SULLIVAN, MOUNTJOY, STAINBACK & MILLER PSC
ATTORNEYS AT LAW

Ronald M. Sullivan
e T. Mountjoy
. rank Stainback
James M. Miller
Michael A. Fiorella
Allen W. Holbrook
R. Michael Sullivan
Bryan R. Reynolds*
Tyson A. Kamuf
Mark W. Starnes
C. Ellsworth Mountjoy

*Also Licensed in Indiana

April 25, 2013

Mr. Jeff Derouen
Executive Director
Public Service Commission of Kentucky
P.O. Box 615
211 Sower Boulevard
Frankfort, KY 40602-0615

In The Matter Of: *Application of Big Rivers Electric Corporation For A General Adjustment In Rates - Case No. 2012-00535*

Dear Mr. Derouen:

Enclosed for filing are an original and ten (10) copies of (i) Big Rivers Electric Corporation's response to Ben Taylor and Sierra Club's initial request for information; (ii) a petition for confidential treatment; and (iii) a motion for deviation.

I certify that on this date copies of this letter, the response, the petition, and the motion have been served on those parties listed on the attached service list by either Federal Express or hand delivery.

Sincerely,

TBK

Tyson Kamuf

cc: Service List
Billie J. Richert

Telephone (270) 926-4000
Telecopier (270) 683-6694

100 St. Ann Building
PO Box 727
'boro, Kentucky
42302-0727

www.westkylaw.com

Service List
PSC Case No. 2012-00535

Jennifer B. Hans
Lawrence W. Cook
Dennis G. Howard, II
Assistant Attorneys General
1024 Capital Center Dr.
Suite 200
Frankfort, KY 40601

Mr. David Brevitz
3623 SW Woodvalley Terrace
Topeka, KS 66614

Mr. Bion C. Ostrander
1121 S.W. Chetopa Trail
Topeka, KS 66615

Mr. Larry Holloway
830 Romine Ridge
Osage City, KS 66523

Michael L. Kurtz, Esq.
Kurt J. Boehm, Esq.
Boehm, Kurtz & Lowry
36 E. Seventh St., Suite 1510
Cincinnati, Ohio 45202

Lane Kollen
J. Kennedy and Associates, Inc.
570 Colonial Park Dr., Suite 305
Roswell, Georgia 30075

Russell L. Klepper
Energy Services Group, LLC
316 Maxwell Road, Suite 400
Alpharetta, Georgia 30009

David C. Brown, Esq.
Stites & Harbison, PLLC
400 W. Market Street, Suite 1800
Louisville, KY 40202

Donald P. Seberger, Esq.
Special Counsel
Rio Tinto Alcan
8770 West Bryn Mawr Avenue
Chicago, Illinois 60631

Gregory Starheim
President & CEO
Kenergy Corp.
6402 Old Corydon Road
P.O. Box 18
Henderson, Kentucky 42419-0018

J. Christopher Hopgood, Esq .
318 Second Street
Henderson, Kentucky 42420

Burns Mercer
Meade County RECC
1351 Hwy. 79
P.O. Box 489
Brandenburg, Kentucky 40108

Thomas C. Brite, Esq.
Brite & Hopkins, PLLC
83 Ballpark Road
Hardinsburg, KY 40143

G. Kelly Nuckols
President and CEO
Jackson Purchase Energy Corporation
2900 Irvin Cobb Drive
P.O. Box 4030
Paducah, KY 42002-4030

Melissa D. Yates
Denton & Keuler, LLP
555 Jefferson Street
Suite 301
Paducah, KY 42001

Joe Childers
Joe F. Childers & Associates
300 Lexington Building
201 West Short Street
Lexington, Kentucky 40507

Shannon Fisk
Senior Attorney
Earthjustice
1617 John F. Kennedy Blvd., Suite 1675
Philadelphia, PA 19103

Robb Kapla
Staff Attorney
Sierra Club
85 Second Street
San Francisco, CA 94105

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

VERIFICATION

I, Billie J. Richert, verify, state, and affirm that I prepared or supervised the preparation of the data responses filed with this Verification, and that those data responses are true and accurate to the best of my knowledge, information, and belief formed after a reasonable inquiry.

Billie J. Richert

COMMONWEALTH OF KENTUCKY)
COUNTY OF HENDERSON)

SUBSCRIBED AND SWORN TO before me by Billie J. Richert on this the 24th day of April, 2013.

Paula Mitchell
Notary Public, Ky. State at Large
My Commission Expires 1-12-17

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

VERIFICATION

I, Christopher A. Warren, verify, state, and affirm that I prepared or supervised the preparation of the data responses filed with this Verification, and that those data responses are true and accurate to the best of my knowledge, information, and belief formed after a reasonable inquiry.

Christopher A. Warren

COMMONWEALTH OF KENTUCKY)
COUNTY OF HENDERSON)

SUBSCRIBED AND SWORN TO before me by Christopher A. Warren on this the 24th day of April, 2013.

Paula Mitchell
Notary Public, Ky. State at Large
My Commission Expires 1-12-17

ORIGINAL

Big Rivers
ELECTRIC CORPORATION

Your Touchstone Energy® Cooperative

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

In the Matter of:

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION FOR A GENERAL ADJUSTMENT IN RATES	)))	Case No. 2012-00535

Response to the Sierra Club's
Initial Request for Information
dated February 14, 2013

FILED: April 25, 2013

ORIGINAL

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 1) *State whether Big Rivers has evaluated how the termination of Alcan's retail electric service agreement with Kenergy will impact Big Rivers' financial situation.*

a. If so, describe the results of such evaluation and produce any documents or reports regarding that evaluation.

b. If not, explain why not.

Response) Big Rivers is in the process of evaluating the impact of the Alcan termination notice. Please see the response to PSC 2-1.

Witness) Billie J. Richert

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 2) *Identify the magnitude of the impact of the termination of Alcan's retail electric service agreement with Kenergy on Big Rivers':*

a. Peak load in MWs

b. Annual energy demand in MWh

c. Projected revenue deficiency in the forecasted test period, 2014, and 2015.

d. The size of the rate increase that Big Rivers would need to eliminate the revenue deficiency in the forecasted test period, 2014, and 2015.

e. Credit rating

f. Ability to maintain two investment-grade credit ratings

g. Ability to meet its financial obligations to its creditors

h. Ability to attract necessary capital

Response) Please see the response to PSC 2-1.

a. The impact of the Alcan contract termination on Big Rivers' forecasted peak load is the amount of Alcan's contract demand, which is 368 MW.

b. The impact on annual energy is the amount of Alcan's contract demand at a 98% load factor, or 3,159,206 MWh.

c. Big Rivers is in the process of evaluating the impact of the Alcan termination notice on its projected revenue deficiency. Please see the response to PSC 2-1.

d. Big Rivers is in the process of evaluating the impact of the Alcan termination notice on any future rate increases. Please see the response to PSC 2-1.

e. Refer to Response AG 1-54(c) in Case No. 2012-00492 for copies of credit reports for Big Rivers issued by the three rating agencies during February 2013 which illustrate the magnitude of the impact of Alcan's termination notice on Big Rivers' credit rating.

f. Big Rivers is implementing steps identified in its Load Concentration Analysis and Mitigation Plan, and, in consultation with the RUS, developed a written plan (the "Corrective Plan to Achieve Two Credit Ratings of Investment Grade") setting forth the actions to be taken that are reasonably expected to achieve two investment grade credit ratings. Please see the response to PSC 3-9 for a copy of the Corrective Plan to Achieve Two Credit Ratings of Investment Grade, dated March 7, 2013.

g. Big Rivers does not believe the Alcan termination notice will prevent it from meeting its financial obligations to its creditors.

h. Big Rivers is in the process of evaluating the impact of the Alcan termination notice on its ability to attract capital. Please see the response to PSC 2-1.

Witnesses) Lindsay N. Barron (parts a, b)
John Wolfram (parts d, e)
Billie J. Richert (parts f, g, h)

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 3) *Refer to p. 11 line 19 through p. 12 line 2 of the testimony of Billie J. Richert. Given Alcan's notice of termination of its retail electric service agreement with Kenergy, state whether the $74.5 million rate increase sought in this proceeding would be:*

a. Adequate to "keep Big Rivers whole"

i. If so, explain how.

ii. If not, explain why not and identify what level of rate increase would be needed to do so.

b. Adequate to "avoid exacerbating the other urgent credit issues facing Big Rivers"

i. If so, explain how.

ii. If not, explain why not and identify what level of rate increase would be needed to do so.

Response) Century's retail contract terminates on August 20, 2013, and Alcan's retail contract terminates January 31, 2014. While Big Rivers is currently in the process of evaluating the impact of the Alcan termination notice, Big Rivers still needs the $74.5 million revenue requirement beginning August 20, 2013, to keep Big Rivers whole at the time of the Century contract termination, to avoid exacerbating the other urgent credit issues facing Big Rivers at this juncture, and for the reasons I stated in my testimony.

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

1 **Witness)** Billie J. Richert

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 4) *Refer to p. 22 lines 13-19 of the testimony of Billie J. Richert. State whether the rates proposed by Big Rivers in this proceeding will still enable Big Rivers to comply with the minimum MFIR covenant in the indenture given the announced termination of Alcan's retail electric service agreement with Kenergy.*

a. If so, explain how.

b. If not:

i. Explain why not.

ii. Identify the level of rate increase needed to enable Big Rivers to comply with the minimum MFIR covenant.

Response) Century's retail contract terminates on August 20, 2013, and Alcan's retail contract terminates January 31, 2014. While Big Rivers is currently in the process of evaluating the impact of the Alcan termination notice, Big Rivers still needs the rate increase proposed in this proceeding beginning August 20, 2013, for the reasons I stated in my testimony, and Big Rivers still expects the proposed rates to produce at least a 1.10 MFIR for fiscal year 2013.

Witness) Billie J. Richert

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 5) *Refer to p. 26 lines 12-13 of the testimony of Billie J. Richert. With regards to the $60 million in pollution control equipment expenditures in 2013 and 2014, identify:*

a. Each pollution control included in that $60 million

i. The cost of each such pollution control

ii. The unit on which each such control is to be installed

iii. The schedule of installation for each such control

iv. The amount that Big Rivers has spent to date for each such control

Response)

a.i – a.iii See attached table.

a.iv. Through March 31, 2013, Big Rivers has spent $617,071 on MATS Testing.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

1

2 **BIG RIVERS POLLUTION CONTROL SYSTEM DATA**

3

Plant	Pollution Control System	Cost ($M)	Start Engineer	Start Procure	Start Construct	In Service Date
Wilson	MATS Carbon and Dry Sorbent Injection Systems and Emission Monitors	11.24	8-13	10-13	4-14	1-15
Green	MATS Carbon and Dry Sorbent Injection Systems and Emission Monitors	18.48	8-13	10-13	4-14	1-15
Coleman	MATS Carbon and Dry Sorbent Injection Systems and Emission Monitors	28.44	8-13	10-13	4-14	1-15
HMPL	MATS	0.48	3-14	4-14	6-14	1-15

	Emission Monitors					
All	MATS and Particulate Testing	1.00	NA	NA	2-13	5-13

1

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 6 ***For each year of 2008 through 2012, identify:***

a. Total off-system sales in MWhs

b. Total off-system sales revenues

Response)

a. Please refer to Big Rivers' response to AG 1-18 for years 2010 through 2012.

b. Please refer to Big Rivers' response to AG 1-18 for years 2010 through 2012.

Off-system sales data prior to the unwind transaction in 2009 is not comparable to current data structure.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Request for Information dated February 14, 2013

April 25, 2013

Item 7) ***For each year of 2013 through 2030, identify:***

a.) Projected total off-system sales in MWh's

b.) Projected total off-system sales revenues

Response) a. and b. Big Rivers' operating plan consists of the current year budget and a three year financial plan; therefore, we can only provide 2013 through 2016 for this request, per the following table:

Year	MWhs	Revenue
2013	[redacted]	[redacted]
2014	[redacted]	[redacted]
2015	[redacted]	[redacted]
2016	[redacted]	[redacted]

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 8 *Describe all DSM programs presently offered by Big Rivers, including demand-response, interruptible load, and efficiency programs. For each such program, identify the:*

a. Annual cost of implementation for the life of the program

b. MW and MWh reductions achieved per year

c. Life expectancy of individual program measures

d. Total Resource Cost test score for each program

e. Monetary savings from each program

Response) Descriptions of existing programs are included in the DSM Tariffs file in tab 9 of the application for this case.

a.-e. Please see the attached table, labeled Big Rivers 2012 DSM/Energy Efficiency Program Targets, for a complete summary of the Big Rivers' programs. Programs are evaluated annually for cost effectiveness, efficacy and technological competitiveness. Due to the advancement in energy efficiency technology, programs may be created, changed or terminated. No program life is predetermined.

Witness) Lindsay N. Barron

Big Rivers 2012 DSM/Energy Efficiency Program Targets

Residential Programs	Annual kWh Savings Per Unit	Winter kW Savings Per Unit	Summer kW Savings Per Unit	Incentive	Measure Life	Unit Quantity	Total Annual kWh Savings	Total Winter kW Savings	Total Summer kW Savings	Target Spend 2012	NPV TRC Benefits	NPV TRC Costs	TRC BC Ratio
Residential Lighting Program													
CFL bulbs	31	0.007	0.003	$1.75	7.0	57,143	1,752,004	408.0	179.2	$100,000	$735,003	$100,000	7.35
Residential Efficient Appliances													
Clothes Washer Rebate	224	0.007	0.026	$100.00	11.0	400	89,600	2.8	10.4	$40,000	$167,539	$103,200	1.62
Energy Star Refrigerator + Recycling	1,084	0.076	0.089	$100.00	6.0	400	433,600	30.4	35.6	$40,000	$136,418	$52,000	2.62
HVAC Program													
Dual Fuel	3,448	7.066	0.146	$500.00	12.0	50	172,400	353.3	7.3	$25,000	$173,070	$100,000	1.73
Air Source Heat Pump	692	0.000	0.146	$200.00	12.0	35	24,220	0.0	5.1	$7,000	$14,590	$35,000	0.42
Goethermal	3,658	4.453	0.365	$750.00	22.0	24	87,792	106.9	8.8	$18,000	$274,281	$199,200	1.38
Weatherization Program													
Stick-Built Home	6,980	4.950	0.890	$2,000.00	17.0	75	523,500	371.3	66.8	$150,000	$681,803	$300,000	2.27
Manufactured Home	4,680	2.200	0.300	$2,000.00	17.0	25	117,000	55.0	7.5	$50,000	$128,815	$100,000	1.29
New Construction													
Gas Heat	2,435	0.260	0.580	$750.00	20.0	48	116,880	12.5	27.8	$36,000	$246,638	$145,440	1.70
Air Source Heat Pump	4,922	2.700	0.580	$1,000.00	20.0	20	98,430	54.0	11.6	$20,000	$128,729	$60,600	2.12
Dual Fuel Heat Pump (w/ Gas)	8,370	9.766	0.580	$1,200.00	20.0	20	167,390	195.3	11.6	$24,000	$227,215	$80,600	2.82
Geothermal Heat Pump	8,580	7.150	0.799	$2,000.00	20.0	10	85,795	71.5	8.0	$20,000	$173,229	$113,300	1.53
Tune-Up													
HVAC Tune-Up	636	0.000	0.304	$25.00	6.0	1,320	839,520	0.0	400.9	$33,000	$312,101	$211,200	1.48
Commercial/Industrial (C/I) Programs	**Annual kWh Savings Per $**	**Winter kW Savings Per $**	**Summer kW Savings Per $**			**Total kW Reduced**	**Total Annual kWh Savings**	**Total Winter kW Savings**	**Total Summer kW Savings**	**Target Spend 2012**	**NPV TRC Benefits**	**NPV TRC Costs**	**TRC BC Ratio**
C&I Lighting													
Lighting Projects	12	0.0029	0.0027	$350.00	10.0	543	2,219,784	543.0	507.3	$190,000	$1,511,932	$407,250	3.71
C&I Products													
Misc. Efficient Projects	7	0.0005	0.0029	$350.00	15.0	86	213,452	16.1	86.0	$30,000	$185,295	$86,000	2.15
	Annual kWh Savings Per Unit	**Winter kW Savings Per Unit**	**Summer kW Savings Per Unit**			**Unit Quantity**	**Total Annual kWh Savings**	**Total Winter kW Savings**	**Total Summer kW Savings**	**Target Spend 2012**	**NPV TRC Benefits**	**NPV TRC Costs**	**TRC BC Ratio**
Tune-Up													
HVAC Tune-Up*	858	0.000	0.569	$50.00	6.0	340	291,720	0.0	193.6	$17,000.00	$130,171	$59,500	2.19
						DSM Portfolio Totals:	7,233,087	2,220.1	1,567.4	$800,000	$5,226,829	$2,153,290	2.43

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 9 ***Describe each new DSM program, including demand-response, interruptible load, and efficiency programs, that Big Rivers plans to offer in the future. For each such program, identify the estimated:***

a. Annual cost of implementation for the life of the program

b. MW and MWh reductions achieved per year

c. Life expectancy of individual program measures

d. Total Resource Cost test score for each program

e. Monetary savings from each program

Response) Two additional programs are being developed by Big Rivers to address outdoor lighting and commercial HVAC. Each program is described below:

Commercial High Efficiency Heating, Ventilation and Air Conditioning ("HVAC") Program Purpose:

This program promotes an increased use of high-efficiency HVAC systems among Rural Customers by paying a Member an incentive for the benefit of an eligible Rural Customer who purchases and installs an HVAC system beyond minimum efficiency standards to HVAC systems meeting ENERGY STAR® standards ("Qualified System").

Availability:

This DSM program's rates, terms and conditions are available to a Member for its Rural Customers, subject to the limitations and eligibility requirements of this program, and to the rules and regulations of this tariff and the Member's corresponding tariff.

Eligibility:

An eligible Rural Customer is a Member's Rural Customer who upgrades an HVAC system located in the Member's service area and installs a Qualified System.

Member Incentives:

Big Rivers will reimburse a Member an incentive payment of $75 per ton (12,000 BTU per hour nominal capacity) when a non-residential Rural Customer installs a Qualified System HVAC upgrade located in the Member's service area.

Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Terms & Conditions:

To qualify for the incentive under this program, a Member must submit to

Big Rivers a copy of a receipt of purchase and installation of a Qualified System from a licensed contractor, along with a certificate from the Member verifying installation of the Qualified System on the premises of a Rural Customer in the Member's service area.

High Efficiency Outdoor Lighting Program Purpose:

This program promotes the increased use of high-efficiency Light Emitting Diode ("LED") and Induction outdoor lighting by Members.

Availability:

This DSM program is available to Members to provide non-metered outdoor lighting to their Rural Customers.

Eligibility:

An eligible Member purchases wholesale power from Big Rivers.

Member Incentives:

Big Rivers will reimburse a Member $70 for each high-efficiency LED or Induction outdoor lamp it purchases and installs.

Terms & Conditions:

To qualify for the incentive under this program, a Member must submit to Big Rivers documentation supporting the purchase and installation of high-efficiency outdoor lighting.

a. Estimated program budgets for these programs are $50,000 each for the outdoor lighting and commercial HVAC replacement programs in 2013. Programs are evaluated annually for cost effectiveness, efficacy and technological competitiveness. Due to the advancement in energy efficiency technology, programs may be created, changed or terminated. No program life is predetermined.

b. Outdoor lighting is estimated to achieve an annual reduction of 136 MWh, 20.7 kW winter demand and 1.1 kW summer demand per year. Commercial HVAC is estimated to achieve an annual reduction of 90 MWh and 66.7 kW summer demand reduction per year.

c. The measure life for the outdoor lighting program is estimated to be 17 years and the life for the commercial HVAC program is estimated to be 15 years.

d.

Outdoor Lighting	1.94
Commercial HVAC	1.28

e.

Outdoor Lighting	$97,000
Commercial HVAC	$64,000

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

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April 25, 2013

Witness) Lindsay N. Barron

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 10 *State whether Big Rivers has performed or reviewed any DSM modeling in determining the level of DSM the company is currently carrying out, or in estimating the level of energy savings or peak demand reduction that is achievable through DSM programs.*

a. If so, identify the model used, and produce, in machine readable format with formulas intact, the input and output files and workpapers for such modeling.

b. If not, explain why not.

Response) Yes.

a. The amount of energy and peak demand savings that is achievable through recommended DSM programs was a major component of the Big Rivers DSM Potential Study conducted in 2010. GDS Associates, Inc. determined several potential DSM programs and analyzed the overall potential that could be achieved through these programs given specified spending budgets. The GDS Benefit-Cost Screening Tools provided (GDS Model – v12 Residential Program Potential $1M and GDS Model – BREC Commercial Programs 11-3-10 p1) provide both the inputs and outputs of this analysis, including participation units, estimated annual kWh savings, peak demand reduction, and annual budgets. Also included are the NPV benefits associated with energy and demand reductions, as well as the results of the California cost-

effectiveness tests. Please note that these models are copyrighted and are not intended for use outside of this request. They are attached on the Confidential CD accompanying these responses and are submitted under petition for confidential treatment.

