of insulation:

Measure RG-28 (R0 to R11 wall insulation) is 140 therms/yr,
Measure RG-29 (R11 to R19 wall insulation) is 195 therms/yr, and
Measure RG-30 (floor/basement insulation) is 98 therms/yr.

There are also cooling electric savings of 127 kWh/yr.

Expected Useful Life

This analysis uses an effective useful life of 25 years, the DEER uses 20 years.

Energy Star Construction (RG-31)

An Energy Star qualified new home is required to be 15 percent more efficient than a similar home that meets the 2004 International Energy Conservation Code, IECC. The mechanism for estimating Energy Star compliance is through the use of a HERS (Home Energy Rating System) score calculated from a brief estimate of annual energy use. The all fuel savings proceed principally from heating, cooling, lighting and water heating savings.

Measure Applicability

This measure is applicable to all new residential construction. But for the purposes of this study the measure is restricted to new residential gas-heated construction.

Incremental Cost

The incremental cost for this measure consists of the increased cost of building components such as insulation, windows, lighting and appliances. This cost is site specific, and there is some choice in selecting the package of measures. An initial cost effectiveness screening of this measure showed that the maximum cost effective cost is $3,000. This requires composing a package of only the most cost effective measures. Therefore this package includes the strongly cost effective measures of flow efficient showerheads and inspection of duct work that are not commonly part of the Energy Star package (but should be). Based on the choice of the most cost effective measures, the cost used for this study is $3,000. This measure includes electric efficiency measures and will have both gas and electric savings.

Average Annual Expected Savings

The savings from this measure are specifically site modeled, estimates for this region are in the range of 250-350 therms/yr. For this study, the savings is assumed to be 285 therms/yr. In addition to the gas savings there are 880 kWh/yr savings principally from lighting and cooling energy savings.

Expected Useful Life

This measure has a useful life comparable to that of new construction and, for this study, is taken as 50 years.

Solar Siting Passive Design (RG-32)

This measure applies to new construction that can be designed and sited to capture solar gain through windows in order to displace space heating. In a new building, the cost of proper orientation and of solar design is small to non-existent if the orientation and design decisions are made before construction starts.

It is well known that if a new residence is tightly designed thermally, and oriented so that about 75-100 feet of glazing is near south facing, then its heating requirements can be reduced by about 30 percent. Much larger heating reductions have been demonstrated, but then the designs need to become more extreme with respect to south glass and with respect to protection from unwanted summer sun. This measure is intended to represent a "minimum graceful design", yielding the maximum savings with the least departure from a normal residential appearance. Physically, this measure consists of re-orienting and re-distributing glazing that would have been used anyway, and in using proper overhang to provide some summer shade. In passive solar design, the south glazing should usually have a high solar heat gain factor. This is an unusual glazing specification for current residential applications because most residential glazing is intended to reject solar gain for cooling purposes. Passive solar design also includes increasing the thermal mass, such as floor tile, adjacent to south facing glazing. The thermal mass of the existing sheetrock and furniture etc in a building also plays a role in thermal storage. Building codes generally try to discourage excessive glazing and solar gain, but they allow for exceptions where thermal design has been explicitly considered and documented.

Measure Applicability

This measure is applicable to new and rebuilt gas-heated construction with suitable solar exposure.

Incremental Cost

This measure is considered a minimum passive design, and it essentially consists of a redistribution or reorientation of materials that would have been used anyway. The cost of this measure is taken as the cost for the information or advice necessary to "tune the design to the sun". The cost for this measure is taken here as $500 per building. Not very much needs to be done to capture these minimal passive solar heating savings, especially if it is done at the outset. The context for this incremental cost is assumed to be to a developer for some extra consideration in overall site planning.

In many reported cases of solar design, the cost is many times this and the building is usually much more expensive as well, but these costs are the common costs associated with personalized new construction, not particularly related to solar design.

Average Annual Expected Savings

The annual savings for this measure are taken as 90 therms/yr.

Expected Useful Life

This measure will last the life of the building which can easily be 50 years or more. For this analysis, the measure life is taken as 50 years.

APPENDIX F. NON-RESIDENTIAL GAS EEM DOCUMENTATION

The purpose of this appendix is to provide documentation of the assumptions used to screen the Commercial Energy Efficiency Measures identified for consideration in this report. Our assumptions are based on references cited throughout this section as well as the direct experience of our team with technologies in the field and actual DSM program evaluations. While not all of the field and DSM program experience can be cited in published works, published references are used to establish a reasonable range of assumptions. The point estimate used within that range is based on our professional opinion. The mapping of EEM to non-residential DSM programs is shown in the table below.

Table 88. Mapping of Gas EEM to Non-Residential DSM Programs

Program #			**5**	**6**	**7**	**8**	**9**
End-Uses	**EEM Description**	**EEM Ref #**	**C&I Rebates**	**C&I Peak Retro-Com Lite**	**C&I HVAC Opt**	**C&I Audit**	**C&I New Constr**
Appliance Improvements	Solar Water Heater	CG-1					
	Low Flow Fixtures	CG-2					
	EE Water Heater with EF >= 0.6	CG-3	0.030				
	Energy Star Gas Oven	CG-4	0.002				
	ES Gas Stove	CG-5	0.002				
	ES Gas Clothes Dryer	CG-6	0.002				
	Commissioning Audit	CG-7				0.48	
Shell Efficiency	Roof Insulation	CG-8					
	Low-E Windows 1500 ft2	CG-9					
	Low-E Windows 1500 ft2 Replace	CG-10					
	Ceiling Insulation (R11 to R38)	CG-11					
	Ceiling Insulation (R30 to R38)	CG-12					
	Ceiling Insulation (R19 to R38)	CG-13					
	House Sealing using Blower Door	CG-14					
	Duct Seal	CG-15					
	Wall Insulation (R0 to R11)	CG-16					
	Wall Insulation (R11 to R19)	CG-17					
	Floor/Basement Insulation	CG-18					
Furnace Efficiency	EE Boiler	CG-19	0.008				
	Proper HVAC Sizing	CG-20					
	HVAC Tune-Up	CG-21					
	CO Remediation	CG-22					
	Integrated Building Design	CG-23					
	AFUE 82 to 92 SFe	CG-24	0.017				
	AFUE 65 to 92 SFe	CG-25					
Controls	Commissioning - New	CG-26					
	Re/Retro-Commissioning	CG-27					
	Controls	CG-28					
	Programmable Thermostats	CG-29	0.050				

Solar Water Heaters (CG-1)

Commercial water heating can vary significantly in scale from minor lavatory use in offices to major washing uses in restaurants and bathing uses in lodging. The most cost effective applications of solar water heat in the commercial context will be associated with high hot water use, and sites with very low hot water use will be unsuitable. For the commercial context we are assuming a hot water load of about twice the size of a residential hot water load, about 500 therms/yr. Countless demonstration cases have shown that solar energy can supply all or a portion of this heating. The portion of the water heating load assumed by a solar water heater depends on the size of the solar water heater in relation to the size of the load. Field experience has shown that the best combination of system size to load favors the more moderately sized systems that can fully meet the summer water heat load, but that only meet about 40-50 percent of the non summer load. In physical terms, this is a system consisting of about 64-128 square feet of solar collector and an additional 80 gallon heated water storage tank and appropriate pumps and controls.

Measure Applicability

This measure is intended to apply to small commercial customers with gas-heated hot water.

Incremental Cost

The installation of a solar water heating system involves a mix of building skills including plumbing, electrical, roofing and general carpentry. In the general market, a turn key residential installation for one of these systems is in the range of $5,000 to $7,000. For this study we will take the cost to be $10,000 for an oversized system.

Average Annual Expected Savings

The savings from solar water heaters depend on site specifics, principally solar insulation, air temperature, incoming water temperature, and hot water usage rate. Considering these dependencies for the DEK service area, leads to average annual savings for a system sized and designed to be in the cost effective range to be 300 therms/yr.

Expected Useful Life

Solar water heating systems are essentially plumbing fixtures that are certified products (SRCC) and are often inspected by local building officials. A well designed system will have a lifetime in excess of 25 years, even though the system will take some intermediate maintenance such as inspecting the pump and fluid level. This study will take 25 years as the useful life.

Low Flow Fixtures (CG-2)

This technology consists of a new showerhead rated at 2.0 gallons/minute (gpm) at 80 pounds/square inch (psi) and a swivel aerator for the kitchen faucet and fixed aerators for the lavatory faucets. The current US standard for showerheads is 2.5 gpm. Measurements of the existing shower flows in building stock show a range of 2.75 gpm to 3.75 gpm with frequent individual cases in excess of 5 gpm. Evaluations have shown that programs that replace with 2.0 gpm heads have greater savings than programs that replace with the standard 2.5 gpm shower heads. Program shower heads should be 2.0 gpm at 80 psi and with a lifetime scaling and clogging warranty. It is important also to be cautious about the use of "pressure compensating" showerheads. These are more prone to clogging and can lead to unintentional increases in flow rate in low pressure situations such as well water systems or older systems with occluded piping. Customer acceptability is an important component in a showerhead program. Customers will remove new low flow showerheads if the quality of the showering experience declines with the new showerhead. Therefore it is important to research and test the showerhead chosen for the program carefully.