Witness) Lindsay N. Barron

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 11. ***Produce the DSM potential study developed by GDS Associates referenced on p. 14 of the testimony submitted by Albert Yockey, including any workpapers and modeling input and output files in machine readable format with formulas intact.***

Response) Please see the attached DSM potential study that was referenced on p. 14 of Mr. Yockey's testimony. In order to develop the Big Rivers DSM Potential Study report, voluminous modeling was required to develop the measure assumptions and related energy efficiency potential inputs and outputs. For select energy efficiency measures, proprietary/licensed building energy simulation software was utilized to determine measure-specific savings. Due to software updates over time and closed-source algorithms, exact replicate files are not able to be produced in all instances. In addition to the models provided in response to request 10a, the major inputs and outputs associated with the residential and commercial/industrial sector DSM potential analyses have also been provided. The residential files (BR Full Potential Spreadsheet v2, GDS Model – Achiev. SF – TRC, and GDS Model – Achiev. MH - TRC) detail the major assumptions and calculations utilized to develop inputs for cost-effectiveness testing and valuation of energy and demand benefits. The C&I files (BREC Commercial & Industrial Assumptions v4, GDS Model – BREC Achievable Potential 9-28-10 P1, and GDS Model – BREC Achievable Potential 9-28-10 P2) represent similar data and function. To ease any review process and

provide transparency, GDS Associates, Inc. also summarized relevant model inputs/outputs in the Big Rivers Potential Study appendices. Any additional review of GDS-developed models and materials can be arranged on-site at the GDS office in Marietta, GA, following the signing of non-disclosure agreements by all interested parties. Please note that these models are copyrighted and are not intended for use outside of this request. They are attached on the Confidential CD accompanying these responses and are submitted under petition for confidential treatment.

Witness) Lindsay N. Barron

Big Rivers Electric Corporation

2010 Integrated Resource Plan

Appendix B
Demand Side Management
Big Rivers Final Potential Study

Appendix 1
General Modeling Assumptions
and Avoided Costs

Big Rivers
ELECTRIC CORPORATION

Your Touchstone Energy® Cooperative

APPENDIX 1

GENERAL MODELING ASSUMPTIONS
AND AVOIDED COSTS

GENERAL MODELING ASSUMPTIONS & AVOIDED COSTS - *Energy Efficiency & Demand Response*

	Electric Energy Seasonal Avoided Energy in Nominal $	Electric Capacity Seasonal Avoided Capacity in Nominal $	
		Summer Generation	Winter Generation
Year		($/kW)	($/kW)
2010		$10.00	$14.00
2011		$15.58	$21.82
2012		$21.17	$29.63
2013		$26.75	$37.45
2014		$32.33	$45.27
2015		$37.92	$53.08
2016		$38.64	$54.09
2017		$39.37	$55.12
2018		$40.12	$56.17
2019		$40.88	$57.23
2020		$41.66	$58.32
2021		$42.45	$59.43
2022		$43.26	$60.56
2023		$44.08	$61.71
2024		$44.92	$62.88
2025		$45.77	$64.08
2026		$46.64	$65.29
2027		$47.52	$66.53
2028		$48.43	$67.80
2029		$49.35	$69.09
2030		$50.29	$70.40
2031		$51.24	$71.74
2032		$52.21	$73.10
2033		$53.21	$74.49
2034		$54.22	$75.90
2035		$55.25	$77.35
2036		$56.30	$78.82
2037		$57.37	$80.31
2038		$58.46	$81.84
2039		$59.57	$83.39
2040		$60.70	$84.98
2041		$61.85	$86.59
2042		$63.03	$88.24
2043		$64.23	$89.92
2044		$65.45	$91.62
2045		$66.69	$93.36
2046		$67.96	$95.14
2047		$69.25	$96.95
2048		$70.56	$98.79
2049		$71.90	$100.67

Inflation Rate: 1.6%

Discount Rate: 6.33%

T&D Avoided Cost: $0.00/kw-year

Transmission and Distribution Line Loss Factor: 5.68%

Reserve Margin: 15%

Big Rivers Electric Corporation

2010 Integrated Resource Plan

Appendix B
Demand Side Management
Big Rivers Final Potential Study

Appendix 2
Residential Sector Data
(Energy Efficiency)

Big Rivers
ELECTRIC CORPORATION

Your Touchstone Energy® Cooperative

APPENDIX 2

RESIDENTIAL SECTOR DATA
(ENERGY EFFICIENCY)

APPENDIX 2-1

RESIDENTIAL MEASURE DESCRIPTIONS,
ASSUMPTIONS, AND SOURCES

DESCRIPTIONS OF RESIDENTIAL ENERGY EFFICIENCY MEASURES

This technical appendix describes a broad range of residential sector energy efficiency measures and programs where GDS has assessed the technical and achievable potential for electric energy savings for Big Rivers. The purpose of this technical appendix is to briefly describe these efficiency measures and to provide data on their costs, energy savings and useful lives.

1. ELECTRIC APPLIANCES

The following section describes the energy efficiency measures that were included in this analysis for various household appliances in Big Rivers' homes. Five residential appliance energy efficiency measures/programs are covered in this section: Energy Star® Compliant Refrigerators, Energy Star® Compliant Freezers, Energy Star® Dehumidifiers, Second Refrigerator Turn-In, and Second Freezer Turn-In.[1] Complete assumptions and sources for the measures can be found at the end of the Appendix B.

(1) Energy Star® Compliant Refrigerators[2]*:* In April 2008, the Energy Star® criteria for refrigerators changed to require all qualifying, full-size models to be at least 20% above the minimum federal standard. High efficiency refrigerators use a number of technologies to achieve energy savings (more efficient compressors, insulation, door seals, etc.). There are a few variations of high efficiency refrigerator models: top freezer models, side by side models, and bottom freezer models.

(2) Energy Star® Compliant Freezers[3]*:* On January 1, 2003, the Energy Star® criteria for freezers was established, mandating all freezers 7.75 cubic feet or greater in volume must be at least 10% above the minimum federal standard to qualify for Energy Star®. Meanwhile, all freezers less than 7.75 cubic feet in volume and 36 inches or less in height must be at least 20% above the minimum federal standard to qualify for Energy Star®. Freezers come in two main styles: Chest and Upright. Chest style models have a door on top that opens upward while Upright models have the door on the front opening outward.

(3) Energy Star® Dehumidifiers[4]*:* Often used in the damp areas of a home, such as basements, dehumidifiers remove moisture from the air to maintain comfort and to limit the growth of mold and mildew. Energy Star® qualified models provide the same features as conventional models but they are more energy efficient. Energy Star® qualified models have more efficient refrigeration coils, compressors, and fans than conventional models. Energy Star® dehumidifiers operate at least 10 percent more efficiently than conventional models. This analysis compared replacing a standard 40 pint dehumidifier with a 40 pint Energy Star® dehumidifier that is used 1,620 hours/year.

(4) Second Refrigerator Turn-In: The goal of a refrigerator turn-in program is to get underutilized but operational second refrigerators out of service and properly dismantled. While appliance recycling programs are praised for handling the disposal of major appliances in an

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[1] Dishwashers & Clothes Washers can be found under the section for Electric Hot Water Heaters due to the electric savings associated with reduced hot water use.

[2] Refrigerators & Freezers: Key Product Criteria. (www.energystar.gov)

[3] Refrigerators & Freezers: Key Product Criteria. (www.energystar.gov)

[4] Dehumidifiers. (www.energystar.gov)

environmentally sound manner, the programs must also provide energy savings on a cost-effective basis, which means that only operating units qualify for recycling.

(5) Second Freezer Turn-In: The freezer turn-in program is the same as the refrigerator turn-in program described above.

2. CONSUMER ELECTRONICS

Five residential energy efficiency measures are covered in this section: Standby Power, Energy Star® Televisions, Energy Star® Desktop Computers, Monitors, and Laptop Computers. Complete assumptions and sources for the measures can be found at the end of Appendix B.

(1) Home Electronics[5]*:* Many consumer electronics continue to consume electricity when switched off or not performing their main function (stand-by mode). The most common sources of standby power consumption include products with remote controls, low-voltage power supplies, rechargeable devices, and continuous displays. A typical North American home may contain fifteen to twenty devices constantly drawing standby power. For this analysis, homes were assumed to replace fifteen devices consuming standby power to an energy saving model.

(2) Energy Star® Televisions[6]*:* In addition to the Home Electronics category defined above, this analysis looks at the most common electronics found in homes today: televisions and computers. Energy Star® televisions must consume 1 watt or less in standby mode. On mode power requirements vary according to screen area and whether the unit is non-high, high, or full-high definition. External power supplies (EPS) packaged with TV products must meet all Energy Star® requirements for EPS devices.

(3) Energy Star® Desktop Computers[7]*:* Today's Energy Star® criteria for personal computers include power supply efficiency standards, operational mode energy efficiency requirements, and power management requirements. Power management features place monitors and computers (CPU, hard drive, etc.) into a low-power "sleep mode" after a period of inactivity.

4) Energy Star® Computer Monitors: Similar to computers, Energy Star® Monitors also are equipped with power management features that enable monitors to switch into a low-power mode after a period of inactivity.

5) Energy Star® Laptop Computers: See Energy Star® Desktop Computers.

3. LIGHTING

Two residential energy efficiency measures are covered in this section: Compact Fluorescent Lighting and LED Lighting. Complete assumptions and sources for the measures can be found at the end of Appendix B.

(1)Compact Fluorescent Lighting[8]*:* Residential fluorescent bulbs and fixtures present a significant opportunity for energy and maintenance savings. On a per lamp basis, compact fluorescent

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[5] Emerging Energy Saving Technologies & Practices for the Buildings Sector as of 2004. ACEEE Report# AO42. October 2004. Pg. 41.

[6] Televisions (www.energystat.gov)

[7] Computers. (www.energystar.gov)

[8] Compact Fluorescent Bulbs. (www.energystar.gov)

lamps are generally 75 percent more efficient than incandescent bulbs and last up to ten times longer. In addition, CFL bulbs produce about 75 percent less heat, so they're safer to operate and can cut energy costs associated with home cooling. CFL bulbs vary in size and shape. Their appearance can be a spiral-shaped fluorescent tube or they can appear as a standard shape, such as the R-30 floodlight used in recessed cans. Dimmable CFL bulbs and 3-way CFL bulbs are also available.

The lighting sockets eligible for CFL replacement were designated as either high use (>5 hrs/day), medium use (1-5 hrs/day), and low use (1 hrs or less/day). In single family homes, more than half (57%) were considered low use bulbs. In manufactured homes, the percent of low use sockets was even greater (80%). Only 10.5% of sockets in single family homes were assumed to be high use bulbs, and less than 4% of bulbs in manufactured homes were estimated to be on 5 hours per day or greater.

(2)LED Lighting[9]*:* Light emitting diode (LED) lights are more efficient than both CFL and incandescent lighting. LED lighting uses at least 75% less energy, lasts 25 times longer than incandescent lighting, and provides optimal light color. LED lights are more rugged and damage-resistant than compact fluorescents and incandescent bulbs. LED lights don't flicker. In addition, LEDs do not produce heat like incandescent bulbs. However, current LEDs have primarily directional output in single direction and are better at placing light in a single direction than incandescent or fluorescent bulbs and may be limited to certain applications, such as under counter or recessed lighting. This analysis compared the savings potential of replacing both incandescent and CFL lighting with the more efficient LED lights.

4. ELECTRIC WATER HEATING

Nine residential water heating energy efficiency measures are covered in this section: Low Flow Showerhead, Low Flow Faucet Aerators, Water Heater Blanket, Pipe Wrap, Electric Water Heaters (stand-alone), Heat Pump Water Heaters(SF), Solar Water Heater with Electric Water Heating Back Up(SF), Energy Star® Dishwashers, and Energy Star® Clothes Washers.[10] Complete assumptions and sources for the measures can be found at the end of Appendix B.

(1) Low Flow Showerheads/Faucets[11],[12]*:* An existing showerhead is replaced with a new unit that has a low-flow rate (<2.5 gallons/minute). Significant savings in hot water use can be achieved by installing low-flow showerheads and faucets. The single best action is to replace old showerheads as showers use 37% of the hot water in typical U.S. homes.

(2) Low Flow Faucet Aerators[13]*:* An existing faucet is replaced with a new unit that has a low-flow rate (<1.0 gallon/minute).

(3) Water Heater Blanket[14]*:* Water heater jackets are designed to wrap around an existing water heater tank to improve insulation, prevent heat loss, and save energy. Installing an insulating blanket can reduce water heating energy use by 3-9%.

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[9] LED Lighting. Toolbase Services. (www.toolbase.org/Technology-Inventory/Electrical-Electronics/white-LED-lighting)

[10] SF: designates measures that were applied only to single-family homes due to measure applicability. For example, solar water heating possesses additional market barriers for manufactured home units.

[11] Global Green USA website (www.globalgreen.org/pha-energytoolbox/tech_dhw.htm)

[12] Residential Deemed Savings, Installation, and Efficiency Standards. Frontier Associates. January 2008. Pg. 35

[13] Residential Deemed Savings, Installation, and Efficiency Standards. Frontier Associates. January 2008. Pg. 36

(4) Pipe Wrap[15]*:* Insulating hot water pipes will reduce losses as the hot water is flowing to the faucet and, more importantly, it will reduce standby losses when the tap is turned off and then back on within an hour or so. Pipe wrap will conserve energy and water that would normally be lost waiting for the hot water to reach the tap. Energy loss still occurs after pipe wrap has been installed, though to a smaller degree than the losses observed in non-insulated pipes.

(5) Efficient Electric Water Heater (stand-alone)[16,17]*:* In this measure, baseline replacement stand alone electric water heaters are replaced with high efficiency stand alone storage tank water heaters. Storage water heaters work by heating up water in an insulated tank. However, because heat is lost through the walls of the storage tank, energy is consumed even when no hot water is being used. New high-efficiency storage water heaters contain higher levels of insulation around the tank, reducing standby losses. In this analysis a baseline replacement model (EF=.90) is replaced with a high efficiency model (EF=.95). This measure applies to homes operating primarily electric heating systems and electric water heaters.

(6) Heat Pump Water Heater (SF)[18,19]*:* Heat pump water heaters are more efficient than electric storage water heaters because the electricity is used for moving heat from one place to another in lieu of generating the heat directly. For heat pump water heaters, the heat source is typically the outside air or air in the basement where units are typically located. A heat pump water heater uses anywhere from 33%-50% of the electricity required by a conventional storage tank water heater and are available with built-in water tanks or as add-ons to existing water tanks. In this analysis a baseline electric storage tank model (EF=.90) is replaced with a heat pump water heater model (EF=2.0). This measure applies to homes operating primarily electric heating systems and electric water heaters.

(7) Solar WH w/ Electric Back-up (SF)[20]*:* Solar water heaters are designed to serve as pre-heaters for conventional storage or demand water heaters. As the solar system preheats the water, the extra temperature boost required by the storage or demand water heater is relatively low, and high flow rate can be achieved. Solar water heaters can be particularly effective if they are designed for three-season use, with a home's heating system providing hot water during the winter months. Although less common in today's market, solar water heating units are considerably less expensive and more reliable than they were two to three decades ago.

In this analysis, 30% of homes were estimated to be available for solar water heating systems. This technical potential is based on factors including: roof orientation, roof size, shading, load-bearing capability, and local building codes and ordinances.

(8) Energy Star® Dishwasher[21]*:* Dishwashers exceeding minimum qualifying efficiency standards established under Energy Star® Program with an Energy Factor (EF) >= .75 (versus the current federal standard energy factor <=.60). Energy Star® labeled dishwashers save energy by using

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[14] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003.
[15] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003.
[16] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003. Table 6.6.
[17] Energy Star Residential Water Heating: Draft Criteria Analysis. (www.energystar.gov)
[18] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003.
[19] Energy Star Residential Water Heating: Final Criteria Analysis. (www.energystar.gov)
[20] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003.
[21] Dishwashers: Key Product Criteria (www.energystar.gov)

both improved technology for the primary wash cycle, and by using less hot water to clean. Construction includes more effective washing action, energy efficient motors and other advanced technology such as sensors that determine the length of the wash cycle and the temperature of the water necessary to clean the dishes. In addition, a high efficiency dishwasher can save approximately 430 gallons of water a year if used to run an average of 4 loads per week.

(9) Energy Star® Clothes Washer[22]*:* Clothes washers exceeding minimum qualifying efficiency standards established under Energy Star® Program with a Modified Energy Factor (MEF) >= 1.8 and a Water Factor (WF) <=7.5. The MEF measures the energy used during the washing process, including machine energy, water heating energy, and dryer energy. The higher the MEF, the more efficient the clothes washer is. Energy Star® qualified washers extract more water from clothes during the spin cycle. This reduces the drying time and saves energy and wear and tear on your clothes. In addition, substantial savings on water and sewer bills contribute to the economic benefits of high-efficiency washers. A high efficiency clothes washer can save nearly 6,542 gallons of water a year based on an average of 7.5 cycles per week.

5. SPACE HEATING & COOLING (Building Envelope Measures)

The following section describes six energy efficiency building envelope measures that were included in this analysis for homes with electric space heating and/or cooling. The nine residential energy efficiency measures covered in this section include: Ceiling Insulation, Floor Insulation, Air Infiltration, Duct Sealing, Energy Star® Windows, and Radiant Barriers. Of these, the ceiling insulation upgrades and radiant barriers are considered only for single family homes, where adequate attic space is present, and not for manufactured homes. This study examines each measure for three heating and cooling scenarios: electric AC only, electric heat pumps and electric furnace heating. Complete assumptions and sources for the measures can be found at the end of Appendix B.

(1) Ceiling Insulation (SF)[23]*:* Ceiling insulation levels vary greatly depending on the age of the home, type of insulation, and activity in the attic (i.e. using the attic for storage and HVAC equipment). For this analysis, measure savings are based on homes with little to no ceiling insulation improving to R-19 levels, and homes with a current ceiling insulation of R-19 increased to an efficient level of R-38.

(2) Floor Insulation[24]*:* In an otherwise well-insulated home, as much as 20% of the total heat loss can occur through uninsulated foundation walls or floors. For this analysis, measure savings are based on a home with no floor insulation increased to R-19. Manufactured homes were assumed to have a minimum of R-11 and upgraded to R-30.

(3) Air Infiltration[25]*:* Hidden air leaks cause some of the largest heating and cooling losses in older homes. Common air leakage sites include plumbing penetrations through insulated floors and ceilings, baseboard moldings, dropped ceilings above bathtubs and cabinets, attic access hatches, and doors. For this analysis, measure savings are based on a reducing a current home's air from 10 ACH_{50} to 7 ACH_{50}.

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[22] Clothes Washers: Key Product Criteria. (www.energystar.gov)
[23] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003.
[24] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003.
[25] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003.

(4) Duct Sealing[26]*:* This measure assumes that leaky and unsealed residential air ducts are properly repaired and sealed. Mastic (a special paste) is the preferred method for duct sealing. Properly sealing leaky ducts can save significant amounts of energy needed to heat a home.

(5) Energy Star® Windows[27]*:* In older homes, windows are often one of the largest sources of heat loss in winter due to their low insulating ability and high air leakage rates. Windows are also generally the major source of unwanted heat gain in the summer. As a result, windows are typically net energy losers, and can be responsible for much of the energy used to heat and cool homes. However, improved windows, combined with proper consideration of their placement and other details, can result in significant energy savings. Energy efficient windows help to reduce air leakage and heat transfer. High efficiency windows usually have double or triple glazing, have argon gas between the panes of glass, have excellent seals, and have a Low-Emissivity coating.

(6) Radiant Barriers (SF)[28]*:* Radiant heat from the sun is absorbed by roofing shingles and transferred to the roof decking below and into the attic space. Conventional insulation absorbs much of this heat and once its saturation point has been met, this heat is then transferred to the living spaces below. Radiant barriers, such as reinforced aluminum foil, reduce the flow of heat from a hot roof to the cooler ceiling insulation. By lowering the temperature in your attic, you can reduce the amount of heat transferred to your living spaces below by up to 50% giving you greater comfort in your home and lessening the strain your air conditioning unit.

6. SPACE HEATING & COOLING (HVAC Equipment)

The following section describes the energy-efficient HVAC equipment measures that were included in this analysis for homes with electric space heating and/or cooling. Seven residential energy efficiency measures are covered in this section: HVAC Tune-Up, Energy Star® Room Air Conditioners, High Efficiency Central Air Conditioners, High Efficiency Heat Pumps, Ground-Source Heat Pumps, Dual-Fuel Heat Pumps, and Electric Furnace Replacement (w/ Air Source Heat Pumps). Complete assumptions and sources for the measures can be found at the end of Appendix 2.

(1) HVAC Tune-Up[29]*:* HVAC tune-up and maintenance helps to keep heat pump and central air conditioning units running at top efficiency, prevent equipment failures, and extend the life of the equipment. A tune-up by a service professional can improve unit efficiency by as much as 20%. An annual HVAC tune up includes: checking the unit's refrigerant pressure and tubing, checking and adjusting belt tension, cleaning and lubricating the indoor blower unit, cleaning inside the "A" coil, and checking the thermostat, wiring, and other electric parts.

(2) Energy Star® Room Air Conditioners[30,31]*:* Room air conditioner units are typically mounted in a window so that part of the unit is outside and part is inside. An insulated divider to reduce heat transfer losses typically separates the two sides. The outdoor portion generally includes a compressor, condenser, condenser fan, fan motor, and capillary tube. The indoor portion

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[26] Efficiency Vermont Technical Reference Usual Manual (TRM). No. 2006-41. Pg. 388.
[27] "Energy Efficiency in Remodeling: Windows" Tool Base Services website. (www.toolbase.org)
[28] Emerging Energy Saving Technologies & Practices for the Buildings Sector as of 2004. ACEEE Report# AO42. October 2004. Pg. 180.
[29] "Tuning Up for Summer" Kansas City Power & Light. (www.kcpl.com)
[30] Room Air Conditioners: Key Product Criterion. Energy Star website (www.energystar.gov)
[31] Technology Summary. CEE website. www.cee1.org

generally includes an evaporator and evaporator fan. The minimum federal standard used in this analysis (based on model type and capacity) is an Energy Efficiency Ratio (EER) of at least 9.8. Currently, units with an EER of 10.8 are eligible for the Energy Star® label. This analysis assumed a room air conditioner cooling capacity of 10,000 Btu/hr for primary units in single-family homes, and 8,000 Btu/hr for all secondary units or manufactured home units.

(3) High Efficiency Central Air Conditioners[32,33]*:* Central air conditioners circulate cool air through a system of supply and return ducts. Supply ducts and registers (i.e. openings in the walls, floors, or ceilings covered by grills) carry cooled air from the air conditioner to the home. This cooled air becomes warmer as it circulates though the home; then it flows back to the central air conditioner through return ducts and registers.

Central air conditioners are rated according to their seasonal energy efficiency ratio (SEER). SEER indicates the relative amount of energy need to provide a specific cooling output. New residential central air conditioner standards went into effect in January 2006. Central air conditioners manufactured after January 2006 must achieve a SEER of 13 or higher. For this analysis, the baseline replacement model has a SEER of 13 for all replace-on-burnout scenarios. The baseline for the early retirement analysis assumes existing homes currently have an average SEER 10 unit. The high efficiency central air conditioner has a SEER of 15. High efficiency central air conditioners were eligible for installation in all homes with central air conditioning.

(4) High Efficiency Electric Heat Pumps[34,35]*:* Electric heat pumps operate by transferring heat from one place to another. In the heating mode, a heat pump extracts heat from outside a residence and delivers it to the house. Like a furnace, most heat pumps work with forced warm-air delivery systems. Heat pumps can also be operated to cool a house during summer months. In the cooling mode, the cycle is reversed and heat is taken from the house and transferred to the outside air. Because heat pumps rely on the outside air as the heat source in the wintertime, they are much more common in warmer climates. Heat pumps are rated for both heating and cooling – both in terms of capacity and efficiency.

Heating efficiency is indicated by the heating season performance factor (HSPF). Cooling efficiency is indicated by the seasonal energy efficiency rating (SEER). Both indicate the relative amount of energy needed to provide a specific heating or cooling output. New residential heat pump standards went into effect in January 2006. Heat pumps manufactured after January 2006 must achieve a HSPF of 7.7 and a SEER of 13 or higher. For this analysis, the baseline replacement model has a HSPF of 7.7 and a SEER of 13 (replace-on-burnout) or a HSPF of 6.8 and a SEER of 10 (early retirement). The high efficiency heat pump has a HSPF of 8.5 and a SEER of 15.

(5) Ground Source Heat Pumps[36]*:* Ground Source heat pumps, or geothermal heat pumps, use the earth or groundwater as a heat source, instead of the outside air. Stable underground temperature allow geothermal systems to be rated for heating efficiency and cooling efficiency.

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[32] Consumer Guide to Home Energy Savings' 8th ed. ACEEE. 2003.

[33] Central Air Conditioners and Heat Pumps Energy Conservation Standards. Federal Register. Volume 6:, No. 14. January 22, 2001. Pg. 31

[34] Consumer Guide to Home Energy Savings' 8th ed. ACEEE. 2003.

[35] Central Air Conditioners and Heat Pumps Energy Conservation Standards. Federal Register. Volume 6:, No. 14. January 22, 2001. Pg. 31

[36] "Consumer Guide to Home Energy Savings' 8th ed. ACEEE. 2003.

Geothermal heat pumps may be 25-45% more efficient than air-source heat pumps, but are more expensive and difficult to install. Most geothermal systems include "loops" that are buried in the ground in shallow trenches or in vertical boreholes. As an alternative, other systems may draw in groundwater and pass it through a heat exchanger instead of refrigerant before returning the water to the aquifer. Geothermal systems may also include 'desuperheaters' which recover discharged heat to provide domestic hot water at little to no cost.

Geothermal systems currently are eligible for a federal person tax credit up to 30% of the installation costs. These credits are available through December 2016.

(6) Dual-Fuel Heat Pump: A dual-fuel heat pump is an electric heat pump and a gas furnace all in one. When temperatures are above freezing, a heat pump is an efficient way to heat the home. In instances when the temperature drops below freezing, a gas furnace is able to provide heat more economically. When the outside temperature falls below 35 degrees, the heat pump automatically switches to supplemental gas heat for better efficiency. This analysis considered the benefits of installing a dual fuel heat pump in place of either a standard electric heat pump or a central AC/Electric Furnace unit.

(7) Electric Furnace Replacement with Air Source Heat Pumps (SF)[37]*:* Heat Pumps are considered to be more energy efficient than furnaces. As a result, this measure examines the possible energy savings derived from replacing an existing central AC/Electric Furnace or a central AC /Electric Furnace that has reached the end of its useful life with a new energy efficient air-source heat pump. The heat pump has a HSPF of 8.5 and a SEER of 15.

7. OTHER

Three residential energy efficiency measures are covered in this section: In Home Energy Displays, Pre-Pay Metering, and Pool pumps (single family only). Complete assumptions and sources for the measures can be found at the end of Appendix B.

(1)In Home Energy Displays[38]*:* In-home energy displays provide real-time feedback to occupants on whole-house electricity consumption. Displays collect demand data from the meter and display instantaneous power usage and cumulative energy usage over selected time periods. Providing instantaneous feedback on household electrical demand has shown the promise to reduce energy consumption in households by 5-15% through behavioral changes. Although studies have shown reduced consumption, the persistence of these savings remains relatively unknown. For this analysis, savings were assumed to persist for a period of three years.

(2)Pre-Pay Metering[39]*:* Prepaid meters require consumers to purchase power in advance. In home display indicates how much money is on the account, how many kilowatts the household consumed in the last hour, day, and month, how much that power costs in dollar and cents, and when, approximately, the account will need to be replenished.

While pre-paid metering is not an applicable measure for all consumers, pre-paid metering has proven effective for credit-challenged consumers. The plan eliminates the need for a security deposit and late fees, and forces consumers to use only as much power as they afford. Utilities

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[37] "Consumer Guide to Home Energy Savings' 8th ed. ACEEE. 2003.

[38] Pilot Evaluation of Energy Savings from Residential Energy Demand Feedback Devices. Florida Solar Energy Center. Janaury 2008.

[39] Prepaid Meters: Pay-as-you-use consumption. Consumer Reports.

currently offering pre-pay as an option to consumers has also shown the benefit of decreased consumption by users. One utility, Salt River Project, reports pre-pay consumers used an average of 12.8% less electricity annually than regular consumers.

Similar to in-home energy displays, reduced consumption is a result of behavior change and the persistence of savings is relative unknown. This analysis assumed savings for a period of 3 years.

(3)Pool Pumps (SF)[40]*:* Residential pool pumps are used to circulate and filter swimming pool water. While large, single speed pool pumps filter pools quickly, they use substantially more energy than a multi-speed pool pump. Two-speed operation saves energy while still filtering the same amount of pool water because the pumps operate more efficiently at lower water flow rates. High speed operation is only required intermittently.

8. MULTI-FAMILY ENERGY EFFICIENT RETROFIT PACKAGE

One residential energy efficiency measures are covered in this section: Multi-Family Energy Efficiency Kit (Tier 1). Complete assumptions and sources for the measures can be found at the end of Appendix B.

(1)Multi-Family Energy Efficiency Kit (Tier 1): Multi-family homes make a relatively small part of the Big Rivers service territory, at approximately 2% of all residential units. In addition, the likelihood of shared walls and the possibility of inhabitants merely renting the property can create some additional obstacles for installing and investing in energy efficient measures. For this analysis, GDS considered installing a relatively inexpensive package of energy efficient retrofit measures for the multi-family population. This package consisted of: 5 CFL bulbs, a low flow showerhead, and basic air sealing measures (i.e. caulking). Total savings are estimated at a conservative 4% of total annual consumption.

9. NEW HOMES CONSTRUCTION

Two residential energy efficiency programs are covered in this section: Energy Efficient New Homes Construction (Tier 1: 15% more efficient) and Energy Efficient New Homes Construction (Tier 2: 35% more efficient). Tier 2 new construction homes are limited to single-family residences. Complete assumptions and sources for the measures can be found at the end of Appendix B.

(1) Energy Efficient New Homes Construction (15% more efficient)[41]*:* In this analysis, new homes are designed to be built to Energy Star® standards: at least 15 percent more energy efficient than those built to the 2006 International Residential Code (IRC).

Builders would receive an incentive for constructing new homes designed to Energy Star® standards: at least 15 percent more energy efficient than those built to the 2006 International Residential Code (IRC). Energy Star® Homes also incorporate other energy savings features that typically make them 20–30% more efficient than standard homes. The US Environmental Protection Agency reports that 165 home builders have partnered with EPA to construct more

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[40] Leading the Way: Continued Opportunities for New State Appliance & Equipment Efficiency Standards. ACEEE Report # ASAP-6/ACEEE-AO62. March 2006.

[41] About Energy Star New Homes. (www.energystar.gov)

than 1,290 Energy Star® qualified homes in the state of Kentucky in 2010 to date. Nationwide, just over 1.1 million homes have earned the Energy Star® rating to date.

Energy savings are based on heating, cooling, and hot water energy use and are typically achieved through a combination of the following: high performance windows, controlled air infiltration, upgraded heating and air conditioning systems, tight duct systems, high efficiency water heating equipment, and high efficiency building envelope standards. Energy Star® Homes also encourage the use of energy-efficient lighting and appliances. These features contribute to improved home quality and homeowner comfort, and to lower energy demand and reduced air pollution.

Both single-family and manufactured homes can be built to Tier 1 (15% more efficient than code) standards.

(2) Energy Efficient New Homes Construction (35% more efficient): Similar to a Tier 1 home, homeowners would receive an incentive for purchasing new homes designed to exceed Energy Star® standards: at least 35 percent more energy efficient than those built to the 2006 International Residential Code. Tier 2 construction is limited to single family homes.

Electric Measure Assumptions (Initial Assumptions & Levelized Costs)

Discount Rate 6.33%

Measure	Measure Name	Home Type	Base Elec Use (kWh)	Elec Savings	Elec Savings (kWh)	Summer kW Savings	Winter kW Savings	Measure Life	Increm. Measure Cost	ROB vs. Retrofit	Measure/ End Use Description	Base Saturation	EE Saturation	Gas (MMBTU) Savings	Water Savings (Gal)	Annual Quantity Cost Per Unit	Levelized Cost (¢/kWh)	TRC Test	Utility Test	PCT Test	RIM Test
Electric Appliances - Single Family/Mobile Home																					
1	Energy Star® Compliant Top-Mount Refrigerator	SF	508.00	20.87%	106.00	0.007	0.006	12.00	$30.00	ROB	Homes w/ Refrigerators	65.00%	25.00%			$3.64	$0.034	1.86	1.00	1.00	1.00
2	Energy Star® Compliant Side-by-Side Refrigerator	SF	699.00	19.03%	133.00	0.007	0.006	12.00	$30.00	ROB	Homes w/ Refrigerators	35.00%	25.00%			$3.64	$0.027	2.29	1.00	1.00	1.00
3	Energy Star® Compliant Chest Freezer	SF	420.00	10.00%	42.00	0.004	0.003	11.00	$33.00	ROB	Homes w/ Freezers	36.40%	7.00%			$4.26	$0.101	0.64	1.00	1.00	1.00
4	Energy Star® Compliant Upright Freezer (Manual Def.)	SF	469.00	10.02%	47.00	0.004	0.003	11.00	$33.00	ROB	Homes w/ Freezers	15.60%	7.00%			$4.26	$0.091	0.70	1.00	1.00	1.00
5	Energy Star® Dehumidifer	SF	1,064.00	20.02%	213.00	0.131	0.131	12.00	$1.00	ROB	Homes w/ Dehumidifiers	7.00%	50.00%			$0.12	$0.001	207.42	1.00	1.00	1.00
6	Second Refrigerator Turn In	SF	978.00	100.00%	978.00	0.082	0.070	5.00	$142.20	Retrofit	Homes w/ more than one refrigerator	34.00%	10.00%			$34.06	$0.035	1.55	1.00	1.00	1.00
7	Second Freezer Turn In	SF	774.00	100.00%	774.00	0.065	0.055	5.00	$142.20	Retrofit	Homes w/ more than one freezer	4.00%	10.00%			$34.06	$0.044	1.23	1.00	1.00	1.00
8	Energy Star® Compliant Top-Mount Refrigerator	MH	508.00	20.87%	106.00	0.007	0.006	12.00	$30.00	ROB	Homes w/ Refrigerators	65.00%	25.00%			$3.64	$0.034	1.86	1.00	1.00	1.00
9	Energy Star® Compliant Side-by-Side Refrigerator	MH	699.00	19.03%	133.00	0.007	0.006	12.00	$30.00	ROB	Homes w/ Refrigerators	35.00%	25.00%			$3.64	$0.027	2.29	1.00	1.00	1.00
10	Energy Star® Compliant Chest Freezer	MH	420.00	10.00%	42.00	0.004	0.003	11.00	$33.00	ROB	Homes w/ Freezers	36.40%	7.00%			$4.26	$0.101	0.64	1.00	1.00	1.00
11	Energy Star® Compliant Upright Freezer (Manual Def.)	MH	469.00	10.02%	47.00	0.004	0.003	11.00	$33.00	ROB	Homes w/ Freezers	15.60%	7.00%			$4.26	$0.091	0.70	1.00	1.00	1.00
12	Energy Star® Dehumidifer	MH	1,064.00	20.02%	213.00	0.131	0.131	12.00	$1.00	ROB	Homes w/ Dehumidifiers	7.00%	50.00%			$0.12	$0.001	207.42	1.00	1.00	1.00
13	Second Refrigerator Turn In	MH	847.00	100.00%	847.00	0.071	0.060	5.00	$142.20	Retrofit	Homes w/ more than one refrigerator	34.00%	10.00%			$34.06	$0.040	1.34	1.00	1.00	1.00
14	Second Freezer Turn In	MH	774.00	100.00%	774.00	0.065	0.055	5.00	$142.20	Retrofit	Homes w/ more than one freezer	4.00%	10.00%			$34.06	$0.044	1.23	1.00	1.00	1.00
Consumer Electronics - Single Family/Mobile Home																					
15	Home Electronics	SF	440.00	60.23%	265.00	0.030	0.030	7.00	$30.00	ROB	All Homes	100.00%	30.00%			$5.44	$0.021	2.98	1.00	1.00	1.00
16	Televisions	SF	310.00	15.81%	49.00	0.017	0.017	6.00	$1.00	ROB	Homes w/ a TV	245.00%	30.00%			$0.21	$0.004	18.82	1.00	1.00	1.00
17	Energy Star® Desktop Computer	SF	134.00	31.34%	42.00	0.005	0.005	4.00	$1.00	ROB	Homes w/ a Desktop	85.00%	30.00%			$0.29	$0.007	7.80	1.00	1.00	1.00
18	Energy Star® Computer Monitor	SF	97.00	21.65%	21.00	0.002	0.002	5.00	$1.00	ROB	Homes w/ a Desktop	85.00%	30.00%			$0.24	$0.011	4.98	1.00	1.00	1.00
19	Energy Star® Laptop Computer	SF	44.00	29.55%	13.00	0.001	0.001	4.00	$1.00	ROB	Homes w/ a Laptop	16.00%	30.00%			$0.29	$0.022	2.41	1.00	1.00	1.00
20	Home Electronics	MH	440.00	60.23%	265.00	0.030	0.030	7.00	$30.00	ROB	All Homes	100.00%	30.00%			$5.44	$0.021	2.98	1.00	1.00	1.00
21	Televisions	MH	310.00	15.81%	49.00	0.017	0.017	6.00	$1.00	ROB	Homes w/ a TV	150.00%	30.00%			$0.21	$0.004	18.82	1.00	1.00	1.00
22	Energy Star® Desktop Computer	MH	134.00	31.34%	42.00	0.005	0.005	4.00	$1.00	ROB	Homes w/ a Desktop	85.00%	30.00%			$0.29	$0.007	7.80	1.00	1.00	1.00
23	Energy Star® Computer Monitor	MH	97.00	21.65%	21.00	0.002	0.002	5.00	$1.00	ROB	Homes w/ a Desktop	85.00%	30.00%			$0.24	$0.011	4.98	1.00	1.00	1.00
24	Energy Star® Laptop Computer	MH	44.00	29.55%	13.00	0.001	0.001	4.00	$1.00	ROB	Homes w/ a Laptop	16.00%	30.00%			$0.29	$0.022	2.41	1.00	1.00	1.00
Lighting - Single Family /Mobile Home																					
25	CFL (vs. Incandescent) - 5 hours/day	SF	76.65	-	51.10	0.003	0.007	4.00	$1.60	ROB	Sockets with Inc. bulbs (5hrs/day)	10.54%	22.48%			$0.47	$0.009	7.08	1.00	1.00	1.00
26	CFL (vs. Incandescent) - 3 hours/day	SF	45.99	-	30.66	0.003	0.007	7.00	$1.60	ROB	Sockets with Inc. bulbs (3hrs/day)	31.82%	19.27%			$0.29	$0.009	8.16	1.00	1.00	1.00
27	CFL (vs. Incandescent) - 1 hours/day	SF	15.33	-	10.22	0.003	0.007	20.00	$1.60	ROB	Sockets with Inc. bulbs (1hrs/day)	57.64%	9.03%			$0.14	$0.014	9.68	1.00	1.00	1.00
28	LED (vs. Incandescent)	SF	45.99	-	40.52	0.004	0.009	20.00	$29.75	ROB	Sockets with Inc. bulbs	100.00%	17.00%			$2.66	$0.066	1.41	1.00	1.00	1.00
29	LED (vs. CFL)	SF	15.33	-	9.86	0.001	0.002	20.00	$28.15	ROB	Sockets with CFL bulbs	17.00%	0.00%			$2.52	$0.256	0.44	1.00	1.00	1.00
30	CFL (vs. Incandescent) - 5 hours/day	MH	76.65	-	51.10	0.003	0.007	4.00	$1.60	ROB	Sockets with Inc. bulbs (5hrs/day)	3.40%	25.00%			$0.47	$0.009	7.08	1.00	1.00	1.00
31	CFL (vs. Incandescent) - 3 hours/day	MH	45.99	-	30.66	0.003	0.007	7.00	$1.60	ROB	Sockets with Inc. bulbs (3hrs/day)	14.53%	20.51%			$0.29	$0.009	8.16	1.00	1.00	1.00
32	CFL (vs. Incandescent) - 1 hours/day	MH	15.33	-	10.22	0.003	0.007	20.00	$1.60	ROB	Sockets with Inc. bulbs (1hrs/day)	81.99%	14.55%			$0.14	$0.014	9.68	1.00	1.00	1.00
33	LED (vs. Incandescent)	MH	45.99	-	40.52	0.004	0.009	20.00	$29.75	ROB	Sockets with Inc. bulbs	100.00%	12.00%			$2.66	$0.066	1.41	1.00	1.00	1.00
34	LED (vs. CFL)	MH	15.33	-	9.86	0.001	0.002	20.00	$28.15	ROB	Sockets with CFL bulbs	12.00%	0.00%			$2.52	$0.256	0.44	1.00	1.00	1.00
Electric Water Heating - Single Family/Mobile Homes																					
35	Low Flow Faucets	SF	3,694.00	2.22%	82.00	0.014	0.022	10.00	$10.00	Retrofit	Homes w/ Electric WH	62.00%	60.00%		965	$1.38	$0.017	8.86	1.00	1.00	1.00
36	Low Flow Showerhead	SF	3,694.00	5.52%	204.00	0.014	0.022	10.00	$14.00	Retrofit	Homes w/ Electric WH	62.00%	60.00%		2738	$1.93	$0.009	15.29	1.00	1.00	1.00
37	Water Heater Blanket	SF	3,694.00	4.85%	179.16	0.010	0.014	13.00	$20.00	Retrofit	Homes w/ Electric WH	62.00%	15.00%			$2.30	$0.013	5.64	1.00	1.00	1.00
38	Pipe Wrap	SF	3,694.00	2.95%	109.00	0.010	0.014	13.00	$6.00	Retrofit	Homes w/ Electric WH	62.00%	15.00%			$0.69	$0.006	12.17	1.00	1.00	1.00
39	Efficient Water Heater	SF	3,694.00	5.25%	193.94	0.005	0.007	13.00	$50.00	ROB	Homes w/ Electric WH	62.00%	30.00%			$5.76	$0.030	2.31	1.00	1.00	1.00
40	Heat Pump Water Heater	SF	3,694.00	55.98%	2,067.90	0.187	0.281	10.00	$850.00	ROB	Homes w/ Electric WH	62.00%	30.00%			$117.30	$0.057	1.28	1.00	1.00	1.00
41	Solar Water Heating	SF	3,694.00	53.49%	1,975.92	0.289	0.000	14.00	$4,850.00	Retrofit	Homes w/ Electric WH	62.00%	30.00%			$372.75	$0.189	0.57	1.00	1.00	1.00
42	Energy Star® Dishwasher (Electric Water Heating)	SF	368.00	20.11%	74.00	0.003	0.001	10.00	$12.00	ROB	Homes w/ Dishwashers & Electric WH	35.3%	47.00%		430	$1.66	$0.022	3.97	1.00	1.00	1.00
43	Energy Star® Dishwasher (Non-Electric WH)	SF	167.00	19.76%	33.00	0.003	0.001	10.00	$12.00	ROB	Homes w/ Dishwashers & Non-Elec. WH	21.7%	47.00%	0.19	430	$1.66	$0.050	4.26	1.00	1.00	1.00
44	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	SF	787.00	28.46%	224.00	0.026	0.007	11.00	$258.00	ROB	Homes w/ CW, Elec. WH and Elec. Dryer	55.2%	36.00%		6542	$33.27	$0.149	1.57	1.00	1.00	1.00
45	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	SF	487.00	19.92%	97.00	0.026	0.007	11.00	$258.00	ROB	Homes w/ CW, NG WH and Elec. Dryer	33.8%	36.00%	0.61	6542	$33.27	$0.343	1.59	1.00	1.00	1.00
46	Low Flow Faucets	MH	3,151.00	2.13%	67.00	0.010	0.014	10.00	$10.00	Retrofit	Homes w/ Electric WH	95.00%	60.00%		965	$1.38	$0.021	7.75	1.00	1.00	1.00
47	Low Flow Showerhead	MH	3,151.00	5.30%	167.00	0.010	0.014	10.00	$7.00	Retrofit	Homes w/ Electric WH	95.00%	60.00%		2190	$0.97	$0.006	24.45	1.00	1.00	1.00
48	Water Heater Blanket	MH	3,151.00	5.87%	184.96	0.010	0.014	13.00	$20.00	Retrofit	Homes w/ Electric WH	95.00%	15.00%			$2.30	$0.012	5.80	1.00	1.00	1.00
49	Pipe Wrap	MH	3,151.00	2.82%	89.00	0.010	0.014	13.00	$6.00	Retrofit	Homes w/ Electric WH	95.00%	15.00%			$0.69	$0.008	10.28	1.00	1.00	1.00
50	Efficient Water Heater	MH	3,151.00	6.35%	200.09	0.005	0.007	13.00	$50.00	ROB	Homes w/ Electric WH	95.00%	30.00%			$5.76	$0.029	2.38	1.00	1.00	1.00
51	Energy Star® Dishwasher (Electric Water Heating)	MH	368.00	20.11%	74.00	0.003	0.001	10.00	$12.00	ROB	Homes w/ Dishwashers & Electric WH	54.2%	47.00%		430	$1.66	$0.022	3.97	1.00	1.00	1.00
52	Energy Star® Dishwasher (Non-Electric WH)	MH	167.00	19.76%	33.00	0.003	0.001	10.00	$12.00	ROB	Homes w/ Dishwashers & Non-Elec. WH	2.9%	47.00%	0.19	430	$1.66	$0.050	4.26	1.00	1.00	1.00
53	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	MH	787.00	28.46%	224.00	0.026	0.007	11.00	$258.00	ROB	Homes w/ CW, Elec. WH and Elec. Dryer	84.6%	36.00%		6542	$33.27	$0.149	1.57	1.00	1.00	1.00
54	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	MH	487.00	19.92%	97.00	0.026	0.007	11.00	$258.00	ROB	Homes w/ CW, NG WH and Elec. Dryer	4.5%	36.00%	0.61	6542	$33.27	$0.343	1.59	1.00	1.00	1.00
Space Heating and Space Cooling Shell Measures - Single Family Homes w/ Electric AC Only (& Gas Heat)																					
55	Insulation - Ceiling (R-0 to R-19)	SF	6,836.00	28.51%	1,949.00	1.241	0.000	20.00	$882.30	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	57.00%	89.00%	29.40		$79.00	$0.041	8.23	1.00	1.00	1.00
56	Insulation - Floor (R-0 to R-19)	SF	4,887.00	2.28%	111.42	0.146	0.000	20.00	$1,366.70	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	57.00%	50.00%	9.22		$122.37	$0.098	1.32	1.00	1.00	1.00
57	Energy Star® Windows	SF	4,887.00	8.41%	411.00	0.219	0.000	20.00	$3,610.88	ROB	Homes w/ Electric AC Only (& Gas Heat)	57.00%	41.00%	5.90		$323.30	$0.787	0.40	1.00	1.00	1.00
58	Insulation -Ceiling (R-19 to R-38)	SF	4,887.00	2.58%	126.08	0.073	0.000	20.00	$882.30	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	57.00%	36.00%	2.16		$79.00	$0.627	0.58	1.00	1.00	1.00
59	Air infiltration	SF	4,887.00	2.08%	101.65	0.110	0.000	11.00	$529.00	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	57.00%	27.00%	3.94		$68.21	$0.671	0.98	1.00	1.00	1.00
60	Duct Sealing	SF	4,887.00	11.99%	585.95	0.292	0.000	18.00	$500.00	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	57.00%	10.00%	6.96		$47.33	$0.081	3.33	1.00	1.00	1.00
61	Radiant Barriers	SF	4,887.00	12.76%	623.58	0.292	0.000	15.00	$641.00	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	57.00%	5.00%	0.00		$67.43	$0.108	0.74	1.00	1.00	1.00
Space Heating and Space Cooling Shell Measures - Single Family Homes w/ Electric Heat Pump																					
62	Insulation - Ceiling (R-0 to R-19)	SF	19,902.00	40.47%	8,054.00	1.241	5.548	20.00	$882.30	Retrofit	Homes w/ Electric Heat Pump	16.00%	89.00%			$79.00	$0.010	11.95	1.00	1.00	1.00
63	Insulation - Floor (R-0 to R-19)	SF	11,848.00	12.69%	1,502.93	0.146	1.460	20.00	$1,366.70	Retrofit	Homes w/ Electric Heat Pump	16.00%	50.00%			$122.37	$0.081	1.64	1.00	1.00	1.00
64	Energy Star® Windows	SF	11,848.00	11.39%	1,350.04	0.219	1.095	20.00	$3,610.88	ROB	Homes w/ Electric Heat Pump	16.00%	41.00%			$323.30	$0.239	0.53	1.00	1.00	1.00
65	Insulation -Ceiling (R-19 to R-38)	SF	11,848.00	4.04%	478.31	0.073	0.438	20.00	$882.30	Retrofit	Homes w/ Electric Heat Pump	16.00%	36.00%			$79.00	$0.165	0.80	1.00	1.00	1.00
66	Air Infiltration	SF	11,848.00	6.04%	715.61	0.110	0.657	11.00	$529.00	Retrofit	Homes w/ Electric Heat Pump	16.00%	27.00%			$68.21	$0.095	1.22	1.00	1.00	1.00
67	Duct Sealing	SF	11,848.00	14.36%	1,703.19	0.292	1.460	18.00	$500.00	Retrofit	Homes w/ Electric Heat Pump	16.00%	10.00%			$47.33	$0.028	1.54	1.00	1.00	1.00
68	Radiant Barriers	SF	11,848.00	5.26%	623.58	0.292	0.000	15.00	$641.00	Retrofit	Homes w/ Electric Heat Pump	16.00%	5.00%			$67.43	$0.108	0.74	1.00	1.00	1.00