Measure Applicability

This measure is applicable to commercial customers with significant hot water heating loads due to extensive showering activity; such as, schools, hotels, health clubs, etc.

Incremental Cost

Low flow fixture costs vary widely, and depend on whether the fixtures are purchased retail or in bulk. The costs for a bulk purchase for a high quality low flow showerhead are about $10/unit, and the installation labor is taken as $15/unit. The most important feature of these fixtures is the long term acceptability and durability because these factors have a direct impact on the lifetime savings. With a long enough lifetime, this is such a cost effective measure that all prices in the range are quite cost effective. Because the cost of the showerhead varies significantly and quality is so important for this program, it is essential to test, choose and pay the price for a high quality showerhead. A quality showerhead will also ensure measure persistence. The commercial context here assumes the installation of 40 units. The installed cost will be taken as $1000/site.

Average Annual Expected Savings

The savings from a large-scale showerhead change are taken as 600 therms/yr. It should be noted that the savings can vary significantly with shower usage.

Expected Useful Life

The lifetime of this equipment is the key to its cost effectiveness. If an adequate, even pleasant, shower can be provided through lifetime warranted equipment, then the practical lifetime of the equipment is the length of time until the equipment is replaced in the course of renovation. For these purposes, lifetime is taken as 10 years.[76] Normally showerheads will last longer but with renovations and changes in ownership a 10 year expected useful life is a good planning number.

EE Water Heater (CG-3)

This measure applies commercial installations with significant gas water heating. The more efficient gas water heater, essentially a 90% efficient boiler, will have thicker tank insulation and a more efficient burner system.

Measure Applicability

This measure is applicable to commercial stock with high hot water heating loads.

Incremental Cost

An incremental cost of $3,500 is associated with the more efficient water heater.

Average Annual Expected Savings

A more efficient water heater will achieve 500 therms/yr annual savings.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used. An expected useful life of 15 years is being used.

Efficient Gas Oven (CG-4)

This measure applies to gas cooking ovens. Savings proceed from the fact that this is a slightly more efficient energy star rated commercial appliance that is heavily used. It involves heavier insulation and spark or other ignition of burners and oven thereby saving the gas used in the pilot light. This is a common feature of most new appliances.

Measure Applicability

This measure is applicable to commercial cooking applications.

Incremental Cost

The incremental cost of this measure is taken as $5,000.

[76] DEER Database, 2005

Average Annual Expected Savings

This measure will save 616 therms/yr.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used. An expected useful life of 15 years is being used.

Efficient Gas Stove (CG-5)

This measure applies to commercial gas cooking stoves. Savings proceed from the fact that this is a slightly more efficient Energy Star rated commercial appliance that is heavily used. It involves heavier insulation and spark or other ignition of burners and oven thereby saving the gas used in the pilot light.

Measure Applicability

This measure is applicable to commercial gas cooking.

Incremental Cost

The incremental cost of this measure is taken as $4,000.

Average Annual Expected Savings

This measure will save 462 therms/yr.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used. An expected useful life of 15 years is being used.

Efficient Gas Clothes Dryer (CG-6)

This measure applies to commercial gas clothes dryers. The more efficient gas clothes dryers are larger and can process more clothes in a single load, and use more sophisticated controls to avoid over-drying the load resulting in shorter cycles and lower dryer energy use.

Measure Applicability

This measure is applicable to commercial laundry applications.

Incremental Cost

The incremental cost of this measure is taken here as $4,000.

Average Annual Expected Savings

This measure is expected to save 539 therms/yr annually.

Expected Useful Life

An expected useful life of 15 years is being used.

Commissioning Audit (CG-7)

This measure applies to a walk-through audit of a commercial kitchen. The process in a commercial kitchen is usually frenzied, and details such as unnecessary appliances turned on, leaky faucets, and jury rigged controls are of much lower priority than the kitchen operations. A walk-through audit by a competent auditor will usually reveal several small problems that are easy to ignore individually but that can add up to significant savings taken together.

Measure Applicability

This measure is applicable to commercial kitchens that use gas.

Incremental Cost

The incremental cost of this measure is taken here as $1,794.

Average Annual Expected Savings

This measure is expected to save 400 therms/yr annually.

Expected Useful Life

An expected useful life of 5 years is being used.

Roof Insulation (CG-8)

This measure applies to commercial space heating. Both heating and cooling energy is saved by adding roof insulation during a re-roofing or during initial construction.

Measure Applicability

This measure is applicable to gas-heated commercial stock.

Incremental Cost

The incremental cost of this measure is taken here as $1,875.

Average Annual Expected Savings

This measure is expected to save 600 therms/yr annually.

Expected Useful Life

An expected useful life of 25 years is being used.

EE Windows (CG-9, CG-10)

This measure involves increasing window insulation from a U value of 1.1 BTU/sqft/hr deg F to a U value of 0.45. This measure saves both heating and cooling energy. In the case of gas-heated residences, the electric savings are for cooling only and are much less than the heating savings. So the cost effective application of this measure is to electric-heated sites only.

Measure Applicability

This measure is considered applicable to most residential and commercial customers that have single-pane glass windows.

Incremental Cost

We assume a total cost of $25/square foot of window area. DEER uses a value of $28/square foot of window area, and C&RD uses a value of $16/square foot. For new construction we assume an incremental cost of 30 percent of total cost. For the average site considered here, we assume replacement EE windows (CG-10) at the total cost, $7,500/site. For an EE window upgrade in new construction (CG-9), a 30 percent incremental cost of $2,250 is assumed.

Average Annual Expected Savings

Savings from this measure are dependent on the efficiency of the gas heat source and the square feet of windows replaced. Simulations from DEK specific data show savings of 400 therms/yr for an average gas-heated commercial building and with an additional 600 kWh/yr cooling savings.

Expected Useful Life

This analysis uses an effective useful life of 25 years; the DEER uses 20 years.

Ceiling Insulation (CG-11, CG-12, CG-13)

This measure involves increasing ceiling insulation from R6 to the R30 level. This measure saves both heating and cooling energy. In the case of gas-heated commercial spaces, the electric savings are for cooling only and are much less than the heating savings.

Measure Applicability

This measure is considered applicable to all non-residential buildings heated with gas.

Incremental Cost

We assume a cost of $0.75/sqft of wall area and 1,000 square feet of ceiling space for a total cost of $750. DEER uses a value of $0.757 per square foot of wall area. This job includes the cost of providing for adequate attic venting. For this analysis three levels of insulation and costs are considered:

Measure CG-11 (R11 to R38) is $1,875,
Measure CG-12 (R30 to R38) is $1,250, and
Measure CG-13 (R19 to R38) is $1,875.

Average Annual Expected Savings

Savings from this measure are dependent on the efficiency of the heat source. The stock to which this measure is applied consists primarily of post-1985 furnaces with an assumed AFUE of 85%. Annual energy savings are considered in three levels:

Measure CG-11 (R11 to R38) is 600 therms/yr,
Measure CG-12 (R30 to R38) is 69 therms/yr, and
Measure CG-13 (R19 to R38) is 300 therms/yr.

In addition to gas savings, there are 127 kWh/yr cooling savings.

Expected Useful Life

This analysis uses an effective useful life of 25 years. The DEER uses 20 years.

House Sealing Using Blower Door (CG-14)

This measure applies to smaller commercial gas-heated properties. It involves using blower door technology to pressurize the building. Once the building is pressurized, the air leaks are identified and sealed with appropriate materials to decrease heat loss from the building envelope. This is essentially a procedure used widely on residences; in this commercial application, the sites are residential scale, as are most small commercial sites.

Measure Applicability

This measure is applicable to most of the gas-heated small commercial stock.

Incremental Cost

The incremental cost of sending a technician to a site and performing a Blower Door test and sealing the identified leaks is assumed here to be $300 per 1,000 square foot site. By comparison, the C&RD database lists $0.16 per 0.1 air change per square foot. For this commercial application we will take $500 as the average cost.

Average Annual Expected Savings

A gas-heated commercial space will achieve 69 therms/yr annual savings according to our modeling. In addition there will be 150 kWh/yr in cooling electric savings.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used especially for the gaskets for the windows and doors. An expected useful life of 13 years is being used. DEER lists 13 years and C&RD lists 20.

Refrigeration Charge and Duct Tune-Up (CG-15)

This measure is designed to save gas and electric energy by increasing the operating efficiency of distribution system (ducts), and the refrigerant system by insuring that it is properly charged. It is common in cooling or heat pump systems to have an incorrect amount of refrigerant charge because these systems are usually charged on-site during installation. But the principal savings, gas and electric, for this measure proceed from finding and sealing duct leaks which increases the system distribution efficiency.

Measure Applicability

This measure is applicable to small commercial stock that heats with gas. Notably even new installations can benefit from this measure. This measure is intended to apply to the significant portion of the small commercial stock that is similar to and of residential scale.