Electric Measure Assumptions (Initial Assumptions & Levelized Costs)

Discount Rate 6.33%

Measure #	Measure Name	Home Type	Base Elec Use (kWh)	% Savings	Elec. Savings (kWh)	Summer kW Savings	Winter kW Savings	Useful Life	Incremental Measure Cost	ROB vs. Retrofit	Measure/End Use Description	Base Saturation	EE Saturation	Annual Gas (MMBTU) Savings	Annual Water Savings (Gal)	Annual & Amortized Cost per Unit	Levelized Cost (¢/kWh)	TRC	Utility Test	Participant Test	RIM Test
											Space Heating and Space Cooling Shell Measures - Single Family Homes w/ Electric Furnace										
69	Insulation - Ceiling (R-0 to R-19)	SF	26,239.00	32.97%	8,650.00	1.241	5.540	20.00	$882.30	Retrofit	Homes w/ Electric Furnace & AC	12.00%	89.00%			$79.00	$0.009	12.43	1.00	1.00	1.00
70	Insulation - Floor (R-0 to R-19)	SF	17,589.00	12.51%	2,200.90	0.146	1.460	20.00	$1,366.70	Retrofit	Homes w/ Electric Furnace & AC	12.00%	50.00%			$122.37	$0.056	2.00	1.00	1.00	1.00
71	Energy Star® Windows	SF	17,589.00	9.96%	1,752.33	0.219	1.095	20.00	$3,610.68	ROB	Homes w/ Electric Furnace & AC	12.00%	41.00%			$323.30	$0.184	0.60	1.00	1.00	1.00
72	Insulation -Ceiling (R-19 to R-38)	SF	17,589.00	3.50%	615.11	0.073	0.365	20.00	$882.30	Retrofit	Homes w/ Electric Furnace & AC	12.00%	36.00%			$79.00	$0.128	0.85	1.00	1.00	1.00
73	Air Infiltration	SF	17,589.00	5.63%	990.79	0.110	0.621	11.00	$529.00	Retrofit	Homes w/ Electric Furnace & AC	12.00%	27.00%			$68.21	$0.069	1.41	1.00	1.00	1.00
74	Duct Sealing	SF	17,589.00	12.36%	2,173.70	0.292	1.460	18.00	$500.00	Retrofit	Homes w/ Electric Furnace & AC	12.00%	10.00%			$47.33	$0.022	5.16	1.00	1.00	1.00
75	Radiant Barriers	SF	17,589.00	3.55%	623.58	0.292	0.000	15.00	$641.00	Retrofit	Homes w/ Electric Furnace & AC	12.00%	5.00%			$67.43	$0.108	0.74	1.00	1.00	1.00
											Space Heating and Space Cooling Shell Measures - Mobile Homes w/ Electric AC Only (& Gas Heat)										
76	Air Infiltration	MH	4,114.00	2.51%	103.26	0.073	0.000	11.00	$326.00	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	24.00%	42.00%	4.31		$42.03	$0.407	1.68	1.00	1.00	1.00
77	Insulation - Floor (R-11 to R-30)	MH	4,114.00	0.65%	26.74	0.000	0.000	20.00	$821.60	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	24.00%	60.00%	4.17		$73.56	$2.751	0.93	1.00	1.00	1.00
78	Energy Star® Windows	MH	4,114.00	20.19%	830.62	0.365	0.000	20.00	$4,218.48	ROB	Homes w/ Electric AC Only (& Gas Heat)	24.00%	26.00%	12.45		$377.70	$0.455	0.71	1.00	1.00	1.00
79	Duct Sealing	MH	4,114.00	12.03%	494.91	0.219	0.000	18.00	$500.00	Retrofit	Homes w/ Electric AC Only (& Gas Heat)	24.00%	26.00%	6.96		$47.33	$0.096	3.14	1.00	1.00	1.00
											Space Heating and Space Cooling Shell Measures - Mobile Homes w/ Electric Heat Pump										
80	Air Infiltration	MH	11,093.00	6.30%	739.05	0.073	0.511	11.00	$326.00	Retrofit	Homes w/ Electric Heat Pump	7.50%	42.00%			$42.03	$0.057	1.77	1.00	1.00	1.00
81	Insulation - Floor (R-11 to R-30)	MH	11,093.00	16.10%	647.87	0.000	0.511	20.00	$821.60	Retrofit	Homes w/ Electric Heat Pump	7.50%	60.00%			$73.56	$0.114	1.03	1.00	1.00	1.00
82	Energy Star® Windows	MH	11,093.00	4.90%	2,619.33	0.365	1.825	20.00	$4,218.48	ROB	Homes w/ Electric Heat Pump	7.50%	26.00%			$377.70	$0.144	0.81	1.00	1.00	1.00
83	Duct Sealing	MH	11,093.00	17.50%	1,546.65	0.219	1.095	18.00	$500.00	Retrofit	Homes w/ Electric Heat Pump	7.50%	26.00%			$47.33	$0.031	3.76	1.00	1.00	1.00
											Space Heating and Space Cooling Shell Measures - Mobile Homes w/ Electric Heat										
84	Air Infiltration	MH	16,849.00	7.50%	1,080.04	0.073	0.511	11.00	$326.00	Retrofit	Homes w/ Electric Heat & Cool	53.00%	42.00%			$42.03	$0.039	2.22	1.00	1.00	1.00
85	Insulation - Floor (R-11 to R-30)	MH	16,849.00	20.70%	980.59	0.000	0.511	20.00	$821.60	Retrofit	Homes w/ Electric Heat & Cool	53.00%	60.00%			$73.56	$0.075	1.32	1.00	1.00	1.00
86	Energy Star® Windows	MH	16,849.00	3.30%	3,675.62	0.365	1.825	20.00	$4,218.48	ROB	Homes w/ Electric Heat & Cool	53.00%	26.00%			$377.70	$0.103	0.99	1.00	1.00	1.00
87	Duct Sealing	MH	16,849.00	17.50%	2,086.79	0.219	1.095	18.00	$500.00	Retrofit	Homes w/ Electric Heat & Cool	53.00%	26.00%			$47.33	$0.023	4.47	1.00	1.00	1.00
											Space Heating and Space Cooling Equipment - Single Family/Mobile Homes										
88	HVAC Tune-Up	SF	4,887.00	13.01%	635.80	0.304	0.000	6.00	$160.00	Retrofit	Homes with Central AC or Heat Pump	85.00%	10.00%			$32.88	$0.052	1.26	1.00	1.00	1.00
89	Energy Star® Room A/C	SF	1,205.00	9.26%	111.58	0.069	0.000	9.00	$50.00	ROB	Homes w/ Electric Room AC	12.50%	25.00%			$7.46	$0.067	1.15	1.00	1.00	1.00
90	Second Energy Star® Room A/C	SF	964.00	9.26%	89.27	0.055	0.000	9.00	$50.00	ROB	Homes w/ more than one Room AC	6.50%	25.00%			$7.46	$0.084	0.92	1.00	1.00	1.00
91	High Efficiency Central AC	SF	3,379.00	11.29%	381.49	0.146	0.000	14.00	$555.71	ROB	Homes w/ Electric Central AC	68.00%	4.00%			$61.01	$0.160	0.47	1.00	1.00	1.00
92	High Efficiency Central AC/Early Retire	SF	4,887.00	38.66%	1,889.31	0.365	0.000	14.00	$3,413.00	Retrofit	Homes w/ Electric Central AC	68.00%	4.00%			$374.73	$0.198	0.31	1.00	1.00	1.00
93	High Efficiency Heat Pump (HP Upgrade)	SF	8,949.00	7.74%	692.29	0.146	0.000	12.00	$1,000.00	ROB	Homes with Electric Heat Pump (H&C)	16.00%	10.00%			$121.44	$0.175	0.38	1.00	1.00	1.00
94	High Efficiency Heat Pump/Early Retire (HP Upgrade)	SF	11,848.00	30.31%	3,591.28	0.365	0.000	12.00	$6,700.00	Retrofit	Homes with Electric Heat Pump (H&C)	16.00%	10.00%			$813.68	$0.227	0.26	1.00	1.00	1.00
95	Ground Source Heat Pump (HP Upgrade)	SF	12,643.00	28.93%	3,658.00	0.073	4.453	22.00	$8,300.00	ROB	Homes with Electric Heat Pump (H&C)	16.00%	10.00%			$350.32	$0.096	1.28	1.00	1.00	1.00
96	Ground Source Heat Pump/Early Retire (HP Upgrade)	SF	15,542.00	42.15%	6,551.00	0.288	4.453	22.00	$14,000.00	Retrofit	Homes with Electric Heat Pump (H&C)	16.00%	10.00%			$837.35	$0.128	0.91	1.00	1.00	1.00
97	Heat Pump (Replacing Electric Furnace)	SF	15,445.90	46.54%	7,189.19	0.146	0.000	12.00	$3,843.00	ROB	Homes with Electric Furnaces and CAC	12.00%	0.00%			$466.71	$0.065	0.89	1.00	1.00	1.00
98	Heat Pump/Early Retire (Replacing Electric Furnace)	SF	17,589.00	53.06%	9,332.29	0.365	0.000	12.00	$6,700.00	Retrofit	Homes with Electric Furnaces and CAC	12.00%	0.00%			$813.68	$0.087	0.72	1.00	1.00	1.00
99	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	SF	8,949.00	38.53%	3,448.00	0.146	7.066	12.00	$2,000.00	ROB	Homes with Electric Heat Pump (H&C)	16.00%	10.00%	-19.22		$242.89	$0.070	1.43	1.00	1.00	1.00
100	Dual Fuel Heat Pump (Replacing Electric Furnace)	SF	15,445.90	64.39%	9,944.90	0.146	7.066	12.00	$4,843.00	ROB	Homes with Electric Furnaces and CAC	12.00%	0.00%	-19.22		$588.16	$0.059	1.22	1.00	1.00	1.00
101	HVAC Tune-Up	MH	4,114.00	13.00%	534.82	0.256	0.000	6.00	$160.00	Retrofit	Homes with Central AC or Heat Pump	72.50%	10.00%			$32.88	$0.061	1.06	1.00	1.00	1.00
102	Energy Star® Room A/C	MH	964.00	9.26%	89.27	0.055	0.000	9.00	$50.00	ROB	Homes w/ Electric Room AC	26.00%	25.00%			$7.46	$0.084	0.92	1.00	1.00	1.00
103	Second Energy Star® Room A/C	MH	964.00	9.26%	89.27	0.055	0.000	9.00	$50.00	ROB	Homes w/ more than one Room AC	14.00%	25.00%			$7.46	$0.084	0.92	1.00	1.00	1.00
104	High Efficiency Central AC	MH	2,845.00	11.31%	321.77	0.146	0.000	14.00	$555.71	ROB	Homes w/ Electric Central AC	65.00%	4.00%			$61.01	$0.190	0.41	1.00	1.00	1.00
105	High Efficiency Central AC/Early Retire	MH	4,114.00	38.66%	1,590.47	0.292	0.000	14.00	$3,252.00	Retrofit	Homes w/ Electric Central AC	65.00%	4.00%			$357.05	$0.224	0.27	1.00	1.00	1.00
106	High Efficiency Heat Pump (HP Upgrade)	MH	8,398.00	7.74%	650.00	0.146	0.000	12.00	$1,000.00	ROB	Homes with Electric Heat Pump (H&C)	7.50%	8.00%			$122.05	$0.188	0.35	1.00	1.00	1.00
107	High Efficiency Heat Pump/Early Retire (HP Upgrade)	MH	11,093.00	30.15%	3,344.71	0.292	0.000	12.00	$6,384.00	Retrofit	Homes with Electric Heat Pump (H&C)	7.50%	8.00%			$775.30	$0.232	0.25	1.00	1.00	1.00
108	Heat Pump (Replacing Electric Furnace)	MH	14,943.25	48.15%	7,195.25	0.146	0.000	12.00	$3,688.00	ROB	Homes with Electric Furnaces and CAC	53.00%	0.00%			$447.89	$0.062	0.93	1.00	1.00	1.00
109	Heat Pump/Early Retire (Replacing Electric Furnace)	MH	16,849.00	54.02%	9,101.00	0.292	0.000	12.00	$6,384.00	Retrofit	Homes with Electric Furnaces and CAC	53.00%	0.00%			$775.30	$0.085	0.75	1.00	1.00	1.00
110	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	MH	8,398.00	40.03%	3,362.00	0.146	7.066	12.00	$2,000.00	ROB	Homes with Electric Heat Pump (H&C)	7.50%	8.00%	-19.26		$242.89	$0.072	1.41	1.00	1.00	1.00
111	Dual Fuel Heat Pump (Replacing Electric Furnace)	MH	14,943.25	66.30%	9,907.25	0.146	7.066	12.00	$4,688.00	ROB	Homes with Electric Furnaces and CAC	53.00%	0.00%	-19.26		$569.33	$0.057	1.25	1.00	1.00	1.00
											Other										
112	In Home Energy Display Monitor	SF	18,090.00	5.00%	904.50	0.075	0.075	3.00	$240.00	Retrofit	All Homes	100.00%	0.00%			$90.34	$0.100	0.50	1.00	1.00	1.00
113	Pre-Pay Metering	SF	18,090.00	12.80%	2,315.52	0.193	0.193	3.00	$99.00	Retrofit	All Homes	100.00%	0.00%			$37.26	$0.016	3.09	1.00	1.00	1.00
114	Pool Pump and Motor	SF			1,260.00	0.315	0.000	10.00	$664.00	ROB	Homes with Pools	6.00%	30.00%			$91.63	$0.073	0.86	1.00	1.00	1.00
115	In Home Energy Display Monitor	MH	20,720.00	5.00%	1,036.00	0.086	0.086	3.00	$240.00	Retrofit	All Homes	100.00%	0.00%			$90.34	$0.087	0.57	1.00	1.00	1.00
116	Pre-Pay Metering	MH	20,720.00	12.80%	2,652.16	0.221	0.221	3.00	$99.00	Retrofit	All Homes	100.00%	0.00%			$37.26	$0.014	3.54	1.00	1.00	1.00
											Multi-Family Units										
117	Multi-Family Homes Efficiency Kit	MF	8,626.73	4.14%	357.30	0.030	0.057	9.00	$60.00	Retrofit	All Multi-Family Homes	85.00%	50.00%			$8.95	$0.025	2.63	1.00	1.00	1.00
											New Construction Homes - Single Family										
118	New Construction - 15% more efficient	SF	13,915.00	10.00%	1,391.50	0.584	0.073	20.00	$1,763.00	NEW	All Single Family New Homes w/ AC Only	35.00%	28.00%	13.08		$157.85	$0.113	2.09	1.00	1.00	1.00
119	New Construction - 25% more efficient	SF	19,686.00	20.00%	3,937.20	0.584	2.409	20.00	$1,763.00	NEW	All Single Family New Homes w/ Elec. HP	40.00%	28.00%	-		$157.85	$0.040	2.79	1.00	1.00	1.00
120	New Construction - 35% more efficient	SF	13,915.00	25.00%	3,478.75	0.876	0.438	20.00	$4,300.00	NEW	All Single Family New Homes w/ AC Only	35.00%	28.00%	15.26		$385.00	$0.111	1.39	1.00	1.00	1.00
121	New Construction - 35% more efficient	SF	19,686.00	30.00%	5,905.80	0.876	2.993	20.00	$4,300.00	NEW	All Single Family New Homes w/ Elec. HP	40.00%	28.00%	-		$385.00	$0.065	1.61	1.00	1.00	1.00
122	New Construction - 15% more efficient	MH	11,211.00	15.00%	1,681.65	0.584	0.073	20.00	$1,300.00	NEW	All Single Family New Homes w/ AC Only	15.00%	28.00%	6.56		$116.39	$0.069	2.10	1.00	1.00	1.00
123	New Construction - 15% more efficient	MH	16,992.00	15.00%	2,548.80	0.584	2.409	20.00	$1,300.00	NEW	All Single Family New Homes w/ Elec. HP	19.00%	28.00%			$116.39	$0.046	3.02	1.00	1.00	1.00

Note: In general, savings estimates for the thermal envelope were based on engineering calculations derived from the REMrate modeling software, but were adjusted down based on experience that suggests actual savings are much lower than pure engineering assumptions would suggest. This adjustment was completed by creating adjusted base consumptions and applying the savings % found in the modeling runs to this new base usage. Additional assumptions utilized for the calculation of individual measure savings, costs, and measure saturation can be found noted in the "Residential Electric Measure Sources and Notes" table.