Incremental Cost

The incremental cost of this measure pays for a visit by a specially trained HVAC technician. For this analysis this cost is taken as $350.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the size of the site. Based on simulations we find savings of 60 therms/yr and 295 kWh/yr electric air conditioning savings.

Expected Useful Life

This is measure is considered here to have a useful life of 13 years.

Wall and Floor Insulation (CG-16, CG-17, GC-18)

This measure involves increasing wall surface insulation. This measure saves both heating and cooling energy. In the case of gas-heated commercial spaces, the electric savings are for cooling only and are much less than the heating savings.

Measure Applicability

This measure is considered applicable to a portion of the non-residential customers that heat with gas.

Incremental Cost

This measure contemplates adding wall insulation to a 2x4 stud wall where there is none. We assume a cost of $1.25/square foot of wall area for CG-16, and $1.75/square foot for CG-17, and $1.40/square foot for CG-18. DEER uses a value of $1.32/square foot of wall area. The DEER values are based on going from an R0 to an R13, the equipment costs are given as $0.15 for equipment and $1.17 for labor resulting in the overall cost of $1.32. Our estimate is for 2,500 square feet of wall, and applies to three levels of insulation:

Measure CG-16 (R0 to R11 wall insulation) is $3,125;
Measure CG-17 (R11 to R19 wall insulation) is $4,375; and
Measure CG-18 (floor/basement insulation) is $1,400.

Average Annual Expected Savings

Savings from this measure are dependent on the efficiency of the heat source. The savings are differentiated by three levels of insulation:

Measure CG-16 (R0 to R11 wall) is 259 therms/yr,
Measure CG-17 (R11 to R19 wall) is 346 therms/yr, and
Measure CG-18 (floor/basement insulation) is 173 therms/yr.

There are also cooling electric savings of 127 kWh/yr.

Expected Useful Life

This analysis uses an effective useful life of 25 years; the DEER uses 20 years.

EE Boiler (CG-19)

This measure applies to commercial gas water heating. The more efficient gas boiler will have thicker tank insulation and a significantly more efficient burner system, leading to heating efficiencies in the range of 92-95 percent.

Measure Applicability

This measure is applicable to large commercial stock with large water or space heat loads.

Incremental Cost

An incremental cost of $20,000 is associated with the more efficient water heater.

Average Annual Expected Savings

A more efficient water heater will achieve 2,400 therms/yr annual savings according to our modeling.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used. An expected useful life of 20 years is being used.

Proper HVAC Sizing (CG-20)

This measure applies to residential and small commercial gas-heated properties. It involves using rule-of-thumb engineering to avoid over-sizing the gas furnace. Oversized heating equipment can lead to energy losses through higher than necessary duct temperatures and losses and through unnecessary on/off cycling.

Measure Applicability

This measure is applicable to most small commercial stock.

Incremental Cost

The incremental cost of this measure is associated with the extra design consideration which is taken here to be $0. It is possible that the incremental cost is negative in the event that a significant over-sizing is avoided.

Average Annual Expected Savings

A gas-heated commercial space will achieve 385 therms/yr annual savings.

Expected Useful Life

The life of the savings for this measure depends on the quality of the materials used, especially for the gaskets for the windows and doors. An expected useful life of 18 years is being used.

HVAC Tune-Up (CG-21)

This measure applies to small commercial gas heating. The furnace tune-up is accomplished in a brief visit that checks the filters with replacement, the burner with carbon monoxide (CO) check and combustion air, the controls including the fan delay, and air leaks where the ducts mate with the furnace.

Measure Applicability

This measure is applicable to most gas-heated small commercial stock.

Incremental Cost

The incremental cost of sending a technician to a site and performing a furnace tune-up is taken here to be $300/site. In a best case this cost can be spread over several package rooftop units which are often serving each commercial space. But for this analysis we assume the conservative case where there is only one unit at a site.

Average Annual Expected Savings

Annual savings from the diverse tune-up measures are taken as 154 therms/yr.

Expected Useful Life

The life of this measure is taken as 3 years.

Carbon Monoxide Remediation (CG-22)

This measure applies to commercial gas heating. Part of a furnace tune-up is a check for carbon monoxide (CO) in the exhaust. Presence of carbon monoxide indicates incomplete combustion which is a significant furnace inefficiency. Carbon monoxide is also a significant health and safety hazard and should be eliminated in all cases. The remedy is usually an adjustment of the primary air to the burner or cleaning the burner. But in some cases the toxic carbon monoxide could find its way from the exhaust stream into the supply air through a cracked heat exchanger. A faulty heat exchanger is an immediate hazard and needs to be replaced immediately.

Measure Applicability

This measure is applicable to gas-heated commercial stock.

Incremental Cost

The incremental cost of sending a technician to a site is taken here as $400. This cost does not include the cost of a new heat exchanger when one is indicated. The cost of the energy savings is attributed to the site cost of $400. Other costs are safety related.

Average Annual Expected Savings

Carbon monoxide remediation can have very significant savings in extreme cases, of the order of several hundred therms/yr. But for this study we will take 231 therms/yr annual savings for this treatment.

Expected Useful Life

The life of the savings for this measure is taken as 10 years.

Energy Star Construction (CG-23)

An Energy Star qualified new home is required to be 15 percent more efficient than a similar home that meets the 2004 International Energy Conservation Code, IECC. The mechanism for estimating Energy Star compliance is through the use of a HERS (Home Energy Rating System) score calculated from a brief estimate of annual energy use. The all fuel savings proceed principally from heating, cooling, lighting and water heating savings. In the commercial context the Energy Star new building has the better Energy Star insulation and glazing details.

Measure Applicability

This measure is applicable to all new gas-heated small commercial construction.

Incremental Cost

The incremental cost for this measure consists of the increased cost of building components such as insulation, windows, and lighting. The incremental cost is taken here at $3,000. This measure includes electric efficiency measures and will have both gas and electric savings.

Average Annual Expected Savings

For this study, the savings is assumed to be 518 therms/yr for a building that is essentially large commercial scale. In addition to the gas savings there are 880 kWh/yr savings principally from lighting and cooling energy savings.

Expected Useful Life

This measure has a useful life comparable to that of new construction and, for this study, is taken as 50 years.

Upgrade Furnace Efficiency (CG-24, CG-25)

This measure applies to more efficient gas space heating. Two levels of efficiency improvement are considered. The first level of improvement (CG-25) involves taking an old, pre-1985 gas space heater, and replacing with a modern high efficiency 92% AFUE furnace. The second level of improvement (CG-24) involves replacing an 82%

AFUE unit with a modern high efficiency 92% AFUE furnace. These two options are intended to reflect the principal heating efficiency improvement options.

Measure Applicability

This measure is applicable to gas space heated small commercial premises.

Incremental Cost

These incremental costs refer to a larger than residential scale furnace. For both measures CG-24 and CG-25 the cost is taken as $750.

Average Annual Expected Savings

The average annual expected savings from this measure depends on the size of the site. We assume average savings of 846 therms/yr for CG-24, and 1,539 therms/yr for CG-25.

Expected Useful Life

A useful life of 15 years is used in this analysis.

Commissioning - New (CG-26)

This measure applies to commercial gas heating. The commissioning refers to exercising and validating the controls. Newer building controls often employ demand control ventilation to limit non-occupied ventilation during non-occupied heating. These more sophisticated controls use carbon dioxide sensors and control linkages that require a careful on site check out. The commissioning process also includes a measurement and check of duct leaks.

Measure Applicability

This measure is applicable to larger gas-heated commercial stock.

Incremental Cost

The incremental cost of sending a technician to a site to perform a furnace commissioning is taken here to be $2,500/site.

Average Annual Expected Savings

Annual savings from new commissioning are taken as 1,000 therms/yr.

Expected Useful Life

The life of this measure is taken as 5 years.

Retro-Commissioning (CG-27)

This measure applies to commercial gas space and water heating. Retro-Commissioning starts with an analytical review of past billing information, and follows any indications of excess energy use with site inspection and remedy.

Measure Applicability

This measure is applicable to most of the small- and medium-sized commercial stock.

Incremental Cost

The incremental cost of sending a technician to a site and performing a furnace tune-up is taken here to be $1,500/site.

Average Annual Expected Savings

Annual savings from the diverse commissioning corrections are taken as 650 therms/yr.

Expected Useful Life

The life of this measure is taken as 5 years.

Controls (CG-28)

This measure applies to larger scale commercial gas and water heating. The need for a controls audit is prompted by high energy use evident in the less detailed Retro-Commissioning. In large facilities the control of ventilation air has a significant effect on heating energy, as does the control of hot water recirculation and reheat. At any site the control options are bound to be quite diverse, but post occupancy inspections have repeatedly found improper control operation to be the cause of significant energy inefficiency. Some of the most serious inefficiencies involve interactions between the heating and cooling systems, referred to as reheat. Therefore, an inspection of gas heating controls will usually involve a review of the overall control system including the cooling and lighting controls. A controls review is best done in the all fuels context.

Measure Applicability

This measure is applicable to most of the larger commercial stock.

Incremental Cost

The incremental cost of sending a technician to a site and performing a comprehensive controls inspection is taken here to be $4,500/site.

Average Annual Expected Savings

Annual savings from the diverse controls corrections are taken as 2,000 therms/yr.

Expected Useful Life

The life of this measure is taken as 15 years.

Programmable Thermostats (CG-29)

Programmable thermostats save energy by lowering the average daily temperature of the inside of a building. Most of the energy savings is heating energy because that heating thermal load is much larger than the cooling load, but some energy savings in cooling energy will also be realized. Programmable thermostats are commonly sold for self-installation. But the installation has the following four important issues that need to be considered.

- Some thermostats are line voltage thermostats, and there is some shock hazard to the unaware.
- The first step in programming a thermostat is the system specification. Here the installer tells the thermostat what kind of a system it is controlling. The system type is selected from a list of about 30-50 different system types. This is a non-obvious choice.
- For system controls there are standard colored wires, but often hookups use non-standard wire. For the mechanically inclined this process is okay but for others it is daunting.
- Then, after it is installed successfully there is the issue of controlling it to get satisfactory results. Sometimes this needs a guiding hand.

The US DOE is planning to phase out programmable thermostats from the Energy Star program. The planned phase out is apparently related to recent evaluation studies that found insufficient savings to warrant the Energy Star designation. Proper installation and operation appear to be at the root of the lack of energy savings. We have chosen to leave these devices in our mix of EEMs and feel that with proper installation and setup the technology is sound. Our incremental cost includes the cost of installation over-and-above the off-the-shelf cost of programmable thermostats. Even with proper installation, there is an ongoing need for a design that is more user-friendly and easier to operate.

Measure Applicability

This measure is applicable to all gas and electric heating installations that do not have a programmable thermostat.

Incremental Cost

Programmable thermostats cost retail in the range of $50-$100. A utility program may be able to purchase in bulk. It may be necessary to have a range of options which include at least line voltage and low voltage. For these purposes we take $70 as the melded cost of the thermostats.[77] It is assumed here that thermostats will be installed as part of a site visit in a broader program with $50 allocated for installation labor. In total the installed cost will be taken as $120 per thermostat.[78] In this commercial context it is assumed that two thermostats are used, leading to a site cost of $240.

Average Annual Expected Savings

For this estimate a five degree thermostat set back is assumed, leading to heating savings in the average gas-heated small commercial premise of 207 therms/yr.

Expected Useful Life

In principal, these thermostats can last for in excess of 20 years, but the backup batteries have a finite life and the programming can be changed or confused. In this case, the effective lifetime will be taken as 13 years.[79]

[77] DEER lists the incremental cost as $56.30 and the installed cost as $73.33 per unit.
[78] DEER lists the incremental cost as $73.33 of which $56.37 is equipment cost and $16.96 is labor. This analysis uses $50 for the labor cost which accounts for some of the difference in the costs.
[79] DEER list the EUL as 12 years.

APPENDIX G. SEGMENTATION AND CIS SAMPLING PLAN

In order to accurately understand the nature of loads and DSM opportunities, we start by disaggregating Duke Energy customers into smaller groups of customers. These customer segments are chosen so that customers with similar energy attributes can be grouped for modeling purposes.

Customer Segments

Duke Energy provided extracts from their customer information system (CIS) and other databases that included information for segmenting retail customers in the DEK service area. Segments were developed using the data provided and the following rules-based approach:

1. Sum 2007 customer usage (kW, kWh and therms) for each site.
2. Group customers based on electric rate codes
   a. Residential (Electric rates: RS, ORH, HEC, TD, CUR and TD. Gas rates: RS, FTRS and FTRT)
   b. Non-Residential (rate codes other than those listed in 2 (a))
3. Residential customers were then grouped into housing type and vintage.
   a. Housing type was created from 4 customer address columns. Data from the address columns was used because housing type was not provided by the CIS extracts.
      i. Single Family: Customers with null values in address fields used for apartment numbers (Address Line2-Address Line 4).
      ii. Multi Family: Customers with populated values (excluding "Barn/Lot") in address fields used for apartment numbers (Address Line2-Address Line 4).
   b. Vintage based on Year Built column from Real Estate extract. (Note: The importance of delineating between new and existing stock is to describe and contrast current construction practices. The cutoff is somewhat arbitrary)
      i. New construction (2004 and after)
      ii. Existing stock (prior to 2004)
4. Non-residential customers were then grouped by load and SIC (from Donnelley business data extract).
   a. Customers with exceptionally small loads were assigned the small loads segment (less than 3,000 kWh over a recent 12-month period unadjusted for weather).
   b. Customers not classified in the small load were assigned segments based on their SIC code.

The segmentation strategy is shown in the table below.

Residential (based on rate code)			**Non-Residential (based on rate code)**
Single Family New Construction	Single Family Existing		Manufacturing and Non-Manufacturing Segments Based on SIC
Multi Family New Construction	Multi Family Existing		Small Loads (< 3,000 kWh/year)

Commercial segment assignments, based on SIC code, are shown in the table below.

SIC Code	Business Type Assignment
01 – 17	Agriculture, Mining and Construction
20 – 39	Manufacturing
42, 50 and 51	Warehouse
54	Grocery
58	Eating/Drinking
70	Hotels
80 (except 806)	Health Services (excludes hospitals)
806	Hospitals
82	Schools
52 – 59 nec	Retail
40 – 98 nec	Office
All other SIC	Other
nec=not elsewhere classified	

Observations:

- Vintage of construction is determined from real estate data rather than information from CIS. Real estate data provide better coverage in single family than multi family. Hence, multi family new construction is not well identified in the underlying data or resulting segmentation.
- There are nearly 9,800 non-residential electric customer sites with less than 3,000 kWh of annual usage, typical of an electric utility of this size. These are most likely non-building types of usages.

Sample Selection

A random sample of 5,000 customer sites with a minimum of 9 billing records (to allow sufficient billing history) for each segment was drawn. This level of sampling essentially provided a census of all customers in all segments but the ones with the largest number of customers (e.g. single family existing).

APPENDIX H. END-USE/APPLIANCE USAGE TABLES

This appendix provides tables showing the electric and/or gas usage for various combinations of heating and cooling appliances.

Electric Furnace with Central Air Conditioning

Monthly Electricity Usage (kWh)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	472.7	134.0	386.9	184.4	7.4	3,165.6	4,350.9
Feb	427.0	121.0	351.6	159.4	6.4	2,377.7	3,443.0
Mar	472.7	134.0	379.3	165.7	6.6	1,436.2	2,594.5
Apr	457.5	129.7	354.1	152.5	6.1	229.0	1,328.8
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	385.4	0.0	1,425.8
Jul	472.7	134.0	291.2	150.2	640.1	0.0	1,688.2
Aug	472.7	134.0	294.1	148.3	538.5	0.0	1,587.7
Sep	457.5	129.7	301.0	152.9	136.9	0.0	1,178.0
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	1,272.9	2,378.1
Dec	472.7	134.0	367.8	191.4	7.7	2,552.0	3,725.6
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**1,754.8**	**11,033.5**	**25,913.2**

Hourly Electricity Demand (kW)		
Hour	Summer (July)	Winter (January)
1	1.8	3.9
2	1.6	3.8
3	1.5	3.9
4	1.3	3.8
5	1.4	4.2
6	1.4	4.0
7	1.5	3.7
8	1.8	4.5
9	1.8	5.8
10	2.0	6.3
11	2.1	6.0
12	2.3	6.7
13	2.3	6.1
14	2.4	6.7
15	2.6	6.5
16	2.7	6.8
17	3.0	7.0
18	3.2	7.2
19	3.2	8.2
20	3.1	7.8
21	3.2	7.4
22	3.1	7.3
23	2.8	6.4
24	2.3	6.3

Electric Furnace with Window Air Conditioning

Monthly Electricity Usage (kWh)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	472.7	134.0	386.9	184.4	7.4	3,165.6	4,350.9
Feb	427.0	121.0	351.6	159.4	6.4	2,377.7	3,443.0
Mar	472.7	134.0	379.3	165.7	6.6	1,436.2	2,594.5
Apr	457.5	129.7	354.1	152.5	6.1	229.0	1,328.8
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	195.6	0.0	1,235.9
Jul	472.7	134.0	291.2	150.2	323.0	0.0	1,371.1
Aug	472.7	134.0	294.1	148.3	272.2	0.0	1,321.4
Sep	457.5	129.7	301.0	152.9	71.5	0.0	1,112.6
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	1,272.9	2,378.1
Dec	472.7	134.0	367.8	191.4	7.7	2,552.0	3,725.6
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**916.2**	**11,033.5**	**25,074.6**

Hourly Electricity Demand (kW)		
Hour	Summer (July)	Winter (January)
1	1.5	3.9
2	1.3	3.8
3	1.2	3.9
4	1.1	3.8
5	1.1	4.2
6	1.3	4.0
7	1.4	3.7
8	1.7	4.5
9	1.6	5.8
10	1.8	6.3
11	1.7	6.0
12	1.9	6.7
13	1.9	6.1
14	1.9	6.7
15	2.0	6.5
16	2.1	6.8
17	2.3	7.0
18	2.4	7.2
19	2.5	8.2
20	2.5	7.8
21	2.6	7.4
22	2.5	7.3
23	2.2	6.4
24	1.8	6.3