Residential Electric Measure Sources And Notes

Measure	Measure Name	Unit	Electric (kWh)	Source	Gas (Therm)	Electric kWh Savings	Measure Life	Measure Cost	Cost Source	ES Estimate	Notes
					Electric Appliances - Single Family/Multi Family						
1	Energy Star® Compliant Top-Mount Refrigerator	SF	ES-Calc RF		ES-Calc RF	DUKE/ACEEE	ES-Calc RF	ES-Calc RF	MEEA/EIA	MEEA	Avg. Total Volume= 20 cubic ft.; Auto Defrost Baseline: 100% w/ Refrigerators (MEEA); 65% Top Mount (EIA)
2	Energy Star® Compliant Side-by-Side Refrigerator	SF	ES-Calc RF		ES-Calc RF	DUKE/ACEEE	ES-Calc RF	ES-Calc RF	MEEA/EIA	MEEA	Avg. Total Volume= 23.6 cubic ft.; through the door ice dispenser Baseline: 100% w/ Refrigerators (MEEA); 35% SxS Mount (EIA)
3	Energy Star® Compliant Chest Freezer	SF	ES-Calc Freez		ES-Calc Freez	DUKE/ACEEE	ES-Calc Freez	ES-Calc Freez	MEEA/EIA	MEEA	Avg. Total Volume= 16.14 cubic ft. Baseline: 52% w/ Freezers (MEEA); 70% Chest (EIA)
4	Energy Star® Compliant Upright Freezer (Manual Def.)	SF	ES-Calc Freez		ES-Calc Freez	DUKE/ACEEE	ES-Calc Freez	ES-Calc Freez	MEEA/EIA	MEEA	Avg. Total Volume= 16.14 cubic ft. Baseline: 52% w/ Freezers (MEEA); 30% Upright (EIA)
5	Energy Star® Dehumidifer	SF	ES Calc-Dhum		ES Calc-Dhum	GDS LOAD-1	ES Calc-Dhum	ES Calc-Dhum	EIA RECS 2005	GDS Est.	40 pint capacity; runs 1,620 hrs/yr.; 1.20 L/kWh vs. 1.50 L/kWh EE Sat: Assumed 50% based on no cost difference and high 2008 Energy Star market penetration (75%) Incremental cost is $0. Set at $1 for benefit/cost purposes
6	Second Refrigerator Turn In	SF	ES Calc - RRS		ES Calc - RRS	DUKE/ACEEE	GDS-1	DEER-1	MEEA	GDS Est.	Assumed 2nd appliance had 5 years remaining useful life; Age between 1993-2000; Size 19 - 24.4 cub. feet Cost: $92.20 for recycling and pick-up (DEER); $50 Incentive (GDS)
7	Second Freezer Turn In	SF	ES Calc - RRS	-	ES Calc - RRS	DUKE/ACEEE	GDS-1	DEER-1	MEEA	GDS Est.	Assume 2nd appliance had 5 years remaining useful life; Age between 1993-2000; Size 16.5 - 18.9 cub. feet Cost: $92.20 for recycling and pick-up (DEER); $50 Incentive (GDS)
8	Energy Star® Compliant Top-Mount Refrigerator	MH	ES-Calc RF	-	ES-Calc RF	DUKE/ACEEE	ES-Calc RF	ES-Calc RF	MEEA/EIA	MEEA	Avg. Total Volume= 20 cubic ft.; Auto Defrost
9	Energy Star® Compliant Side-by-Side Refrigerator	MH	ES-Calc RF		ES-Calc RF	DUKE/ACEEE	ES-Calc RF	ES-Calc RF	MEEA/EIA	MEEA	Avg. Total Volume= 23.6 cubic ft.; through the door ice dispenser
10	Energy Star® Compliant Chest Freezer	MH	ES-Calc Freez	-	ES-Calc Freez	DUKE/ACEEE	ES-Calc Freez	ES-Calc Freez	MEEA/EIA	MEEA	Avg. Total Volume= 16.14 cubic ft.
11	Energy Star® Compliant Upright Freezer (Manual Def.)	MH	ES-Calc Freez		ES-Calc Freez	DUKE/ACEEE	ES-Calc Freez	ES-Calc Freez	MEEA/EIA	MEEA	Avg. Total Volume= 16.14 cubic ft.
12	Energy Star® Dehumidifer	MH	ES Calc-Dhum	-	ES Calc-Dhum	GDS LOAD-1	ES Calc-Dhum	ES Calc-Dhum	EIA RECS 2005	GDS Est.	40 pint capacity; runs 1,620 hrs/yr.; 1.20 L/kWh vs. 1.50 L/kWh EE Sat: Assumed 50% based on no cost difference and high 2008 Energy Star market penetration (75%) Incremental cost is $0. Set at $1 for benefit/cost purposes
13	Second Refrigerator Turn In	MH	ES Calc - RRS	-	ES Calc - RRS	DUKE/ACEEE	GDS-1	DEER-1	MEEA	GDS Est.	Assume 2nd appliance had 5 years remaining useful life; Age between 1993-2000; Size 19 - 21.4 cubicfeet Cost: $92.20 for recycling and pick-up (DEER); $50 Incentive (GDS)
14	Second Freezer Turn In	MH	ES Calc - RRS	-	ES Calc - RRS	DUKE/ACEEE	GDS-1	DEER-1	MEEA	GDS Est.	Assume 2nd appliance had 5 years remaining useful life; Age between 1993-2000; Size 16.5 - 18.9 cub. feet Cost: $92.20 for recycling and pick-up (DEER); $50 Incentive (GDS)
					Consumer Electronics- Single Family/Multi Family						
15	Home Electronics	SF	ACEEE A042	-	ACEEE A042	ACEEE A042	ACEEE A042	ACEEE A042	GDS Est.	Amann	All homes have standby power appliances
16	Televisions	SF	ES-Calc TV	-	ES-Calc TV	ES-Calc TV	ES-Calc TV	ES-Calc TV	EIA RECS 2005	GDS Est.	TV w/ Screen 31" - 40" Baseline: Avg. of 2.45 TVs per home. (Based on EIA Data for East South Central Region)
17	Energy Star® Desktop Computer	SF	ES-Calc Office	-	ES-Calc Office	ES-Calc Office	ES-Calc Office	ES-Calc Office	EIA RECS 2005	GDS Est.	78% turned off a night; 75% sleep mode activated. Incremental cost is $0. Set at $1 dollar for benefit/cost purposes.
18	Energy Star® Computer Monitor	SF	ES-Calc Office	-	ES-Calc Office	ES-Calc Office	ES-Calc Office	ES-Calc Office	EIA RECS 2005	GDS Est.	75% Turned off at night; 40% Power Saver Mode Enabled. Incremental cost is $0. Set at $1 dollar for benefit/cost purposes.
19	Energy Star® Laptop Computer	SF	ES-Calc Office		ES-Calc Office	ES-Calc Office	ES-Calc Office	ES-Calc Office	EIA RECS 2005	GDS Est.	78% turned off a night; 75% sleep mode activated. Incremental cost is $0. Set at $1 dollar for benefit/cost purposes.
20	Home Electronics	MH	ACEEE A042	-	ACEEE A042	ACEEE A042	ACEEE A042	ACEEE A042	GDS Est.	Amann	All homes have standby power appliances
21	Televisions	MH	ES-Calc TV	-	ES-Calc TV	ES-Calc TV	ES-Calc TV	ES-Calc TV	GDS Est.	GDS Est.	TV w/ Screen 31" - 40" Baseline: Avg. of 1.5 TVs / home. (GDS Est based on fewer rooms & smaller house size from SF home)
22	Energy Star® Desktop Computer	MH	ES-Calc Office	-	ES-Calc Office	ES-Calc Office	ES-Calc Office	ES-Calc Office	EIA RECS 2005	GDS Est.	78% turned off a night; 75% sleep mode activated. Incremental cost is $0. Set at $1 dollar for benefit/cost purposes.
23	Energy Star® Computer Monitor	MH	ES-Calc Office	-	ES-Calc Office	ES-Calc Office	ES-Calc Office	ES-Calc Office	EIA RECS 2005	GDS Est.	75% Turned off at night; 40% Power Saver Mode Enabled. Incremental cost is $0. Set at $1 dollar for benefit/cost purposes.
24	Energy Star® Laptop Computer	MH	ES-Calc Office		ES-Calc Office	ES-Calc Office	ES-Calc Office	ES-Calc Office	EIA RECS 2005	GDS Est.	78% turned off a night; 75% sleep mode activated. Incremental cost is $0. Set at $1 dollar for benefit/cost purposes.
					Lighting - Single Family /Multi Family						
25	CFL (vs. Incandescent) - 5 hours/day	SF	GDS-2	-	GDS-2	GDS-2	GDS-2	Hoosier	Hoosier	Hoosier	$1.85 Avg. CFL bulb cost - $.25 for replacement incandescent Assumed daily use: 5 hours Assumed incand. bulbs currently meet 2012 standard of 30% more efficient
26	CFL (vs. Incandescent) - 3 hours/day		GDS-2	-	GDS-2	GDS-2	GDS-2	Hoosier	Hoosier	Hoosier	Assumed daily use: 3 hours
27	CFL (vs. Incandescent) - 1 hours/day		GDS-2	-	GDS-2	GDS-2	GDS-2	Hoosier	Hoosier	Hoosier	Assumed daily use: 1 hour. Useful life capped at 20 years.
28	LED (vs. Incandescent)	SF	GDS-2	-	GDS-2	GDS-2	GDS-2	Eco-Story	GDS Est.	BR EU Survey	$30 LED bulb cost - $.25 for replacement incandescent Assumed daily use: 3 hours; Useful life capped at 20 years. Assumed incand. bulbs currently meet 2012 standard of 30% more efficient
29	LED (vs. CFL)	SF	GDS-2	-	GDS-2	GDS-2	GDS-2	Eco-Story	BR EU Survey	GDS Est.	Daily Use: 3 hours; Useful life capped at 20 years.
30	CFL (vs. Incandescent) - 5 hours/day	MH	GDS-2	-	GDS-2	GDS-2	GDS-2	Hoosier	Hoosier	Hoosier	$1.85 Avg. CFL bulb cost - $.25 for replacement incandescent Assumed daily use: 5 hours Assumed incand. bulbs currently meet 2012 standard of 30% more efficient
31	CFL (vs. Incandescent) - 3 hours/day		GDS-2	-	GDS-2	GDS-2	GDS-2	Hoosier	Hoosier	Hoosier	Assumed daily use: 3 hours
32	CFL (vs. Incandescent) - 1 hours/day		GDS-2	-	GDS-2	GDS-2	GDS-2	Hoosier	Hoosier	Hoosier	Assumed daily use: 1 hour. Useful life capped at 20 years.
33	LED (vs. Incandescent)	MH	GDS-2	-	GDS-2	GDS-2	GDS-2	Eco-Story	GDS Est.	BR EU Survey	$30 LED bulb cost - $.25 for replacement incandescent Assumed daily use: 3 hours; Useful life capped at 20 years Assumed incand. bulbs currently meet 2012 standard of 30% more efficient
34	LED (vs. CFL)	MH	GDS-2	-	GDS-2	GDS-2	GDS-2	Eco-Story	BR EU Survey	GDS Est.	Daily Use: 3 hours; Useful life capped at 20 years.
					Electric Water Heating - Single Family/Multi Family						
35	Low Flow Faucets	SF	REM/Rate	-	MEEA/SB	DUKE/SB	DEER-2	MEEA/SB	BR EU Survey	MEEA	< 1.5 gallons/minute for bathrooms vs 2.5 gpm; Cost assumes 2 per home Baseline: *½ of Single Story and Multi Story Gas Heat Homes. Table B. (323+127 / 506+215)*
36	Low Flow Showerhead	SF	REM/Rate	-	MEEA/SB	DUKE/SB	DEER-2	MEEA/SB	BR EU Survey	MEEA	< 2.0 gallons/minute vs 2.5 gpm; Cost assumes 2 per home
37	Water Heater Blanket	SF	REM/Rate	REM/Rate		REM/GDS	GDS Est.	HD	BR EU Survey	MEEA	Baseline: R0; EE: Added R8 insulation to existing water heater; Useful life estimated at 13 years (similar to pipe insulation)
38	Pipe Wrap	SF	REM/Rate	-	MEEA/SB	REM/GDS	DEER-2	MEEA/SB	BR EU Survey	MEEA	All hot and cold pipe lengths insulated
39	Efficient Water Heater	SF	REM/Rate	REM/Rate	-	GDS Est.	EnergyStar	EnergyStar	BR EU Survey	MEEA	Base: Medium Size Tank (40 gal.), EF=.88, $650; EE: Medium Size Tank (40 gal.), EF=.93, $700
40	Heat Pump Water Heater	SF	REM/Rate	REM/Rate		ACEEE A042	EnergyStar	EnergyStar	BR EU Survey	MEEA	Base: Medium Size Tank (40 gal.), EF=.90, $650; EE: Medium Size Tank (40 gal.), EF=2.0, $1500
41	Solar Water Heating	SF	REM/Rate	ACEEE Solar		ACEEE Solar	ACEEE Solar	ACEEE Solar	BR EU Survey	MEEA	Base: Medium Size Tank (40 gal.); EF=.90; EE: Medium Size Tank (40 gal.); EF=1.8 .6 Peak kW savings in Summer. No Peak Savings in Winter. Levelized "cost" does include Federal Tax Incentive (30% of cost); $4850 - $1455 = $3395
42	Energy Star® Dishwasher (Electric Water Heating)	SF	ES-Calc DW	-	ES-Calc DW	DUKE/ACEEE	ES-Calc DW	ES-Calc DW	BR EU Survey / MEEA	MEEA	Assumed 208 cycles per year. ES Dishwasher EF=.60; Standard EF=.75. Water Savings = 430 gallon Baseline: 62% w/ Electric WH (BR EU Survey); 57% Dishwashers (MEEA)