Electric Furnace with No Air Conditioning

Monthly Electricity Usage (kWh)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	472.7	134.0	386.9	184.4	7.4	3,165.6	4,350.9
Feb	427.0	121.0	351.6	159.4	6.4	2,377.7	3,443.0
Mar	472.7	134.0	379.3	165.7	6.6	1,436.2	2,594.5
Apr	457.5	129.7	354.1	152.5	6.1	229.0	1,328.8
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	32.3	0.0	1,072.6
Jul	472.7	134.0	291.2	150.2	50.4	0.0	1,098.5
Aug	472.7	134.0	294.1	148.3	43.2	0.0	1,092.4
Sep	457.5	129.7	301.0	152.9	15.3	0.0	1,056.4
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	1,272.9	2,378.1
Dec	472.7	134.0	367.8	191.4	7.7	2,552.0	3,725.6
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**195.0**	**11,033.5**	**24,353.5**

Hourly Electricity Demand (kW)		
Hour	Summer (July)	Winter (January)
1	1.1	3.9
2	1.0	3.8
3	1.0	3.9
4	0.9	3.8
5	0.9	4.2
6	1.1	4.0
7	1.3	3.7
8	1.5	4.5
9	1.5	5.8
10	1.5	6.3
11	1.5	6.0
12	1.5	6.7
13	1.4	6.1
14	1.4	6.7
15	1.4	6.5
16	1.5	6.8
17	1.7	7.0
18	1.8	7.2
19	1.9	8.2
20	2.0	7.8
21	2.2	7.4
22	2.0	7.3
23	1.7	6.4
24	1.4	6.3

Electric Resistance with Central Air Conditioning

Monthly Electricity Usage (kWh)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	472.7	134.0	386.9	184.4	7.4	2,532.5	3,717.8
Feb	427.0	121.0	351.6	159.4	6.4	1,902.1	2,967.5
Mar	472.7	134.0	379.3	165.7	6.6	1,149.0	2,307.3
Apr	457.5	129.7	354.1	152.5	6.1	183.2	1,283.0
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	385.4	0.0	1,425.8
Jul	472.7	134.0	291.2	150.2	640.1	0.0	1,688.2
Aug	472.7	134.0	294.1	148.3	538.5	0.0	1,587.7
Sep	457.5	129.7	301.0	152.9	136.9	0.0	1,178.0
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	1,018.3	2,123.5
Dec	472.7	134.0	367.8	191.4	7.7	2,041.6	3,215.2
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**1,754.8**	**8,826.8**	**23,706.5**

Hourly Electricity Demand (kW)		
Hour	**Summer (July)**	**Winter (January)**
1	1.8	3.4
2	1.6	3.3
3	1.5	3.3
4	1.3	3.3
5	1.4	3.6
6	1.4	3.4
7	1.5	3.2
8	1.8	3.9
9	1.8	5.0
10	2.0	5.4
11	2.1	5.1
12	2.3	5.7
13	2.3	5.2
14	2.4	5.7
15	2.6	5.5
16	2.7	5.8
17	3.0	6.0
18	3.2	6.1
19	3.2	7.0
20	3.1	6.6
21	3.2	6.4
22	3.1	6.3
23	2.8	5.5
24	2.3	5.4

Electric Resistance with Window Air Conditioning

Monthly Electricity Usage (kWh)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	472.7	134.0	386.9	184.4	7.4	2,532.5	3,717.8
Feb	427.0	121.0	351.6	159.4	6.4	1,902.1	2,967.5
Mar	472.7	134.0	379.3	165.7	6.6	1,149.0	2,307.3
Apr	457.5	129.7	354.1	152.5	6.1	183.2	1,283.0
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	195.6	0.0	1,235.9
Jul	472.7	134.0	291.2	150.2	323.0	0.0	1,371.1
Aug	472.7	134.0	294.1	148.3	272.2	0.0	1,321.4
Sep	457.5	129.7	301.0	152.9	71.5	0.0	1,112.6
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	1,018.3	2,123.5
Dec	472.7	134.0	367.8	191.4	7.7	2,041.6	3,215.2
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**916.2**	**8,826.8**	**22,867.9**

Hourly Electricity Demand (kW)		
Hour	**Summer (July)**	**Winter (January)**
1	1.5	3.4
2	1.3	3.3
3	1.2	3.3
4	1.1	3.3
5	1.1	3.6
6	1.3	3.4
7	1.4	3.2
8	1.7	3.9
9	1.6	5.0
10	1.8	5.4
11	1.7	5.1
12	1.9	5.7
13	1.9	5.2
14	1.9	5.7
15	2.0	5.5
16	2.1	5.8
17	2.3	6.0
18	2.4	6.1
19	2.5	7.0
20	2.5	6.6
21	2.6	6.4
22	2.5	6.3
23	2.2	5.5
24	1.8	5.4

Electric Resistance with No Air Conditioning

Monthly Electricity Usage (kWh)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	472.7	134.0	386.9	184.4	7.4	2,532.5	3,717.8
Feb	427.0	121.0	351.6	159.4	6.4	1,902.1	2,967.5
Mar	472.7	134.0	379.3	165.7	6.6	1,149.0	2,307.3
Apr	457.5	129.7	354.1	152.5	6.1	183.2	1,283.0
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	32.3	0.0	1,072.6
Jul	472.7	134.0	291.2	150.2	50.4	0.0	1,098.5
Aug	472.7	134.0	294.1	148.3	43.2	0.0	1,092.4
Sep	457.5	129.7	301.0	152.9	15.3	0.0	1,056.4
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	1,018.3	2,123.5
Dec	472.7	134.0	367.8	191.4	7.7	2,041.6	3,215.2
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**195.0**	**8,826.8**	**22,146.8**

Hourly Electricity Demand (kW)		
Hour	**Summer (July)**	**Winter (January)**
1	1.1	3.4
2	1.0	3.3
3	1.0	3.3
4	0.9	3.3
5	0.9	3.6
6	1.1	3.4
7	1.3	3.2
8	1.5	3.9
9	1.5	5.0
10	1.5	5.4
11	1.5	5.1
12	1.5	5.7
13	1.4	5.2
14	1.4	5.7
15	1.4	5.5
16	1.5	5.8
17	1.7	6.0
18	1.8	6.1
19	1.9	7.0
20	2.0	6.6
21	2.2	6.4
22	2.0	6.3
23	1.7	5.5
24	1.4	5.4

Heat Pump/Electric Backup with Central Air Conditioning

Monthly Electricity Usage (kWh)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	472.7	134.0	386.9	184.4	7.4	1,407.0	2,592.3
Feb	427.0	121.0	351.6	159.4	6.4	1,056.7	2,122.1
Mar	472.7	134.0	379.3	165.7	6.6	638.3	1,796.6
Apr	457.5	129.7	354.1	152.5	6.1	101.8	1,201.6
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	385.4	0.0	1,425.8
Jul	472.7	134.0	291.2	150.2	640.1	0.0	1,688.2
Aug	472.7	134.0	294.1	148.3	538.5	0.0	1,587.7
Sep	457.5	129.7	301.0	152.9	136.9	0.0	1,178.0
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	565.7	1,670.9
Dec	472.7	134.0	367.8	191.4	7.7	1,134.2	2,307.8
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**1,754.8**	**4,903.8**	**19,783.5**

Hourly Electricity Demand (kW)		
Hour	Summer (July)	Winter (January)
1	1.8	2.4
2	1.6	2.3
3	1.5	2.3
4	1.3	2.2
5	1.4	2.4
6	1.4	2.4
7	1.5	2.4
8	1.8	3.0
9	1.8	3.5
10	2.0	3.8
11	2.1	3.6
12	2.3	3.9
13	2.3	3.6
14	2.4	3.8
15	2.6	3.7
16	2.7	3.9
17	3.0	4.1
18	3.2	4.3
19	3.2	4.8
20	3.1	4.7
21	3.2	4.6
22	3.1	4.5
23	2.8	3.9
24	2.3	3.6

Heat Pump/Electric Backup with Window Air Conditioning

Monthly Electricity Usage (kWh)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	472.7	134.0	386.9	184.4	7.4	1,407.0	2,592.3
Feb	427.0	121.0	351.6	159.4	6.4	1,056.7	2,122.1
Mar	472.7	134.0	379.3	165.7	6.6	638.3	1,796.6
Apr	457.5	129.7	354.1	152.5	6.1	101.8	1,201.6
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	195.6	0.0	1,235.9
Jul	472.7	134.0	291.2	150.2	323.0	0.0	1,371.1
Aug	472.7	134.0	294.1	148.3	272.2	0.0	1,321.4
Sep	457.5	129.7	301.0	152.9	71.5	0.0	1,112.6
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	565.7	1,670.9
Dec	472.7	134.0	367.8	191.4	7.7	1,134.2	2,307.8
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**916.2**	**4,903.8**	**18,944.9**