Residential Electric Measure Sources And Notes

Measure Number	Measure Name	Home Type	Unit Energy Savings	Peak Coincident Demand Savings	Unit Energy Savings	Unit Energy Savings	Unit Energy Savings	Measure Cost	Source of Baseline	Source of Measure Cost	Notes
43	Energy Star® Dishwasher (Non-Electric WH)	SF	ES-Calc DW	-	ES-Calc DW	DUKE/ACEEE	ES-Calc DW	ES-Calc DW	BR EU Survey / MEEA	MEEA	Assumed 208 cycles per year. ES Dishwasher EF=.60 ; Standard EF=.75. Water Savings = 430 gallon Baseline: 38% w/ Non-Electric WH (BR EU Survey) ; 57% Dishwashers (MEEA)
44	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	SF	ES-Calc CW	-	ES-Calc CW	DUKE/ACEEE	ES-Calc CW	ES-Calc CW	BR EU Survey / MEEA	MEEA	Assumed 392 per year. Water Savings = 6,542 gallons Baseline: 62% w/ Electric WH (BR EU Survey) ; 89% ClothesWashers (MEEA)
45	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	SF	ES-Calc CW	-	ES-Calc CW	DUKE/ACEEE	ES-Calc CW	ES-Calc CW	BR EU Survey / MEEA	MEEA	Assumed 392 per year. Water Savings = 6,542 gallons Baseline: 38% w/ Non-Electric WH (BR EU Survey) ; 89% ClothesWashers (MEEA)
46	Low Flow Faucets	MH	REM/Rate	-	MEEA/SB	DUKE/SB	DEER-2	MEEA/SB	BR EU Survey	MEEA	< 1.5 gallons/minute for bathrooms vs 2.5 gpm ; Cost assumed 2 per home Baseline: % of Manufactured Homes with Electric WH, Table 8.
47	Low Flow Showerhead	MH	REM/Rate	-	MEEA/SB	DUKE/SB	DEER-2	MEEA/SB	BR EU Survey	MEEA	< 2.0 gallons/minute vs 2.5 gpm ; Cost assumes 2 per home
48	Water Heater Blanket	MH	REM/Rate	REM/Rate	-	REM/GDS	GDS Est.	HD	BR EU Survey	MEEA	Baseline: R0 ; EE: Added R8 insulation to existing water heater Useful life estimated at 13 years (similar to pipe insulation)
49	Pipe Wrap	MH	REM/Rate	-	MEEA/SB	REM/GDS	DEER-2	MEEA/SB	BR EU Survey	MEEA	All hot and cold pipe lengths insulated
50	Efficient Water Heater	MH	REM/Rate	REM/Rate	-	GDS Est.	EnergyStar	EnergyStar	BR EU Survey	MEEA	Base: Medium Size Tank (40 gal) , EF=.88 , $650 ; EE: Medium Size Tank (40 gal) , EF=.93 , $700
51	Energy Star® Dishwasher (Electric Water Heating)	MH	ES-Calc DW	-	ES-Calc DW	DUKE/ACEEE	ES-Calc DW	ES-Calc DW	BR EU Survey / MEEA	MEEA	Assumed 208 cycles per year. ES Dishwasher EF=.60 ; Standard EF=.75. Water Savings = 430 gallon Baseline: 95% w/ Electric WH (BR EU Survey) ; 57% Dishwashers (MEEA)
52	Energy Star® Dishwasher (Non-Electric WH)	MH	ES-Calc DW	-	ES-Calc DW	DUKE/ACEEE	ES-Calc DW	ES-Calc DW	BR EU Survey / MEEA	MEEA	Assumed 208 cycles per year. ES Dishwasher EF=.60 ; Standard EF=.75. Water Savings = 430 gallon Baseline: 5% w/ Non-Electric WH (BR EU Survey) ; 57% Dishwashers (MEEA)
53	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	MH	ES-Calc CW	-	ES-Calc CW	DUKE/ACEEE	ES-Calc CW	ES-Calc CW	BR EU Survey / MEEA	MEEA	Assumed 392 per year. Water Savings = 6,542 gallons Baseline: 95% w/ Electric WH (BR EU Survey) ; 89% ClothesWashers (MEEA)
54	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	MH	ES-Calc CW	-	ES-Calc CW	DUKE/ACEEE	ES-Calc CW	ES-Calc CW	BR EU Survey / MEEA	MEEA	Assumed 392 per year. Water Savings = 6,542 gallons Baseline: 5% w/ Non-Electric WH (BR EU Survey) ; 89% ClothesWashers (MEEA)
	Space Heating and Space Cooling Shell Measures - Single Family Homes w/ Electric AC Only (& Gas Heat)										
55	Insulation - Ceiling (R-0 to R-19)	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	MEEA	R-0 to R-19 ; 1730sq.ft. ; $0.51/sq.ft. for R-19 fiberglass install. Baseline: % of Single Story and Multi Story Gas Heat Homes. Table 6. (280+133 / 506+215)
56	Insulation - Floor (R-0 to R-19)	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	GDS Est.	Little to no floor insulation ; upgrade to R-13; floor area: 1730sqft. ; $0.79 per sq.ft. 55.6 MMBTU for Gas Heating (Based on ESTAR Calc-Furnace)
57	Energy Star® Windows	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	DEER-1	BR EU Survey	BR EU Survey	Window Area=166.4 sq.ft. Baseline: Uvalue-.72, SHGC-.55 ; EE:Uvalue-.32, SHGC-.40 Incremental Cost = $21.70 sq. foot (Full retrofit cost, Materials and Install)
58	Insulation -Ceiling (R-19 to R-38)	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	EIA RECS 2005	R-19 to R-38 ; 1730sq.ft. ; $0.51/sq.ft. for ~R-19. EE Sat: % of Homes well insulated (2.5/6.9). Table:c13.5
59	Air Infiltration	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	MEEA/SB	BR EU Survey	BR EU Survey	From 12 ACH @ 50 Pascals to 7 ACH @ 50 Pascals
60	Duct Sealing	SF	GDS Calc.	REM/Rate		REM/GDS	DEER-2	PSE/WI FOE	BR EU Survey	GDS Est.	Measure cost assumes duct sealing program does not require pre/post testing on most homes. Reduce leakage from Qualitative (Leaky, Uninsulated) to Quantitative (6% of floor area =CFM@25)
61	Radiant Barriers	SF	GDS Calc.	REM/Rate		REM/GDS	ICF	ICF	BR EU Survey	GDS Est.	Minimal to no winter savings
	Space Heating and Space Cooling Shell Measures - Single Family Homes w/ Electric Heat Pump										
62	Insulation - Ceiling (R-0 to R-19)	SF	GDS Calc.	REM/Rate		REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	MEEA	R-0 to R-19 ; 1730sq.ft. ; $0.51/sq.ft. for R-19 fiberglass install. Baseline: % of Single Story and Multi Story Electric HP Homes. Table 6. (82+33 / 506+215)
63	Insulation - Floor (R-0 to R-19)	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	GDS Est.	Little to no floor insulation ; upgrade to R-13; floor area: 1730sqft. ; $0.79 per sq.ft.
64	Energy Star® Windows	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	DEER-1	BR EU Survey	BR EU Survey	Window Area=166.4 sq.ft. Baseline: Uvalue-.72, SHGC-.55 ; EE:Uvalue-.32, SHGC-.40 Incremental Cost = $21.70 sq. foot (Full retrofit cost, Materials and Install)
65	Insulation -Ceiling (R-19 to R-38)	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	EIA RECS 2005	R-19 to R-38 ; 1730sq.ft. ; $0.51/sq.ft. for ~R-19. EE Sat: % of Homes well insulated (2.5/6.9). Table:c13.5
66	Air Infiltration	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	MEEA/SB	BR EU Survey	BR EU Survey	From 12 ACH @ 50 Pascals to 7 ACH @ 50 Pascals
67	Duct Sealing	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	PSE/WI FOE	BR EU Survey	GDS Est.	Measure cost assumes duct sealing program does not require pre/post testing on most homes. Reduce leakage from Qualitative (Leaky, Uninsulated) to Quantitative (6% of floor area =CFM@25)
68	Radiant Barriers	SF	GDS Calc.	REM/Rate	-	REM/GDS	ICF	ICF	BR EU Survey	GDS Est.	Minimal to no winter savings
	Space Heating and Space Cooling Shell Measures - Single Family Homes w/ Electric Furnace										
69	Insulation - Ceiling (R-0 to R-19)	SF	GDS Calc.	REM/Rate		REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	MEEA	R-0 to R-19 ; 1730sq.ft. ; $0.51/sq.ft. for R-19 fiberglass install. Baseline: % of Single Story and Multi Story Electric Furnace Homes. Table 6. (66+21 / 506+215)
70	Insulation - Floor (R-0 to R-19)	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	GDS Est.	Little to no floor insulation ; upgrade to R-13; floor area: 1730sqft. ; $0.79 per sq.ft.
71	Energy Star® Windows	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	DEER-1	BR EU Survey	BR EU Survey	Window Area=166.4 sq.ft. Baseline: Uvalue-.72, SHGC-.55 ; EE:Uvalue-.32, SHGC-.40 Incremental Cost = $21.70 sq. foot (Full retrofit cost, Materials and Install)
72	Insulation -Ceiling (R-19 to R-38)	SF	GDS Calc.	REM/Rate		REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	EIA RECS 2005	R-19 to R-38 ; 1730sq.ft. ; $0.51/sq.ft. for ~R-19. EE Sat: % of Homes well insulated (2.5/6.9). Table:c13.5
73	Air Infiltration	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	MEEA/SB	BR EU Survey	BR EU Survey	From 12 ACH @ 50 Pascals to 7 ACH @ 50 Pascals
74	Duct Sealing	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	PSE/WI FOE	BR EU Survey	GDS Est.	Measure cost assumes duct sealing program does not require pre/post testing on most homes. Reduce leakage from Qualitative (Leaky, Uninsulated) to Quantitative (6% of floor area =CFM@25)
75	Radiant Barriers	SF	GDS Calc.	REM/Rate	-	REM/GDS	ICF	ICF	BR EU Survey	GDS Est.	Minimal to no winter savings
	Space Heating and Space Cooling Shell Measures - Mobile Homes w/ Electric AC Only (& Gas Heat)										
76	Air Infiltration	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	MEEA/SB	BR EU Survey	BR EU Survey	From 12 ACH @ 50 Pascals to 7 ACH @ 50 Pascals
77	Insulation - Floor (R-11 to R-30)	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	GDS Est.	R11 to R30 insulation under floor ; house w/ enclosed crawl space. Assumed install cost: $0.79/sqft. Baseline: % of mobile homes with Gas Heat and AC (24% of MH have Gas Heat ; 73% of MH have electric cooling. *Assumed the 60.5% of MH with Electric Central Heat have Central AC. Remaining 12.5% are Gas Heat, Other Gas Heat* Homes equipped with Room AC or Other)
78	Energy Star® Windows	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	DEER-1	BR EU Survey	BR EU Survey	Window Area=194.4 sq.ft. Baseline: Uvalue-.87, SHGC-.73 ; EE:Uvalue-.32, SHGC-.40 Incremental Cost = $21.70 sq. foot (Full retrofit cost, Materials and Install)
79	Duct Sealing	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	PSE/WI FOE	BR EU Survey	GDS Est.	Measure cost assumes duct sealing program does not require pre/post testing on most homes. Reduce leakage from Qualitative (Leaky, Uninsulated) to Quantitative (6% of floor area =CFM@25)
	Space Heating and Space Cooling Shell Measures - Mobile Homes w/ Electric Heat Pump										
80	Air Infiltration	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	MEEA/SB	BR EU Survey	BR EU Survey	From 12 ACH @ 50 Pascals to 7 ACH @ 50 Pascals
81	Insulation - Floor (R-11 to R-30)	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	GDS Est.	*R11 to R30 insulation under floor ; house w/ enclosed crawl space. Assumed install cost: $0.79/sqft.* Baseline: % of mobile homes with Electric HP
82	Energy Star® Windows	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	DEER-1	BR EU Survey	BR EU Survey	*Window Area=194.4 sq.ft. Baseline: Uvalue-.87, SHGC-.73 ; EE:Uvalue-.32, SHGC-.40* Incremental Cost = $21.70 sq. foot (Full retrofit cost, Materials and Install)
83	Duct Sealing	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	PSE/WI FOE	BR EU Survey	GDS Est.	Measure cost assumes duct sealing program does not require pre/post testing on most homes. Reduce leakage from Qualitative (Leaky, Uninsulated) to Quantitative (6% of floor area =CFM@25)
	Space Heating and Space Cooling Shell Measures - Mobile Homes w/ Electric Heat										
84	Air Infiltration	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	MEEA/SB	BR EU Survey	BR EU Survey	From 12 ACH @ 50 Pascals to 7 ACH @ 50 Pascals

Residential Electric Measure Sources And Notes

Measure	Measure Name	Home Type	Base Elec Use (kWh)	kWh Savings	Elec Savings (kWh)	Peak kW Savings	Useful Life	Measure Cost	Base Saturation	EE Saturation	Notes
85	Insulation - Floor (R-11 to R-30)	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ORNL/GDS	BR EU Survey	GDS Est.	R11 to R30 insulation under floor; house w/ enclosed crawl space. Assumed install cost: $0.79/sqft. Baseline: % of mobile homes with Electric Furnace and Central AC
86	Energy Star® Windows	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	DEER-1	BR EU Survey	BR EU Survey	Window Area=194.4 sq.ft. Baseline: Uvalue-.87, SHGC-.73 ; EE:Uvalue-.32, SHGC-.40 Incremental Cost = $21.70 sq. foot (Full retrofit cost, Materials and Install)
87	Duct Sealing	MH	GDS Calc.	*REM/Rate*	-	*REM/GDS*	*DEER-2*	*PSE/WI FOE*	*BR EU Survey*	*GDS Est.*	Measure cost assumes duct sealing program does not require pre/post testing on most homes. *Reduce leakage from Qualitative (Leaky, Uninsulated) to Quantiative (6% of floor area =CFM@25)*
	Space Heating and Space Cooling Equipment - Single Family/Mobile Homes										
88	HVAC Tune-Up	SF	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ACEEE/DEER	BR EU Survey	GDS Est.	HVAC Maintence improves efficiency 13% in existing air conditioner (SEER 10) Baseline: % of Single Story and Multi Story CAC/HP Homes. Table 7. (340+141+88+41 / 506+215)
89	Energy Star® Room A/C	SF	ES Calc-RAC	-	ES Calc-RAC	GDS Calc.	ES Calc-RAC	ES Calc-RAC	BR EU Survey / EIA	MEEA	Base: EER - 9.8 / EE: EER - 10.8 (10000 btu/hr) Baseline: % of Single Story and Multi Story RAC Homes. Table 7. (65+26/ 506+215)
90	Second Energy Star® Room A/C	SF	ES Calc-RAC	-	ES Calc-RAC	GDS Calc.	ES Calc-RAC	ES Calc-RAC	BR EU Survey / EIA	MEEA	Base: EER - 9.8 / EE: EER - 10.8 (8000 btu/hr) Baseline: % of Single Story and Multi Story RAC Homes * % with more than one (EIA RECS) (.9/1.7)
91	High Efficiency Central AC	SF	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-CAC	ES Calc-CAC	BR EU Survey	BR EU Survey	Replace on Burnout. Install SEER 15 in lieu of purchasing a new *SEER 13. 3 Ton Unit* Baseline: % of Single Story and Multi Story CAC Only Homes. Table 7. (340+141/ 506+215)
92	High Efficiency Central AC/Early Retire	SF	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-CAC	ES Calc-CAC	BR EU Survey	BR EU Survey	SEER 10 (existing home) upgrade to a SEER 15 3 ton Central AC. Cost shown as full cost of new SEER 15 unit. 381 kWh annual savings is the incremental savings between SEER 13 vs. SEER 15. (4887*30.86%)=1508. 4887-1508=3379 (SEER 13 H&C Consumption). 3379*11.29% = 381 kWh
93	High Efficiency Heat Pump (HP Upgrade)	SF	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-HP	ES Calc-HP	BR EU Survey	BR EU Survey	Replace on Burnout. Install SEER 15/HSPF 8.5 in lieu of purchasing a new SEER 13/HSPF 7.7.
94	High Efficiency Heat Pump/Early Retire (HP Upgrade)	SF	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-HP	ES Calc-HP	BR EU Survey	BR EU Survey	SEER 10/HSPF 6.8 (existing home) upgrade to a SEER 15/HSPF 8.5 3 ton Heat Pump. *Cost shown as full cost of SEER 15 ASHP.* 692 kWh annual savings is the incremental savings between SEER 13 vs. SEER 15 (11840*24.47%)=2899. 10308-2899=8949(SEER 13 H&C Consumption). 8949*7.73% = 692 kWh
95	Ground Source Heat Pump (HP Upgrade)	SF	GDS Calc.	REM/Rate	-	ACEEE GSHP	ACEEE GSHP / DOE	Indiana	BR EU Survey	BR EU Survey	Incremental Cost assumes $14,000 full install cost (Indiana Heat Pump Review) - $5700 cost of std. hp. Levelized "cost" also includes federal tax credit (30%): $14000-$4200 = $9800 (-$5700)=$4100 Includes Water Heating Consumption and savings (GSHP:3.3 COP ; 14 EER)
96	Ground Source Heat Pump/Early Retire (HP Upgrade)	SF	GDS Calc.	*REM/Rate*	-	*ACEEE GSHP*	ACEEE GSHP / *DOE*	*Indiana*	*BR EU Survey*	*BR EU Survey*	Full Cost assumes $14,000 full install cost (Indiana Heat Pump Review) Levelized "cost" also includes federal tax credit (30%): $14000-$4200 = $9800 *Includes Water Heating Consumption and savings (GSHP:3.3 COP ; 14 EER)*
97	Heat Pump (Replacing Electric Furnace)	SF	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-HP	ES Calc-HP/CAC	BR EU Survey	GDS Calc.	Baseline: 17589(Base H&C of Strip Heat/AC Home) 12702*95% (Improve strip heat efficiency from 95% to 100% with new unit)+(4887 (Base AC Consumption) *30.86%(% savings to upgrade from SEER 10 to 13)) Cost = $6700 (Full Cost of ASHP) - $2857 (New SEER 13 CAC Unit)
98	Heat Pump/Early Retire (Replacing Electric Furnace)	SF	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-HP	ES Calc-HP/CAC	BR EU Survey	GDS Calc.	Baseline: 17589(Base H&C of Strip Heat/AC HOME) Cost = $6700 (Full Cost of ASHP)
99	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	SF	GDS Calc.	GDS Calc.	-	REM/GDS	ES Calc-HP	ES Calc-HP	BR EU Survey	BR EU Survey	Heat Pump switches to back-up gas heat at 35 degrees and under. SEER 15 ; Gas Furnace 90% AFUE (Base Gas Usage from Estar Calc) Assumes dual fuel heat pump is approximately $1000 more than ASHP. (Added to $1000 incremental cost of SEER 13 vs SEER 15 HP)
100	Dual Fuel Heat Pump (Replacing Electric Furnace)	SF	GDS Calc.	GDS Calc.	-	REM/GDS	ES Calc-HP	ES Calc-HP	BR EU Survey	GDS Calc.	Heat Pump switches to back-up gas heat at 35 degrees and under. SEER 15 ; Gas Furnace 90% AFUE Incremental cost reflects efficient dual fuel heat pump vs. standard efficiency CAC.
101	HVAC Tune-Up	MH	GDS Calc.	REM/Rate	-	REM/GDS	DEER-2	ACEEE/DEER	BR EU Survey	GDS Est.	HVAC Maintence improves efficiency 13% in existing air conditioner (SEER 10) Baseline: % of Manufactured Homes with CAC/HP. Table 7. (75+9 / 116)
102	Energy Star® Room A/C	MH	ES Calc-RAC	-	ES Calc-RAC	GDS Calc.	ES Calc-RAC	ES Calc-RAC	BR EU Survey / EIA	MEEA	Base: EER - 9.8 / EE: EER - 10.8 (8000 btu/hr) Baseline: % of Manufactured Home RAC Homes. Table 7.
103	Second Energy Star® Room A/C	MH	ES Calc-RAC	-	ES Calc-RAC	GDS Calc.	ES Calc-RAC	ES Calc-RAC	BR EU Survey / EIA	MEEA	Base: EER - 9.8 / EE: EER - 10.8 (8000 btu/hr) Baseline: % of Manufactured Home RAC Homes * % with more than one (EIA RECS) (.9/1.7)
104	High Efficiency Central AC	MH	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-CAC	ES Calc-CAC	BR EU Survey	BR EU Survey	Replace on Burnout. Install SEER 15 in lieu of purchasing a new SEER 13. Baseline: % of Single Story and Multi Story CAC Only Homes. Table 7
105	High Efficiency Central AC/Early Retire	MH	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-CAC	ES Calc-CAC	BR EU Survey	BR EU Survey	SEER 10 (existing home) upgrade to a SEER 15 2.5 ton Central AC. Cost shown as full cost of SEER 15. 322 kWh annual savings is the incremental savings between SEER 13 vs. SEER 15. (4114*30.84%)=1269. 4114-1269=2845(SEER 13 H&C Consumption). 2845*11.31% = 322 kWh
106	High Efficiency Heat Pump (HP Upgrade)	MH	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-HP	ES Calc-HP	BR EU Survey	BR EU Survey	Replace on Burnout. Install SEER 15/HSPF 8.5 in lieu of purchasing a new SEER 13/HSPF 7.7.
107	High Efficiency Heat Pump/Early Retire (HP Upgrade)	MH	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-HP	ES Calc-HP	BR EU Survey	BR EU Survey	SEER 10/HSPF 6.8 (existing home) upgrade to a SEER 15/HSPF 8.5 2.5 ton Heat Pump. Cost shown as full cost of SEER 15. 650 kWh annual savings is the incremental savings between SEER 13 vs. SEER 15 (11093*24.29%)=2694. 11093-2694=8399(SEER 13 H&C Consumption). 8399*7.74% = 650 kWh
108	Heat Pump (Replacing Electric Furnace)	MH	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-HP	ES Calc-HP/CAC	BR EU Survey	GDS Calc.	Baseline: 16849(Base H&C of Strip Heat/AC HOME): 12735*95% (Improve strip heat efficiency from 95% to 100% with new unit)+(4114 (Base AC Consumption) *30.84%(% savings to upgrade from SEER 10 to 13)) Cost = $6365 (Full Cost of ASHP) - $2696 (New SEER 13 CAC Unit)
109	Heat Pump/Early Retire (Replacing Electric Furnace)	MH	GDS Calc.	REM/Rate	-	REM/GDS	ES Calc-HP	ES Calc-HP/CAC	BR EU Survey	GDS Calc.	Baseline: 16849 (Base H&C of Strip Heat/AC HOME) Cost = $6365 (Full Cost of ASHP)
110	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	MH	GDS Calc.	GDS Calc.	-	REM/GDS	ES Calc-HP	ES Calc-HP	BR EU Survey	BR EU Survey	Heat Pump switches to back-up gas heat at 35 degrees and under. SEER 15 ; Gas Furnace 90% AFUE Assumes dual fuel heat pump is approximately $1000 more than ASHP. (Added to $1000 incremental cost of SEER 13 vs SEER 15 HP)
111	Dual Fuel Heat Pump (Replacing Electric Furnace)	MH	GDS Calc.	GDS Calc.	-	REM/GDS	ES Calc-HP	ES Calc-HP	BR EU Survey	GDS Calc.	Heat Pump switches to back-up gas heat at 35 degrees and under. SEER 15 ; Gas Furnace 90% AFUE Incremental cost reflects efficient dual fuel heat pump vs. standard efficiency CAC.
	Other										
112	*In Home Energy Display Monitor*	SF	GDS Calc.	ACEEE DISPLAY	-	GDS LOAD-2	GDS Est.	ACEEE Display	GDS Est.	GDS Est.	Assumed persistant savings of 3 years
113	Pre-Pay Metering	SF	GDS Calc.	CR-PREPAID	-	GDS LOAD-2	GDS Est.	CR-Prepaid	GDS Est.	GDS Est.	Savings % based on Salt River Project M-Power customer reported savings
114	Pool Pump and Motor	SF	-	-	ACEEE A062	GDS LOAD-3	ACEEE A062	ACEEE A062	EIA RECS 2005	GDS Est.	Baseline: Number of Homes with a Pool Filter / Number of Single Family Homes (.3 / 5.2) EE Saturation: GDS Assumption
115	In Home Energy Display Monitor	MH	GDS Calc.	ACEEE DISPLAY	-	GDS LOAD-2	GDS Est.	ACEEE Display	GDS Est.	GDS Est.	Assumed persistant savings of 3 years
116	Pre-Pay Metering	MH	GDS Calc.	CR-PREPAID	-	GDS LOAD-2	GDS Est.	CR-Prepaid	GDS Est.	GDS Est.	Savings % based on Salt River Project M-Power customer reported savings
	Multi Family Homes										

Residential Electric Measure Sources And Notes

Measure	Measure Name	Home Type	Base Elec Use (kWh)	% Savings	Elec Savings (kWh)	Peak kW Savings	Useful Life	Measure Cost	Base Saturation	EE Saturation	Notes
117	Multi-Family Homes Efficiency Kit	MF	GDS Est.	-	GDS Est.	GDS Est.	GDS Est.	GDS Est.	BR EU Survey	GDS Est.	Consumption: Reduction of SF Consumption based on reduction in sq. footage from EIA RECS 2005 % savings - GDS estimate based on rougly 5 CFL bulbs, low flow showerhead, and basic air sealing measures (i.e. caulking) Cost: Based on cost of similar weatherization kit (AM Conservation).
	New Construction Homes - Single Family/Multi Family										
118	New Construction - 15% more efficient	SF	GDS Calc.	GDS Calc.		REM/GDS	GDS Est.	EnergyStar2	BR EU Survey	EnergyStar 4	Energy Star Tier 1 is 15% efficient. Average savings ~ 20% REMRate modeling for package of efficient upgrades verifies 15% savings or greater Base Sat: % of Gas Homes Built in the last 4 years
119	New Construction - 15% more efficient	SF	GDS Calc.	GDS Calc.		REM/GDS	GDS Est.	EnergyStar2	BR EU Survey	EnergyStar 4	Energy Star Tier 1 is 15% efficient. Average savings ~ 20% REMRate modeling for package of efficient upgrades verifies 15% savings or greater Base Sat: % of Electric Heat Pump Homes Built in the last 4 years
120	New Construction - 35% more efficient	SF	GDS Calc.	GDS Calc.		REM/GDS	GDS Est.	EnergyStar3	BR EU Survey	EnergyStar 4	Savings approximately 30%. Savings may exceed 30% threshold. REMRate modeling verifies 30% savings Cost represents EnergyStar 2011 Estimate. Energy Star standards exceeding 2009 IECC Code. Base Sat: % of Gas Homes Built in the last 4 years
121	New Construction - 35% more efficient	SF	GDS Calc.	GDS Calc.		REM/GDS	GDS Est.	EnergyStar3	BR EU Survey	EnergyStar 4	Savings approximately 30%. Savings may exceed 30% threshold. REMRate modeling verifies 30% savings Cost represents EnergyStar 2011 Estimate. Energy Star standards exceeding 2009 IECC Code. Base Sat: % of Electric Heat Pump Homes Built in the last 4 years
122	New Construction - 50% more efficient	SF	GDS Calc.	GDS Est.	-	GDS Est.	GDS Est.	EnergyStar 5 /RTF	BR EU Survey / GDS Est.	EnergyStar 4	Base Consumption: Whole House Consumption Savings%: Current energy star standards (15%) Base Sat: Adjusted % of MH Gas Heat Homes based on shift found in SF Gas Old vs. New Homes
123	New Construction - 50% more efficient	SF	GDS Calc.	GDS Est.	-	GDS Est.	GDS Est.	EnergyStar 5 /RTF	BR EU Survey / GDS Est.	EnergyStar 4	Base Consumption: Whole House Consumption Savings%: Current energy star standards (15%) Base Sat: Adjusted % of MH ASHP Heat Homes based on shift found in SF Gas Old vs. New Homes