Hourly Electricity Demand (kW)		
Hour	Summer (July)	Winter (January)
1	1.5	2.4
2	1.3	2.3
3	1.2	2.3
4	1.1	2.2
5	1.1	2.4
6	1.3	2.4
7	1.4	2.4
8	1.7	3.0
9	1.6	3.5
10	1.8	3.8
11	1.7	3.6
12	1.9	3.9
13	1.9	3.6
14	1.9	3.8
15	2.0	3.7
16	2.1	3.9
17	2.3	4.1
18	2.4	4.3
19	2.5	4.8
20	2.5	4.7
21	2.6	4.6
22	2.5	4.5
23	2.2	3.9
24	1.8	3.6

Heat Pump/Electric Backup with No Air Conditioning

Monthly Electricity Usage (kWh)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	472.7	134.0	386.9	184.4	7.4	1,407.0	2,592.3
Feb	427.0	121.0	351.6	159.4	6.4	1,056.7	2,122.1
Mar	472.7	134.0	379.3	165.7	6.6	638.3	1,796.6
Apr	457.5	129.7	354.1	152.5	6.1	101.8	1,201.6
May	472.7	134.0	343.1	150.6	6.0	0.0	1,106.5
Jun	457.5	129.7	310.1	143.1	32.3	0.0	1,072.6
Jul	472.7	134.0	291.2	150.2	50.4	0.0	1,098.5
Aug	472.7	134.0	294.1	148.3	43.2	0.0	1,092.4
Sep	457.5	129.7	301.0	152.9	15.3	0.0	1,056.4
Oct	472.7	134.0	327.5	165.3	6.6	0.0	1,106.2
Nov	457.5	129.7	333.5	177.4	7.1	565.7	1,670.9
Dec	472.7	134.0	367.8	191.4	7.7	1,134.2	2,307.8
Total	**5,566.1**	**1,577.4**	**4,040.2**	**1,941.2**	**195.0**	**4,903.8**	**18,223.7**

Hourly Electricity Demand (kW)		
Hour	Summer (July)	Winter (January)
1	1.1	2.4
2	1.0	2.3
3	1.0	2.3
4	0.9	2.2
5	0.9	2.4
6	1.1	2.4
7	1.3	2.4
8	1.5	3.0
9	1.5	3.5
10	1.5	3.8
11	1.5	3.6
12	1.5	3.9
13	1.4	3.6
14	1.4	3.8
15	1.4	3.7
16	1.5	3.9
17	1.7	4.1
18	1.8	4.3
19	1.9	4.8
20	2.0	4.7
21	2.2	4.6
22	2.0	4.5
23	1.7	3.9
24	1.4	3.6

Heat Pump/Gas Backup with Central Air Conditioning

Monthly Electricity Usage (kWh)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	425.5	93.8	0.0	184.4	7.4	454.0	1,165.0
Feb	384.3	84.7	0.0	159.4	6.4	342.3	977.0
Mar	425.5	93.8	0.0	165.7	6.6	210.5	902.1
Apr	411.7	90.8	0.0	152.5	6.1	40.3	701.4
May	425.5	93.8	0.0	150.6	6.0	0.0	675.9
Jun	411.7	90.8	0.0	143.1	376.9	0.0	1,022.5
Jul	425.5	93.8	0.0	150.2	625.8	0.0	1,295.3
Aug	425.5	93.8	0.0	148.3	526.5	0.0	1,194.1
Sep	411.7	90.8	0.0	152.9	134.0	0.0	789.4
Oct	425.5	93.8	0.0	165.3	6.6	5.5	696.7
Nov	411.7	90.8	0.0	177.4	7.1	187.3	874.3
Dec	425.5	93.8	0.0	191.4	7.7	367.6	1,085.9
Total	**5,009.5**	**1,104.2**	**0.0**	**1,941.2**	**1,717.1**	**1,607.6**	**11,379.7**

Monthly Gas Usage (ccf)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	2.1	2.2	23.9	0.0	0.0	90.0	118.1
Feb	1.9	2.0	21.4	0.0	0.0	71.5	96.8
Mar	2.1	2.2	22.6	0.0	0.0	54.5	81.4
Apr	2.0	2.2	20.6	0.0	0.0	28.6	53.4
May	2.1	2.2	19.6	0.0	0.0	4.0	28.0
Jun	2.0	2.2	17.5	0.0	0.0	0.0	21.6
Jul	2.1	2.2	16.5	0.0	0.0	0.0	20.8
Aug	2.1	2.2	16.8	0.0	0.0	0.0	21.0
Sep	2.0	2.2	17.4	0.0	0.0	0.0	21.6
Oct	2.1	2.2	19.5	0.0	0.0	23.6	47.4
Nov	2.0	2.2	20.3	0.0	0.0	49.1	73.6
Dec	2.1	2.2	22.7	0.0	0.0	76.5	103.5
Total	**24.2**	**26.3**	**238.8**	**0.0**	**0.0**	**397.9**	**687.2**

Hourly Electricity Demand (kW)		
Hour	Summer (July)	Winter (January)
1	1.5	1.2
2	1.4	1.2
3	1.2	1.1
4	1.1	1.1
5	1.1	1.2
6	1.1	1.2
7	1.1	1.3
8	1.2	1.3
9	1.0	1.4
10	1.3	1.5
11	1.4	1.5
12	1.7	1.6
13	1.8	1.5
14	1.9	1.6
15	2.1	1.7
16	2.3	1.8
17	2.5	1.9
18	2.6	2.0
19	2.5	2.1
20	2.4	2.0
21	2.4	2.1
22	2.3	2.0
23	2.2	1.8
24	1.8	1.6

Heat Pump/Gas Backup with Window Air Conditioning

Monthly Electricity Usage (kWh)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	425.5	93.8	0.0	184.4	7.4	454.0	1,165.0
Feb	384.3	84.7	0.0	159.4	6.4	342.3	977.0
Mar	425.5	93.8	0.0	165.7	6.6	210.5	902.1
Apr	411.7	90.8	0.0	152.5	6.1	40.3	701.4
May	425.5	93.8	0.0	150.6	6.0	0.0	675.9
Jun	411.7	90.8	0.0	143.1	191.3	0.0	836.9
Jul	425.5	93.8	0.0	150.2	315.9	0.0	985.4
Aug	425.5	93.8	0.0	148.3	266.2	0.0	933.8
Sep	411.7	90.8	0.0	152.9	70.1	0.0	725.5
Oct	425.5	93.8	0.0	165.3	6.6	5.5	696.7
Nov	411.7	90.8	0.0	177.4	7.1	187.3	874.3
Dec	425.5	93.8	0.0	191.4	7.7	367.6	1,085.9
Total	**5,009.5**	**1,104.2**	**0.0**	**1,941.2**	**897.4**	**1,607.6**	**10,559.9**

Monthly Gas Usage (ccf)							
Month	Appliances & Electronics	Laundry	Water Heating	Lighting	Space Cooling	Space Heating	Total
Jan	2.1	2.2	23.9	0.0	0.0	90.0	118.1
Feb	1.9	2.0	21.4	0.0	0.0	71.5	96.8
Mar	2.1	2.2	22.6	0.0	0.0	54.5	81.4
Apr	2.0	2.2	20.6	0.0	0.0	28.6	53.4
May	2.1	2.2	19.6	0.0	0.0	4.0	28.0
Jun	2.0	2.2	17.5	0.0	0.0	0.0	21.6
Jul	2.1	2.2	16.5	0.0	0.0	0.0	20.8
Aug	2.1	2.2	16.8	0.0	0.0	0.0	21.0
Sep	2.0	2.2	17.4	0.0	0.0	0.0	21.6
Oct	2.1	2.2	19.5	0.0	0.0	23.6	47.4
Nov	2.0	2.2	20.3	0.0	0.0	49.1	73.6
Dec	2.1	2.2	22.7	0.0	0.0	76.5	103.5
Total	**24.2**	**26.3**	**238.8**	**0.0**	**0.0**	**397.9**	**687.2**

Hourly Electricity Demand (kW)		
Hour	Summer (July)	Winter (January)
1	1.2	1.2
2	1.1	1.2
3	0.9	1.1
4	0.9	1.1
5	0.9	1.2
6	1.0	1.2
7	1.0	1.3
8	1.0	1.3
9	0.9	1.4
10	1.0	1.5
11	1.1	1.5
12	1.2	1.6
13	1.3	1.5
14	1.4	1.6
15	1.5	1.7
16	1.6	1.8
17	1.8	1.9
18	1.9	2.0
19	1.8	2.1
20	1.8	2.0
21	1.9	2.1
22	1.8	2.0
23	1.6	1.8
24	1.3	1.6