ACEEE A042: Emerging Energy Saving Technologies & Practices for the Buildings Sector as of 2004. ACEEE Report# A042. October 2004. Pg. 41.
ACEEE/DEER: Based on costs found in ACEEE Report E073 for HVAC Tune-UP and DEER Database (Refrigerant Charge, Coil Cleaning, etc.)
ACEEE Display: ACEEE Emerging Technologies Report. April 2007. In Home Energy Displays
ACEEE GSHP: ACEEE Emerging Technologies Report. April 2007. Ground Source Heat Pumps
ACEEE GSHP/DOE: Average useful life of several sources. ACEEEE GSHP estimates 18.4. DOE websites estimate lifetime of equipment at 25, and loop at 50+ years.
ACEEE Solar: ACEEE Emerging Technologies Report. April 2007. Solar Water Heaters
Amann: Jennifer T. Amann (ACEEE), personal communication, Feb. 2006.
BR EU Survey: Big Rivers End-Use and Energy Efficiency Survey (December 2007). System-Wide Data.
BR EU Survey/EIA: Big Rivers End-Use and Energy Efficiency Survey (December 2007). System-Wide Data. Also used data from the Residential Energy Consumption Survey (RECS) 2005 Data reported by EIA. East South Central Region.
BR EU Survey/GDS Est.: Big Rivers End-Use and Energy Efficiency Survey (December 2007). System-Wide Data. Adjusted data based on GDS professional judgement.
BR EU Survey/MEEA: Big Rivers End-Use and Energy Efficiency Survey (December 2007). System-Wide Data. Midwest Residential Market Assessment and DSM Potential Study. March 2006. Baseline and EE Saturations are reported for the state of KY.
CR-Prepaid: Prepaid Meters: Pay As You Use Consumption. Consumer Reports.Org / Salt River Project M-Power Results
DEER-1: Database for Energy Efficient Resources (DEER). Revised DEER Measure Cost Summary (05/2008). Revised 06/2008. Window cost includes material and installation costs.
DEER-2: Database for Energy Efficient Resources (DEER). Effective/Remaining Useful Life Values. Updated Oct. 2008. (Air Sealing assumes similair useful life to LI Weatherization : HVAC Tune-Up (6yrs) based on avg. between condensor coil cleaning (3yrs) and refrigerant charge (10yrs)
DUKE/ACEEE: DSM measure characterizations for Duke Indiana. Completed by Summit Blue. Peak Savings adjusted by coincidence factors in ACEEE Report #U072.
DUKE/SB: DSM measure characterizations for Duke Indiana. Completed by Summit Blue.
EIA RECS 2005: Residential Energy Consumption Survey (RECS) 2005 Data reported by EIA to refine baseline % of appliances. East South Central Region
Eco-Story: Vendor of LED bulbs, including a SW Edison-based LED bulb replacement for bathrooms, lamps, and recessed cans.
EnergyStar: EnergyStar® Residential Water Heater FinalCriteria Analysis. Table 1. Page 10. (www.energystar.gov/ia/partners/prod_development/new_specs/downloads/water_heaters/WaterHeaterFinalCriteriaAnalysis.pdf)
EnergyStar2: Energy Star® Homes information brochure. (www.energy.ky.gov/NR/rdonlyres/4C54401D-F058-4962-AFC2-F43BF5275776/0/ENERGYSTARHomes3.pdf)
EnergyStar3: Energy Star® Qualified Homes 2011 Fact Sheet. May 04, 2009. Pg.4 (www.energystar.gov/ia/partners/bldrs_lenders_raters/downloads/2011_Fact_Sheet.pdf)
EnergyStar4: Energy Star® Qualified New Homes Market Indices for States.
EnergyStar5 / RTF: $1100 incremental cost based on personal communication with two manufactured home Energy Star® qualified contractors that have completed manufactured new homes projects in 2009: Lexington Homes ($1100) and Clayton Homes ($950-$1245). April 13, 2010.
Also included ~$1400 value in $2006 from "Analysis of Cost and Savings Values for Energy Star® Manufactured Homes." powerpoint presentation from the Regional Technical Forum and Northwest Council (www.nwcouncil.org). Aug. 8, 2006
ES-Calc-ASHP: Calculation (www.energystar.gov) Energy Star® Calculator-AirSourceHeatPump (.xls)
ES-Calc-ASHP/CAC: Calculation using cost assumptions from both ASHP and CAC Energy Star® calculators
ES-Calc-CAC: Calculation (www.energystar.gov) Energy Star® Calculator-CentralAirConditioner (.xls)
ES Calc- CCW: Calculation (www.energystar.gov) Energy Star® Calculator - ConsumerClothesWasher (.xls)
ES Calc- DW: Calculation (www.energystar.gov) Energy Star® Calculator - ConsumerDishWasher (.xls)
ES Calc- Freez: Calculation (www.energystar.gov) Energy Star® Calculator - Freezers (.xls)
ES Calc- Office: Calculation (www.energystar.gov) Energy Star® Calculator - Home Office (.xls)
ES Calc-RAC: Calculation (www.energystar.gov) Energy Star® Calculator - Room Air Conditioner (.xls)
ES Calc- RF: Calculation (www.energystar.gov) Energy Star® Calculator - ResidentialRefrigerator (.xls)
ES Calc- RRS: Online calculator for Second Refrigerator Recycling (http://www.energystar.gov/index.cfm?fuseaction=refrig.calculator&which=1&rate=0.102&model=&screen=2)
ES Calc- TV: Calculation (www.energystar.gov) Energy Star® Calculator - Televisions (.xls)
GDS Calc.: GDS calculation. Baseline Consumption developed from regional data (ES Calculators) and engineering calculations to develop estimates for different home types. Weighted avg. whole house use = 18,779 kWh
GDS Est.: GDS estimate based on available regional data or professional judgement.
GDS-1: Assumed second appliance had 5 years remaining useful life
GDS-2: Calculated based on rated hours of 750 for Incandescent, 7500 for CFL, and 40,000 for LEDs and an average daily use of 3 (or 5, or 1) hours per day. Rounded to the nearest whole year. Useful life's > 20 years capped at 20 years.
GDS Load-1: Assumes 1620 Annual Hrs of Operation (Based on Energy Star® calculator-Dehumidifier)
GDS Load-2: Assumed 8760 Annual Hrs of Operation (GDS Assumption)
GDS Load-3: Assumes 2920 Annual Hrs of Operation (Based on GDS Assumption that Pool Pump is only operational during 4 summer months)
HD: Home Depot Website. www.homedepot.com.
Hoosier: Socket and CFL Saturation Data from results of 384 on-site residential surveys in the Hoosier Energy service territory. Cost of CFL per bulb negotiated by Hoosier Energy for their buydown program ($1.85 - $0.25)
ICF: City of Gainesville Electricity Supply Needs. ICF Consulting. March 1, 2006.
Indiana: Indiana Residential Geothermal Heat Pump Rebate: Program Review. Indiana Office of Energy and Defense Development. Completed June 2008.
MEEA: Midwest Residential Market Assessment and DSM Potential Study. March 2006. Baseline and EE Saturations are reported for the state of KY.
MEEA/EIA: Midwest Residential Market Assessment and DSM Potential Study. March 2006. Also used data from the Residential Energy Consumption Survey (RECS) 2005 Data reported by EIA to refine baseline % of appliances. East South Central Region
MEEA/SB: Appendices from the MEEA Market Assessment Report (Appendices provided by Summit Blue)
ORNL/GDS: Oak Ridge National Laboratory and DOE Insulation Fact Sheet - Insulation Costs (www.ornl.gov/~roofs/Zip/tmp/cost3400.html)
PSE/WI FOE: Based on costs reported by Puget Sound Energy on average cost of duct sealing ($400) and Wisconsin Focus on Energy (Mobile Homes) $500-$600.
REM/Rate: Savings % based on results from REM/rate modeling software. Applied the % savings from a measure to the base annual consumption to calculate annual kWh savings.
REM/GDS: Applied best available coincidence factors to REM/Rate specified demand savings. Cooling Summer and Heating Winter CF assumed to be 73%.

APPENDIX 2-2

TECHNICAL, ECONOMIC, AND ACHIEVABLE POTENTIAL

Measure Assumptions (Adjusted for Interactive Effects), Total # of Remaining Homes based on Technical Potential (100% Penetration*), and Technical Potential Savings

	Measure Name	Home Type	Measure/End Use Description	Replace-on-Burnout or Retrofit	Annual Savings - Technical Potential (kWh)	Annual Savings - Technical Potential (Summer kW)	Annual Savings - Technical Potential (Winter kW)	# of applicable homes (total number of homes where the measure is applicable)	Total # of Homes remaining that can still receive efficient measure	Technical Potential: total energy (kWh) savings potential if 100% penetration attained overnight	Technical Potential: summer demand (kW) savings potential if 100% penetration attained overnight	Technical Potential: winter demand (kW) savings potential if 100% penetration attained overnight
1	Energy Star® Compliant Top-Mount Refrigerator	SF	Homes w/ Refrigerators	ROB	106	0.007	0.006	54,135	40,601	4,303,701	296	253
2	Energy Star® Compliant Side-by-Side Refrigerator	SF	Homes w/ Refrigerators	ROB	133	0.007	0.006	29,149	21,862	2,907,653	160	136
3	Energy Star® Compliant Chest Freezer	SF	Homes w/ Freezers	ROB	42	0.004	0.003	30,315	28,193	1,184,119	103	88
4	Energy Star® Compliant Upright Freezer (Manual Def.)	SF	Homes w/ Freezers	ROB	47	0.004	0.003	12,992	12,083	567,894	44	38
5	Energy Star® Dehumidifer	SF	Homes w/ Dehumidifiers	ROB	213	0.131	0.131	5,830	2,915	620,882	383	383
6	Second Refrigerator Turn In	SF	Homes w/ more than one refrigerator	Retrofit	978	0.082	0.070	28,317	25,485	24,924,239	2,077	1,773
7	Second Freezer Turn In	SF	Homes w/ more than one freezer	Retrofit	774	0.065	0.055	3,331	2,998	2,320,626	193	165
8	Energy Star® Compliant Top-Mount Refrigerator	MH	Homes w/ Refrigerators	ROB	106	0.007	0.006	8,279	6,210	658,213	45	39
9	Energy Star® Compliant Side-by-Side Refrigerator	MH	Homes w/ Refrigerators	ROB	133	0.007	0.006	4,458	3,344	444,700	24	21
10	Energy Star® Compliant Chest Freezer	MH	Homes w/ Freezers	ROB	42	0.004	0.003	4,636	4,312	181,101	16	13
11	Energy Star® Compliant Upright Freezer (Manual Def.)	MH	Homes w/ Freezers	ROB	47	0.004	0.003	1,987	1,848	86,854	7	6
12	Energy Star® Dehumidifer	MH	Homes w/ Dehumidifiers	ROB	213	0.131	0.131	892	446	94,958	59	59
13	Second Refrigerator Turn In	MH	Homes w/ more than one refrigerator	Retrofit	847	0.071	0.060	4,331	3,898	3,301,345	275	235
14	Second Freezer Turn In	MH	Homes w/ more than one freezer	Retrofit	774	0.065	0.055	510	459	354,919	30	25
15	Home Electronics	SF	All Homes	ROB	265	0.030	0.030	83,284	58,299	15,449,184	1,749	1,749
16	Televisions	SF	Homes w/ a TV	ROB	49	0.017	0.017	204,046	142,832	6,998,772	2,398	2,398
17	Energy Star® Desktop Computer	SF	Homes w/ a Desktop	ROB	42	0.005	0.005	70,791	49,554	2,081,267	238	238
18	Energy Star® Computer Monitor	SF	Homes w/ a Desktop	ROB	21	0.002	0.002	70,791	49,554	1,040,634	119	119
19	Energy Star® Laptop Computer	SF	Homes w/ a Laptop	ROB	13	0.001	0.001	13,325	9,328	121,262	14	14
20	Home Electronics	MH	All Homes	ROB	265	0.030	0.030	12,738	8,916	2,362,816	267	267
21	Televisions	MH	Homes w/ a TV	ROB	49	0.017	0.017	19,106	13,374	655,347	225	225
22	Energy Star® Desktop Computer	MH	Homes w/ a Desktop	ROB	42	0.005	0.005	10,827	7,579	318,311	36	36
23	Energy Star® Computer Monitor	MH	Homes w/ a Desktop	ROB	21	0.002	0.002	10,827	7,579	159,156	18	18
24	Energy Star® Laptop Computer	MH	Homes w/ a Laptop	ROB	13	0.001	0.001	2,038	1,427	18,546	2	2
25	CFL (vs. Incandescent) - 5 hours/day	SF	Sockets with Inc. bulbs (5hrs/day)	ROB	51	0.003	0.007	337,080	261,305	13,352,670	819	1,866
26	CFL (vs. Incandescent) - 3 hours/day	SF	Sockets with Inc. bulbs (3hrs/day)	ROB	31	0.003	0.007	1,017,637	821,539	25,188,374	2,576	5,866
27	CFL (vs. Incandescent) - 1 hours/day	SF	Sockets with Inc. bulbs (1hrs/day)	ROB	10	0.003	0.007	1,843,388	1,676,930	17,138,228	5,259	11,973
28	LED (vs. Incandescent)	SF	Sockets with Inc. bulbs	ROB	41	0.004	0.009	799,527	663,607	26,889,355	2,750	6,261
29	LED (vs. CFL)	SF	Sockets with CFL bulbs	ROB	10	0.001	0.002	135,920	135,920	1,340,166	137	312
30	CFL (vs. Incandescent) - 5 hours/day	MH	Sockets with Inc. bulbs (5hrs/day)	ROB	51	0.003	0.007	8,511	6,383	326,174	20	46
31	CFL (vs. Incandescent) - 3 hours/day	MH	Sockets with Inc. bulbs (3hrs/day)	ROB	31	0.003	0.007	35,535	28,247	866,039	89	202
32	CFL (vs. Incandescent) - 1 hours/day	MH	Sockets with Inc. bulbs (1hrs/day)	ROB	10	0.003	0.007	200,516	171,341	1,751,101	537	1,223
33	LED (vs. Incandescent)	MH	Sockets with Inc. bulbs	ROB	41	0.004	0.009	61,140	53,803	2,180,115	223	508
34	LED (vs. CFL)	MH	Sockets with CFL bulbs	ROB	10	0.001	0.002	7,337	7,337	72,341	7	17
35	Low Flow Faucets	SF	Homes w/ Electric WH	Retrofit	82	0.014	0.022	51,636	20,654	1,693,664	297	446
36	Low Flow Showerhead	SF	Homes w/ Electric WH	Retrofit	202	0.014	0.021	51,636	20,654	4,176,092	295	442
37	Water Heater Blanket	SF	Homes w/ Electric WH	Retrofit	0	0.000	0.000	0	0	0	0	0
38	Pipe Wrap	SF	Homes w/ Electric WH	Retrofit	106	0.009	0.014	51,636	43,891	4,636,863	408	613
39	Efficient Water Heater	SF	Homes w/ Electric WH	ROB	183	0.005	0.007	10,327	7,229	1,324,743	33	49
40	Heat Pump Water Heater	SF	Homes w/ Electric WH	ROB	1,954	0.177	0.265	10,327	7,229	14,125,541	1,279	1,918
41	Solar Water Heating	SF	Homes w/ Electric WH	Retrofit	1,867	0.272	0.000	15,491	10,844	20,245,852	2,951	0
42	Energy Star® Dishwasher (Electric Water Heating)	SF	Homes w/ Dishwashers & Electric WH	ROB	74	0.003	0.001	29,433	15,599	1,154,345	45	12
43	Energy Star® Dishwasher (Non-Electric WH)	SF	Homes w/ Dishwashers & Non-Elec. WH	ROB	33	0.003	0.001	18,039	9,561	315,508	27	7
44	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	SF	Homes w/ CW, Elec. WH and Elec. Dryer	ROB	224	0.026	0.007	45,956	29,412	6,588,269	760	204
45	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	SF	Homes w/ CW, NG WH and Elec. Dryer	ROB	97	0.026	0.007	28,167	18,027	1,748,586	466	125
46	Low Flow Faucets	MH	Homes w/ Electric WH	Retrofit	67	0.010	0.014	12,101	4,840	324,298	46	70
47	Low Flow Showerhead	MH	Homes w/ Electric WH	Retrofit	166	0.010	0.014	12,101	4,840	801,450	46	69
48	Water Heater Blanket	MH	Homes w/ Electric WH	Retrofit	0	0.000	0.000	0	0	0	0	0
49	Pipe Wrap	MH	Homes w/ Electric WH	Retrofit	86	0.009	0.014	12,101	10,286	888,389	96	144
50	Efficient Water Heater	MH	Homes w/ Electric WH	ROB	190	0.005	0.007	12,101	8,470	1,605,316	39	58
51	Energy Star® Dishwasher (Electric Water Heating)	MH	Homes w/ Dishwashers & Electric WH	ROB	74	0.003	0.001	6,897	3,656	270,515	10	3

Measure Assumptions (Adjusted for Interactive Effects), Total # of Remaining Homes based on Technical Potential (100% Penetration*), and Technical Potential Savings

Measure Number	Home Type	Measure/End Use Description	Replace-on-Burnout or Retrofit	Annual Savings - Technical Potential (kWh)	Annual Savings - Technical Potential (Summer kW)	Annual Savings - Technical Potential (Winter kW)	# of applicable homes (total number of homes where the measure is applicable)	Total # of homes remaining that can still receive efficiency measure	Technical Potential total energy (kWh) savings potential if 100% penetration attained overnight	Technical Potential summer demand (kW) savings potential if 100% penetration attained overnight	Technical Potential winter demand (kW) savings potential if 100% penetration attained overnight
52	MH	Homes w/ Dishwashers & Non-Elec. WH	ROB	33	0.003	0.001	363	192	6,349	1	0
53	MH	Homes w/ CW, Elec. WH and Elec. Dryer	ROB	224	0.026	0.007	10,770	6,893	1,543,930	178	48
54	MH	Homes w/ CW, NG WH and Elec. Dryer	ROB	97	0.026	0.007	567	363	35,188	9	3
55	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	1,949	1.241	0.000	47,472	5,222	10,177,498	6,480	0
56	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	111	0.146	0.000	37,978	18,989	2,115,795	2,772	0
57	SF	Homes w/ Electric AC Only (& Gas Heat)	ROB	406	0.217	0.000	47,472	28,008	11,380,136	6,064	0
58	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	118	0.069	0.000	47,472	30,382	3,599,124	2,084	0
59	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	94	0.101	0.000	47,472	34,654	3,255,011	3,506	0
60	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	533	0.266	0.000	37,978	34,180	18,225,230	9,082	0
61	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	506	0.237	0.000	33,230	31,569	15,980,940	7,483	0
62	SF	Homes w/ Electric Heat Pump	Retrofit	8,054	1.241	5.548	13,325	1,466	11,805,542	1,819	8,132
63	SF	Homes w/ Electric Heat Pump	Retrofit	1,503	0.146	1.460	10,660	5,330	8,010,869	778	7,782
64	SF	Homes w/ Electric Heat Pump	ROB	1,251	0.203	1.015	13,325	7,862	9,839,254	1,596	7,981
65	SF	Homes w/ Electric Heat Pump	Retrofit	410	0.063	0.376	13,325	8,528	3,498,744	534	3,204
66	SF	Homes w/ Electric Heat Pump	Retrofit	586	0.090	0.538	13,325	9,728	5,701,038	872	5,234
67	SF	Homes w/ Electric Heat Pump	Retrofit	1,371	0.235	1.175	10,660	9,594	13,154,965	2,255	11,277
68	SF	Homes w/ Electric Heat Pump	Retrofit	506	0.237	0.000	9,328	8,861	4,495,878	2,101	0
69	SF	Homes w/ Electric Furnace & AC	Retrofit	8,650	1.241	5.548	9,994	1,099	9,509,368	1,364	6,099
70	SF	Homes w/ Electric Furnace & AC	Retrofit	2,201	0.146	1.460	7,995	3,998	8,798,400	584	5,837
71	SF	Homes w/ Electric Furnace & AC	ROB	1,637	0.205	1.023	9,994	5,897	9,654,459	1,207	6,033
72	SF	Homes w/ Electric Furnace & AC	Retrofit	539	0.064	0.320	9,994	6,396	3,449,506	409	2,047
73	SF	Homes w/ Electric Furnace & AC	Retrofit	840	0.093	0.526	9,994	7,296	6,130,133	677	3,839
74	SF	Homes w/ Electric Furnace & AC	Retrofit	1,798	0.242	1.208	7,995	7,196	12,936,638	1,738	8,689
75	SF	Homes w/ Electric Furnace & AC	Retrofit	506	0.237	0.000	6,996	6,646	3,364,408	1,575	0
76	MH	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	103	0.073	0.000	3,057	1,773	183,089	129	0
77	MH	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	26	0.000	0.000	3,057	1,223	32,223	0	0
78	MH	Homes w/ Electric AC Only (& Gas Heat)	ROB	816	0.359	0.000	3,057	2,262	1,846,843	812	0
79	MH	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	414	0.183	0.000	1,529	1,131	468,006	207	0
80	MH	Homes w/ Electric Heat Pump	Retrofit	739	0.073	0.511	955	554	409,495	40	283
81	MH	Homes w/ Electric Heat Pump	Retrofit	615	0.000	0.485	955	382	234,879	0	185
82	MH	Homes w/ Electric Heat Pump	ROB	2,450	0.341	1.707	955	707	1,732,193	241	1,207
83	MH	Homes w/ Electric Heat Pump	Retrofit	1,192	0.169	0.844	955	707	842,847	119	597
84	MH	Homes w/ Electric Heat & Cool	Retrofit	1,080	0.073	0.511	6,751	3,916	4,228,907	286	2,001
85	MH	Homes w/ Electric Heat & Cool	Retrofit	938	0.000	0.489	6,751	2,700	2,532,319	0	1,320
86	MH	Homes w/ Electric Heat & Cool	ROB	3,453	0.343	1.715	6,751	4,996	17,251,985	1,713	8,566
87	MH	Homes w/ Electric Heat & Cool	Retrofit	1,645	0.173	0.863	6,751	4,996	8,219,525	863	4,313
88	SF	HVAC Tune-Up	Retrofit	454	0.217	0.000	70,791	63,712	28,898,417	13,803	0
89	SF	Homes w/ Electric Room AC	ROB	80	0.049	0.000	10,411	7,808	621,514	384	0
90	SF	Homes w/ more than one Room AC	ROB	64	0.039	0.000	5,413	4,060	258,567	160	0
91	SF	Homes w/ Electric Central AC	ROB	272	0.104	0.000	24,919	23,922	6,510,404	2,492	0
92	SF	Homes w/ Electric Central AC	Retrofit	1,348	0.260	0.000	24,919	23,922	32,242,595	6,229	0
93	SF	Homes with Electric Heat Pump (H&C)	ROB	473	0.100	0.000	2,665	2,399	1,134,119	239	0
94	SF	Homes with Electric Heat Pump (H&C)	Retrofit	2,440	0.248	0.000	2,665	2,399	5,852,253	595	0
95	SF	Homes with Electric Heat Pump (H&C)	ROB	2,772	0.055	3.375	1,999	1,799	4,986,929	100	6,071
96	SF	Homes with Electric Heat Pump (H&C)	Retrofit	4,734	0.208	3.215	1,999	1,799	8,516,624	374	5,784
97	SF	Homes with Electric Furnaces and CAC	ROB	5,095	0.103	0.000	1,499	1,499	7,637,777	155	0
98	SF	Homes with Electric Furnaces and CAC	Retrofit	6,614	0.259	0.000	1,499	1,499	9,914,601	388	0
99	SF	Homes with Electric Heat Pump (H&C)	ROB	2,314	0.098	4.743	3,998	3,598	8,327,025	353	17,066