Heat Pump/Gas Backup with No Air Conditioning

Monthly Electricity Usage (kWh)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	425.5	93.8	0.0	184.4	7.4	454.0	1,165.0
Feb	384.3	84.7	0.0	159.4	6.4	342.3	977.0
Mar	425.5	93.8	0.0	165.7	6.6	210.5	902.1
Apr	411.7	90.8	0.0	152.5	6.1	40.3	701.4
May	425.5	93.8	0.0	150.6	6.0	0.0	675.9
Jun	411.7	90.8	0.0	143.1	31.7	0.0	677.3
Jul	425.5	93.8	0.0	150.2	49.4	0.0	718.9
Aug	425.5	93.8	0.0	148.3	42.4	0.0	710.0
Sep	411.7	90.8	0.0	152.9	15.1	0.0	670.5
Oct	425.5	93.8	0.0	165.3	6.6	5.5	696.7
Nov	411.7	90.8	0.0	177.4	7.1	187.3	874.3
Dec	425.5	93.8	0.0	191.4	7.7	367.6	1,085.9
Total	**5,009.5**	**1,104.2**	**0.0**	**1,941.2**	**192.4**	**1,607.6**	**9,854.9**

Monthly Gas Usage (ccf)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	2.1	2.2	23.9	0.0	0.0	90.0	118.1
Feb	1.9	2.0	21.4	0.0	0.0	71.5	96.8
Mar	2.1	2.2	22.6	0.0	0.0	54.5	81.4
Apr	2.0	2.2	20.6	0.0	0.0	28.6	53.4
May	2.1	2.2	19.6	0.0	0.0	4.0	28.0
Jun	2.0	2.2	17.5	0.0	0.0	0.0	21.6
Jul	2.1	2.2	16.5	0.0	0.0	0.0	20.8
Aug	2.1	2.2	16.8	0.0	0.0	0.0	21.0
Sep	2.0	2.2	17.4	0.0	0.0	0.0	21.6
Oct	2.1	2.2	19.5	0.0	0.0	23.6	47.4
Nov	2.0	2.2	20.3	0.0	0.0	49.1	73.6
Dec	2.1	2.2	22.7	0.0	0.0	76.5	103.5
Total	**24.2**	**26.3**	**238.8**	**0.0**	**0.0**	**397.9**	**687.2**

Hourly Electricity Demand (kW)		
Hour	**Summer (July)**	**Winter (January)**
1	0.8	1.2
2	0.8	1.2
3	0.7	1.1
4	0.7	1.1
5	0.7	1.2
6	0.8	1.2
7	0.9	1.3
8	0.9	1.3
9	0.8	1.4
10	0.8	1.5
11	0.8	1.5
12	0.9	1.6
13	0.9	1.5
14	0.9	1.6
15	1.0	1.7
16	1.1	1.8
17	1.2	1.9
18	1.3	2.0
19	1.2	2.1
20	1.3	2.0
21	1.4	2.1
22	1.3	2.0
23	1.2	1.8
24	0.9	1.6

Gas Heat with Central Air Conditioning

Monthly Electricity Usage (kWh)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	425.5	93.8	0.0	184.4	7.4	129.9	840.9
Feb	384.3	84.7	0.0	159.4	6.4	97.9	732.6
Mar	425.5	93.8	0.0	165.7	6.6	60.2	751.8
Apr	411.7	90.8	0.0	152.5	6.1	11.5	672.6
May	425.5	93.8	0.0	150.6	6.0	0.0	675.9
Jun	411.7	90.8	0.0	143.1	376.9	0.0	1,022.5
Jul	425.5	93.8	0.0	150.2	625.8	0.0	1,295.3
Aug	425.5	93.8	0.0	148.3	526.5	0.0	1,194.1
Sep	411.7	90.8	0.0	152.9	134.0	0.0	789.4
Oct	425.5	93.8	0.0	165.3	6.6	1.6	692.7
Nov	411.7	90.8	0.0	177.4	7.1	53.6	740.6
Dec	425.5	93.8	0.0	191.4	7.7	105.2	823.5
Total	**5,009.5**	**1,104.2**	**0.0**	**1,941.2**	**1,717.1**	**459.9**	**10,231.9**

Monthly Gas Usage (ccf)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	2.1	2.2	23.9	0.0	0.0	140.6	168.7
Feb	1.9	2.0	21.4	0.0	0.0	111.7	137.0
Mar	2.1	2.2	22.6	0.0	0.0	85.2	112.0
Apr	2.0	2.2	20.6	0.0	0.0	44.7	69.5
May	2.1	2.2	19.6	0.0	0.0	6.3	30.3
Jun	2.0	2.2	17.5	0.0	0.0	0.0	21.6
Jul	2.1	2.2	16.5	0.0	0.0	0.0	20.8
Aug	2.1	2.2	16.8	0.0	0.0	0.0	21.0
Sep	2.0	2.2	17.4	0.0	0.0	0.0	21.6
Oct	2.1	2.2	19.5	0.0	0.0	36.9	60.7
Nov	2.0	2.2	20.3	0.0	0.0	76.7	101.2
Dec	2.1	2.2	22.7	0.0	0.0	119.5	146.5
Total	**24.2**	**26.3**	**238.8**	**0.0**	**0.0**	**621.7**	**911.0**

Hourly Electricity Demand (kW)		
Hour	**Summer (July)**	**Winter (January)**
1	1.5	0.9
2	1.4	0.9
3	1.2	0.8
4	1.1	0.8
5	1.1	0.8
6	1.1	0.9
7	1.1	1.1
8	1.2	1.0
9	1.0	0.9
10	1.3	1.0
11	1.4	1.0
12	1.7	1.1
13	1.8	1.0
14	1.9	1.1
15	2.1	1.2
16	2.3	1.2
17	2.5	1.3
18	2.6	1.4
19	2.5	1.4
20	2.4	1.5
21	2.4	1.6
22	2.3	1.5
23	2.2	1.3
24	1.8	1.1

Gas Heat with No Air Conditioning

Monthly Electricity Usage (kWh)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	425.5	93.8	0.0	184.4	7.4	129.9	840.9
Feb	384.3	84.7	0.0	159.4	6.4	97.9	732.6
Mar	425.5	93.8	0.0	165.7	6.6	60.2	751.8
Apr	411.7	90.8	0.0	152.5	6.1	11.5	672.6
May	425.5	93.8	0.0	150.6	6.0	0.0	675.9
Jun	411.7	90.8	0.0	143.1	31.7	0.0	677.3
Jul	425.5	93.8	0.0	150.2	49.4	0.0	718.9
Aug	425.5	93.8	0.0	148.3	42.4	0.0	710.0
Sep	411.7	90.8	0.0	152.9	15.1	0.0	670.5
Oct	425.5	93.8	0.0	165.3	6.6	1.6	692.7
Nov	411.7	90.8	0.0	177.4	7.1	53.6	740.6
Dec	425.5	93.8	0.0	191.4	7.7	105.2	823.5
Total	**5,009.5**	**1,104.2**	**0.0**	**1,941.2**	**192.4**	**459.9**	**8,707.2**

Monthly Gas Usage (ccf)							
Month	**Appliances & Electronics**	**Laundry**	**Water Heating**	**Lighting**	**Space Cooling**	**Space Heating**	**Total**
Jan	2.1	2.2	23.9	0.0	0.0	140.6	168.7
Feb	1.9	2.0	21.4	0.0	0.0	111.7	137.0
Mar	2.1	2.2	22.6	0.0	0.0	85.2	112.0
Apr	2.0	2.2	20.6	0.0	0.0	44.7	69.5
May	2.1	2.2	19.6	0.0	0.0	6.3	30.3
Jun	2.0	2.2	17.5	0.0	0.0	0.0	21.6
Jul	2.1	2.2	16.5	0.0	0.0	0.0	20.8
Aug	2.1	2.2	16.8	0.0	0.0	0.0	21.0
Sep	2.0	2.2	17.4	0.0	0.0	0.0	21.6
Oct	2.1	2.2	19.5	0.0	0.0	36.9	60.7
Nov	2.0	2.2	20.3	0.0	0.0	76.7	101.2
Dec	2.1	2.2	22.7	0.0	0.0	119.5	146.5
Total	**24.2**	**26.3**	**238.8**	**0.0**	**0.0**	**621.7**	**911.0**

Hourly Electricity Demand (kW)		
Hour	**Summer (July)**	**Winter (January)**
1	0.8	0.9
2	0.8	0.9
3	0.7	0.8
4	0.7	0.8
5	0.7	0.8
6	0.8	0.9
7	0.9	1.1
8	0.9	1.0
9	0.8	0.9
10	0.8	1.0
11	0.8	1.0
12	0.9	1.1
13	0.9	1.0
14	0.9	1.1
15	1.0	1.2
16	1.1	1.2
17	1.2	1.3
18	1.3	1.4
19	1.2	1.4
20	1.3	1.5
21	1.4	1.6
22	1.3	1.5
23	1.2	1.3
24	0.9	1.1

APPENDIX I. SUMMARY OF ANNUAL PROGRAM DATA

See the following page for a summary of annual program data.

Annual Summary

	C&I Peak Reduction	Res Peak Reduction	Renewables & Demonstration	C&I Incentives	C&I Rebates	C&I Retro Comm. Lite	C&I HVAC Optimization	C&I Audit	C&I New Construction	Res Whole House	Res Rebates	Res Appliance Recycle	Res New Construction	Res Solar Siting	Res Low & Moderate Income	Totals *
Total Program Budget:																
Year 1	126,175	481,500	120,060	151,020	1,349,000	324,000	138,160	90,280	77,700	151,789	109,639	293,725	68,900	54,500	412,528	3,948,976
Year 2	100,850	678,838	95,060	159,530	2,126,500	424,000	119,820	46,060	68,050	181,237	156,492	312,070	75,800	47,000	464,634	5,055,940
Year 3	155,025	944,163	125,060	159,530	2,636,000	574,000	227,040	126,840	140,550	305,596	294,918	460,415	147,700	104,500	611,739	7,013,076
Year 4	194,700	1,203,188	95,060	198,040	3,000,500	724,000	188,700	62,620	68,050	259,026	260,058	416,260	97,700	54,500	536,739	7,359,140
Year 5	263,875	1,499,913	125,060	198,040	3,073,000	874,000	295,360	143,400	179,100	377,455	370,984	536,940	147,700	104,500	616,739	8,806,066
Five year t	840,625	4,807,600	560,300	866,160	12,185,000	2,920,000	969,080	469,200	533,450	1,275,102	1,192,092	2,019,410	537,800	365,000	2,642,379	32,183,199
Cumulative kWh Savings																
Year 1	-	-	6,976	346,200	6,684,600	1,523,600	685,274	119,628	97,724	424,860	1,160,817	1,684,750	18,210	2,250	190,920	12,945,809
Year 2	-	-	13,952	865,500	17,825,600	4,570,800	2,055,822	358,884	244,310	1,133,445	3,869,390	3,706,450	54,630	6,750	420,024	35,125,557
Year 3	-	-	20,928	1,384,800	31,194,800	9,141,600	4,122,878	717,768	390,896	2,125,270	7,351,841	6,065,100	109,260	13,500	687,312	63,325,953
Year 4	-	-	27,904	2,077,200	46,792,200	15,236,000	6,875,208	1,196,280	537,482	3,258,715	11,995,109	8,760,700	163,890	20,250	954,600	97,895,538
Year 5	-	-	34,880	2,769,600	62,389,600	22,854,000	10,312,812	1,794,420	830,654	4,533,780	17,412,255	11,792,100	218,520	27,000	1,221,888	136,191,509
Cumulative kW Savings																
Year 1	286	1,143	3	41	1,515	336	152	41	18	88	221	273	4	1	54	4,178
Year 2	858	2,856	5	104	4,040	1,008	457	123	46	236	736	601	13	2	120	11,206
Year 3	1,716	5,142	8	166	7,071	2,017	917	246	74	442	1,398	983	27	4	196	20,406
Year 4	2,860	7,998	11	249	10,606	3,361	1,530	411	102	678	2,281	1,420	40	5	272	31,824
Year 5	4,290	11,426	13	331	14,141	5,042	2,295	616	157	943	3,311	1,912	54	7	349	44,887
Cumulative MCF Savings																
Year 1	-	-	2	583	(5,535)	6,317	2,822	168	160	1,632	(775)	-	374	118	1,134	6,999
Year 2	-	-	4	1,458	(14,760)	18,950	8,465	504	399	4,355	(2,582)	-	1,122	354	2,494	20,763
Year 3	-	-	6	2,332	(25,830)	37,901	16,977	1,008	639	8,165	(4,907)	-	2,243	708	4,081	43,324
Year 4	-	-	8	3,499	(38,745)	63,168	28,310	1,679	878	12,520	(8,005)	-	3,365	1,063	5,668	73,408
Year 5	-	-	10	4,665	(51,660)	94,752	42,465	2,519	1,357	17,419	(11,621)	-	4,487	1,417	7,255	113,065

* Includes all program-specific costs but excludes "umbrella" DSM costs not identified with specific programs.

STAFF-DR-01-016

REQUEST:

Refer to pages 21-22 of the Stevie Testimony and Attachment RGS-2. Explain why a program (Reach and Teach Energy Conservation) which failed to pass both the Utility Cost Test and Total Resource Cost test is part of the portfolio of programs Duke Kentucky proposes to implement in conjunction with Rider SAW.

RESPONSE:

This is a program that is directed to the low income segment of our customers. The Company believes that further experience with the program will help the Company improve the design and cost-effectiveness of the program. However, the Company believes it also makes sense to have cost-effective programs that can be offered to all customer segments. Under this proposal, customers do not directly pay the program costs associated with this (or any) program. Thus, the Company has an incentive to further refine the program design in the hopes of making it cost-effective. In addition, this program is replacing the Payment Plus program which had limited participation of under 200 customers annually. The Duke Energy Kentucky program design will reach over 1,000 customers annually when fully implemented.

PERSON RESPONSIBLE: Richard G. Stevie/Michael Goldenberg

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Staff Data Requests
Date Received: March 16, 2009

STAFF-DR-01-017

REQUEST:

Refer to page 22 of the Stevie Testimony, specifically, the discussion on lines 12-17 regarding measurement and verification. The fourth reason identified for measurement and verification activities is to "establish independent third-party evaluations and reviews to confirm energy impacts….." Describe the process Duke Kentucky intends to use to select independent third parties to perform evaluations.

RESPONSE:

Similar to the manner M&V activities are conducted in other Duke Energy jurisdictions, Duke Energy Kentucky plans to use an independent third-party evaluation manager to prepare and issue a request for proposals (RFPs) to hire independent evaluators to conduct impact and process evaluations on the save-a-watt programs. The RFP will request bids to conduct evaluations consistent with the M&V plans submitted at the time of the program filing. Consistent with evaluation practice, evaluators will be selected based on experience, thoroughness and creativity in evaluation approach, as well as price. To further ensure the independent nature of the reviews, the evaluators' day to day activities and budget will be managed by an outsourced contractor, who reports directly to the Managing Director of Market Analysis, Duke Energy, Dr. Richard Stevie, who resides within the Strategy and Planning Department, functionally and organizationally separated from the Energy Efficiency Program group.

PERSON RESPONSIBLE: Richard G. Stevie

Duke Energy Kentucky, Inc.
Case No. 2008-00495
First Set Staff Data Requests
Date Received: March 16, 2009

STAFF-DR-01-018

REQUEST:

Refer to page 23 of the Stevie Testimony. Provide a description of the firm, TecMarket Works, a summary *of* the qualifications of Mr. Nick Hall, and a description for how Duke Kentucky selected Mr. Hall and TecMarket Works for the task referenced in the testimony.

RESPONSE:

Mr. Nick Hall is the owner of TecMarket Works, an independent, energy efficiency evaluation and market research firm serving utilities, energy companies and government organizations. TecMarket Works specializes in helping clients identify and implement strategies to achieve their energy efficiency, renewable energy, greenhouse gas, market penetration, and market transformation impact objectives. Their typical projects involve evaluating energy efficiency and renewable energy program processes and operational approaches, assessing markets and market operations for energy products and services, researching customer wants and needs, and estimating energy and non-energy effects, including greenhouse gas reductions, from program efforts. In this effort Mr. Hall has conducted hundreds of research projects over the last 28 years, has authored over 260 publications and is routinely asked to publish and present at national and international conferences. Mr. Hall is the developer of the California Energy Program Evaluation Framework and the lead author of the California Evaluation Protocols for documenting energy efficiency program effects. As such, Mr. Hall was selected based on his extensive evaluation experience and recognized leadership in the field to review the evaluation approaches proposed in the testimony. Mr. Hall has also been utilized by Duke Energy Kentucky in the past to review and prepare impact evaluation studies and process evaluations.

PERSON RESPONSIBLE: Richard G. Stevie

STAFF-DR-01-019

REQUEST:

Refer to Attachment RGS-3 to the Stevie Testimony, which has been provided under a request for confidential treatment. Provide, for the Commission's confidential files, a version of Attachment RGS-3 in at least a 10-point font.

RESPONSE:

CONFIDENTIAL PROPRIETARY TRADE SECRET

The Attachment RGS-3 is being provided to the Commission on CD electronically as it is not feasible to reproduce the Excel spreadsheet in 10-point font in hard copy. This attachment filed with Stevie testimony on December 1, 2008 was approved for Confidential Proprietary Trade Secret status in a letter from the Commission dated March 12, 2009.

PERSON RESPONSIBLE: N/A

STAFF-DR-01-020

REQUEST:

Refer to Attachment B-1 to the application, Rider SAW, specifically, the Applicability section. One of the sentences regarding non-residential customers states that "Customers electing to opt-out of the program will not be credited for an period previously billed.

a. Explain whether Duke Kentucky will notify such customers when Rider SAW is implemented or intends to take a "buyer beware" approach and require that customers be responsible for being aware of if, and when, the rider becomes effective.

b. If Duke Kentucky intends to notify the customers of Rider SAW becoming effective, explain why the rider does not contain language identifying the manner in which they will be notified.

RESPONSE:

a. The Company intends to notify opt-out eligible customers of the benefits of participating and the terms of opting out of participating in the Company's energy efficiency programs once the Commission has provided an order in regards to this issue.

b. The Company intends to notify customers. The Company did not want to limit the medium employed and plans to use several methods (e.g., email, web, letter, etc.,.). The Company will use the approach approved by the Commission.

PERSON RESPONSIBLE: Theodore E. Schultz