Measure Assumptions (Adjusted for Interactive Effects), Total # of Remaining Homes based on Technical Potential (100% Penetration*), and Technical Potential Savings

Measure #	Measure Name	Home Type	Measure/End Use Description	Replace-on-Burnout or Retrofit	Annual Savings - Technical Potential (kWh)	Annual Savings - Technical Potential (Summer kW)	Annual Savings - Technical Potential (Winter kW)	# of applicable homes (total number of homes where the measure is applicable)	# of homes remaining that can still receive efficiency measure	Technical Potential total energy (kWh) savings potential if 100% penetration attained overnight	Technical Potential Summer demand (kW) savings potential if 100% penetration attained overnight	Technical Potential Winter demand (kW) savings potential if 100% penetration attained overnight
100	Dual Fuel Heat Pump (Replacing Electric Furnace)	SF	Homes with Electric Furnaces and CAC	ROB	7,048	0.103	5.008	2,998	2,998	21,130,869	310	15,015
101	HVAC Tune-Up	MH	Homes with Central AC or Heat Pump	Retrofit	407	0.195	0.000	9,235	8,311	3,385,360	1,622	0
102	Energy Star® Room A/C	MH	Homes w/ Electric Room AC	ROB	68	0.042	0.000	3,312	2,484	168,872	104	0
103	Second Energy Star® Room A/C	MH	Homes w/ more than one Room AC	ROB	68	0.042	0.000	1,783	1,337	90,931	56	0
104	High Efficiency Central AC	MH	Homes w/ Electric Central AC	ROB	245	0.111	0.000	3,643	3,497	857,036	389	0
105	High Efficiency Central AC/Early Retire	MH	Homes w/ Electric Central AC	Retrofit	1,211	0.222	0.000	3,643	3,497	4,236,236	778	0
106	High Efficiency Heat Pump (HP Upgrade)	MH	Homes with Electric Heat Pump (H&C)	ROB	463	0.104	0.000	334	308	142,285	32	0
107	High Efficiency Heat Pump/Early Retire (HP Upgrade)	MH	Homes with Electric Heat Pump (H&C)	Retrofit	2,365	0.206	0.000	334	308	727,512	64	0
108	Heat Pump (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	ROB	5,156	0.105	0.000	1,013	1,013	5,221,451	106	0
109	Heat Pump/Early Retire (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	Retrofit	6,522	0.209	0.000	1,013	1,013	6,604,416	212	0
110	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	MH	Homes with Electric Heat Pump (H&C)	ROB	2,341	0.102	4.920	287	264	617,151	27	1,297
111	Dual Fuel Heat Pump (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	ROB	7,100	0.105	5.064	2,025	2,025	14,378,992	212	10,256
112	In Home Energy Display Monitor	SF	All Homes	Retrofit	633	0.053	0.053	37,478	37,478	23,729,072	1,977	1,977
113	Pre-Pay Metering	SF	All Homes	Retrofit	1,621	0.135	0.135	37,478	37,478	60,746,425	5,062	5,062
114	Pool Pump and Motor	SF	Homes with Pools	ROB	1,260	0.315	0.000	4,997	3,498	4,407,390	1,102	0
115	In Home Energy Display Monitor	MH	All Homes	Retrofit	725	0.060	0.060	5,732	5,732	4,156,774	346	346
116	Pre-Pay Metering	MH	All Homes	Retrofit	1,857	0.155	0.155	5,732	5,732	10,641,340	887	887
117	Multi-Family Homes Efficiency Kit	MF	All Multi-Family Homes	Retrofit	357	0.030	0.057	1,666	833	297,574	25	48
118	New Construction - 15% more efficient	SF	All Single Family New Homes w/ AC Only	NEW	1,392	0.584	0.073	2,767	1,992	2,772,237	1,163	145
119	New Construction - 15% more efficient	SF	All Single Family New Homes w/ Elec. HP	NEW	3,937	0.584	2.409	3,162	2,277	8,964,511	1,330	5,485
120	New Construction - 35% more efficient	SF	All Single Family New Homes w/ AC Only	NEW	3,479	0.876	0.438	922	664	2,310,198	582	291
121	New Construction - 35% more efficient	SF	All Single Family New Homes w/ Elec. HP	NEW	5,906	0.876	2.993	1,054	759	4,482,256	665	2,272
122	New Construction - 15% more efficient	MH	All Single Family New Homes w/ AC Only	NEW	1,682	0.584	0.073	242	174	292,799	102	13
123	New Construction - 15% more efficient	MH	All Single Family New Homes w/ Elec. HP	NEW	2,549	0.584	2.409	306	221	562,123	129	531

*Note: Solar Water Heating w/ Electric Back-Up and Geothermal systems only assumed a 30% technical potential penetration ; Radiant Barriers assumed a 70% technical potential penetration

	Energy	Summer Demand	Winter Demand
Total Residential Technical Potential:	730,625,837	130,127	207,951
Percent of 2020 Residential Forecast for Energy/Demand:	42.18%	31.90%	45.47%

Measure Assumptions (Adjusted for Interactive Effects), Total # of Remaining Homes (100% Penetration*), and Economic Potential Savings - *Based on the TRC Test*

#	Measure Name	Home Type	Measure End Use Description	Replace-on-Burnout or Retrofit	Annual Savings - Economic Potential - TRC Test (kWh)	Annual Savings - Economic Potential (Summer) (kW)	Annual Savings - Economic Potential (Winter) (kW)	# of applicable homes (total number of homes where the measure is applicable)	Total # of homes remaining that can still receive efficiency measure	TRC Economic Potential total energy (kWh) savings potential if 100% penetration attained overnight	Economic Potential summer demand (kW) savings potential if 100% penetration attained overnight	Economic Potential winter demand (kW) savings potential if 100% penetration attained overnight
1	Energy Star® Compliant Top-Mount Refrigerator	SF	Homes w/ Refrigerators	ROB	106	0.007	0.006	54,135	40,601	4,303,701	296	253
2	Energy Star® Compliant Side-by-Side Refrigerator	SF	Homes w/ Refrigerators	ROB	133	0.007	0.006	29,149	21,862	2,907,653	160	136
3	Energy Star® Compliant Chest Freezer	SF	Homes w/ Freezers	ROB	0	0.000	0.000	0	0	0	0	0
4	Energy Star® Compliant Upright Freezer (Manual Def.)	SF	Homes w/ Freezers	ROB	0	0.000	0.000	0	0	0	0	0
5	Energy Star® Dehumidifer	SF	Homes w/ Dehumidifiers	ROB	213	0.131	0.131	5,830	2,915	620,882	383	383
6	Second Refrigerator Turn In	SF	Homes w/ more than one refrigerator	Retrofit	978	0.082	0.070	28,317	25,485	24,924,239	2,077	1,773
7	Second Freezer Turn In	SF	Homes w/ more than one freezer	Retrofit	774	0.065	0.055	3,331	2,998	2,320,626	193	165
8	Energy Star® Compliant Top-Mount Refrigerator	MH	Homes w/ Refrigerators	ROB	106	0.007	0.006	8,279	6,210	658,213	45	39
9	Energy Star® Compliant Side-by-Side Refrigerator	MH	Homes w/ Refrigerators	ROB	133	0.007	0.006	4,458	3,344	444,700	24	21
10	Energy Star® Compliant Chest Freezer	MH	Homes w/ Freezers	ROB	0	0.000	0.000	0	0	0	0	0
11	Energy Star® Compliant Upright Freezer (Manual Def.)	MH	Homes w/ Freezers	ROB	0	0.000	0.000	0	0	0	0	0
12	Energy Star® Dehumidifer	MH	Homes w/ Dehumidifiers	ROB	213	0.131	0.131	892	446	94,958	59	59
13	Second Refrigerator Turn In	MH	Homes w/ more than one refrigerator	Retrofit	847	0.071	0.060	4,331	3,898	3,301,345	275	235
14	Second Freezer Turn In	MH	Homes w/ more than one freezer	Retrofit	774	0.065	0.055	510	459	354,919	30	25
15	Home Electronics	SF	All Homes	ROB	265	0.030	0.030	83,284	58,299	15,449,184	1,749	1,749
16	Televisions	SF	Homes w/ a TV	ROB	49	0.017	0.017	204,046	142,832	6,998,772	2,398	2,398
17	Energy Star® Desktop Computer	SF	Homes w/ a Desktop	ROB	42	0.005	0.005	70,791	49,554	2,081,267	238	238
18	Energy Star® Computer Monitor	SF	Homes w/ a Desktop	ROB	21	0.002	0.002	70,791	49,554	1,040,634	119	119
19	Energy Star® Laptop Computer	SF	Homes w/ a Laptop	ROB	13	0.001	0.001	13,325	9,328	121,262	14	14
20	Home Electronics	MH	All Homes	ROB	265	0.030	0.030	12,738	8,916	2,362,816	267	267
21	Televisions	MH	Homes w/ a TV	ROB	49	0.017	0.017	19,106	13,374	655,347	225	225
22	Energy Star® Desktop Computer	MH	Homes w/ a Desktop	ROB	42	0.005	0.005	10,827	7,579	318,311	36	36
23	Energy Star® Computer Monitor	MH	Homes w/ a Desktop	ROB	21	0.002	0.002	10,827	7,579	159,156	18	18
24	Energy Star® Laptop Computer	MH	Homes w/ a Laptop	ROB	13	0.001	0.001	2,038	1,427	18,546	2	2
25	CFL (vs. Incandescent) - 5 hours/day	SF	Sockets with Inc. bulbs (5hrs/day)	ROB	51	0.003	0.007	337,080	261,305	13,352,670	819	1,866
26	CFL (vs. Incandescent) - 3 hours/day	SF	Sockets with Inc. bulbs (3hrs/day)	ROB	31	0.003	0.007	1,017,637	821,539	25,188,374	2,576	5,866
27	CFL (vs. Incandescent) - 1 hours/day	SF	Sockets with Inc. bulbs (1hrs/day)	ROB	10	0.003	0.007	1,843,388	1,676,930	17,138,228	5,259	11,973
28	LED (vs. Incandescent)	SF	Sockets with Inc. bulbs	ROB	41	0.004	0.009	799,527	663,607	26,889,355	2,750	6,261
29	LED (vs. CFL)	SF	Sockets with CFL bulbs	ROB	0	0.000	0.000	0	0	0	0	0
30	CFL (vs. Incandescent) - 5 hours/day	MH	Sockets with Inc. bulbs (5hrs/day)	ROB	51	0.003	0.007	8,511	6,383	326,174	20	46
31	CFL (vs. Incandescent) - 3 hours/day	MH	Sockets with Inc. bulbs (3hrs/day)	ROB	31	0.003	0.007	35,535	28,247	866,039	89	202
32	CFL (vs. Incandescent) - 1 hours/day	MH	Sockets with Inc. bulbs (1hrs/day)	ROB	10	0.003	0.007	200,516	171,341	1,751,101	537	1,223
33	LED (vs. Incandescent)	MH	Sockets with Inc. bulbs	ROB	41	0.004	0.009	61,140	53,803	2,180,115	223	508
34	LED (vs. CFL)	MH	Sockets with CFL bulbs	ROB	0	0.000	0.000	0	0	0	0	0
35	Low Flow Faucets	SF	Homes w/ Electric WH	Retrofit	82	0.014	0.022	51,636	20,654	1,693,664	297	446
36	Low Flow Showerhead	SF	Homes w/ Electric WH	Retrofit	202	0.014	0.021	51,636	20,654	4,176,092	295	442
37	Water Heater Blanket	SF	Homes w/ Electric WH	Retrofit	0	0.000	0.000	0	0	0	0	0
38	Pipe Wrap	SF	Homes w/ Electric WH	Retrofit	106	0.009	0.014	51,636	43,891	4,636,863	408	613
39	Efficient Water Heater	SF	Homes w/ Electric WH	ROB	183	0.005	0.007	18,073	12,651	2,318,300	57	86
40	Heat Pump Water Heater	SF	Homes w/ Electric WH	ROB	1,954	0.177	0.265	18,073	12,651	24,719,696	2,238	3,357
41	Solar Water Heating	SF	Homes w/ Electric WH	Retrofit	0	0.000	0.000	0	0	0	0	0
42	Energy Star® Dishwasher (Electric Water Heating)	SF	Homes w/ Dishwashers & Electric WH	ROB	74	0.003	0.001	29,433	15,599	1,154,345	45	12
43	Energy Star® Dishwasher (Non-Electric WH)	SF	Homes w/ Dishwashers & Non-Elec. WH	ROB	33	0.003	0.001	18,039	9,561	315,508	27	7
44	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	SF	Homes w/ CW, Elec. WH and Elec. Dryer	ROB	224	0.026	0.007	45,956	29,412	6,588,269	760	204
45	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	SF	Homes w/ CW, NG WH and Elec. Dryer	ROB	97	0.026	0.007	28,167	18,027	1,748,586	466	125
46	Low Flow Faucets	MH	Homes w/ Electric WH	Retrofit	67	0.010	0.014	12,101	4,840	324,298	46	70
47	Low Flow Showerhead	MH	Homes w/ Electric WH	Retrofit	166	0.010	0.014	12,101	4,840	801,450	46	69
48	Water Heater Blanket	MH	Homes w/ Electric WH	Retrofit	0	0.000	0.000	0	0	0	0	0
49	Pipe Wrap	MH	Homes w/ Electric WH	Retrofit	86	0.009	0.014	12,101	10,286	888,389	96	144
50	Efficient Water Heater	MH	Homes w/ Electric WH	ROB	190	0.005	0.007	12,101	8,470	1,605,316	39	58
51	Energy Star® Dishwasher (Electric Water Heating)	MH	Homes w/ Dishwashers & Electric WH	ROB	74	0.003	0.001	6,897	3,656	270,515	10	3
52	Energy Star® Dishwasher (Non-Electric WH)	MH	Homes w/ Dishwashers & Non-Elec. WH	ROB	33	0.003	0.001	363	192	6,349	1	0

Measure Assumptions (Adjusted for Interactive Effects), Total # of Remaining Homes (100% Penetration*), and Economic Potential Savings - *Based on the TRC Test*

	Measure Name	Home Type	Measure/End Use Description	Replace-on-Burnout or Retrofit	Annual Savings - Economic Potential - TRC Test (kWh)	Annual Savings - Economic Potential (Summer kW)	Annual Savings - Economic Potential (Winter kW)	# of applicable homes (total number of homes where the measure is applicable)	Total # of homes remaining that can still receive efficiency measure	TRC Economic Potential - Total energy (kWh) savings potential if 100% penetration attained overnight	Economic Potential summer demand (kW) savings potential if 100% penetration attained overnight	Economic Potential winter demand (kW) savings potential if 100% penetration attained overnight
53	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	MH	Homes w/ CW, Elec. WH and Elec. Dryer	ROB	224	0.026	0.007	10,770	6,893	1,543,930	178	48
54	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	MH	Homes w/ CW, NG WH and Elec. Dryer	ROB	97	0.026	0.007	567	363	35,188	9	3
55	Insulation - Ceiling (R-0 to R-19)	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	1,949	1.241	0.000	47,472	5,222	10,177,498	6,480	0
56	Insulation - Floor (R-0 to R-19)	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	111	0.146	0.000	37,978	18,989	2,115,795	2,772	0
57	Energy Star® Windows	SF	Homes w/ Electric AC Only (& Gas Heat)	ROB	0	0.000	0.000	0	0	0	0	0
58	Insulation -Ceiling (R-19 to R-38)	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	0	0.000	0.000	0	0	0	0	0
59	Air Infiltration	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	0	0.000	0.000	0	0	0	0	0
60	Duct Sealing	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	579	0.289	0.000	37,978	34,180	19,799,358	9,867	0
61	Radiant Barriers	SF	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	0	0.000	0.000	0	0	0	0	0
62	Insulation - Ceiling (R-0 to R-19)	SF	Homes w/ Electric Heat Pump	Retrofit	8,054	1.241	5.548	13,325	1,466	11,805,542	1,819	8,132
63	Insulation - Floor (R-0 to R-19)	SF	Homes w/ Electric Heat Pump	Retrofit	1,503	0.146	1.460	10,660	5,330	8,010,869	778	7,782
64	Energy Star® Windows	SF	Homes w/ Electric Heat Pump	ROB	0	0.000	0.000	0	0	0	0	0
65	Insulation -Ceiling (R-19 to R-38)	SF	Homes w/ Electric Heat Pump	Retrofit	0	0.000	0.000	0	0	0	0	0
66	Air Infiltration	SF	Homes w/ Electric Heat Pump	Retrofit	653	0.100	0.600	13,325	9,728	6,352,938	972	5,833
67	Duct Sealing	SF	Homes w/ Electric Heat Pump	Retrofit	1,511	0.259	1.296	10,660	9,594	14,499,925	2,486	12,430
68	Radiant Barriers	SF	Homes w/ Electric Heat Pump	Retrofit	0	0.000	0.000	0	0	0	0	0
69	Insulation - Ceiling (R-0 to R-19)	SF	Homes w/ Electric Furnace & AC	Retrofit	8,650	1.241	5.548	9,994	1,099	9,509,368	1,364	6,099
70	Insulation - Floor (R-0 to R-19)	SF	Homes w/ Electric Furnace & AC	Retrofit	2,201	0.146	1.460	7,995	3,998	8,798,400	584	5,837
71	Energy Star® Windows	SF	Homes w/ Electric Furnace & AC	ROB	0	0.000	0.000	0	0	0	0	0
72	Insulation -Ceiling (R-19 to R-38)	SF	Homes w/ Electric Furnace & AC	Retrofit	0	0.000	0.000	0	0	0	0	0
73	Air Infiltration	SF	Homes w/ Electric Furnace & AC	Retrofit	916	0.101	0.574	9,994	7,296	6,686,483	739	4,188
74	Duct Sealing	SF	Homes w/ Electric Furnace & AC	Retrofit	1,953	0.262	1.312	7,995	7,196	14,054,519	1,888	9,440
75	Radiant Barriers	SF	Homes w/ Electric Furnace & AC	Retrofit	0	0.000	0.000	0	0	0	0	0
76	Air Infiltration	MH	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	103	0.073	0.000	3,057	1,773	183,089	129	0
77	Insulation - Floor (R-11 to R-30)	MH	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	0	0.000	0.000	0	0	0	0	0
78	Energy Star® Windows	MH	Homes w/ Electric AC Only (& Gas Heat)	ROB	0	0.000	0.000	0	0	0	0	0
79	Duct Sealing	MH	Homes w/ Electric AC Only (& Gas Heat)	Retrofit	488	0.216	0.000	1,529	1,131	551,645	244	0
80	Air Infiltration	MH	Homes w/ Electric Heat Pump	Retrofit	739	0.073	0.511	955	554	409,495	40	283
81	Insulation - Floor (R-11 to R-30)	MH	Homes w/ Electric Heat Pump	Retrofit	615	0.000	0.485	955	382	234,879	0	185
82	Energy Star® Windows	MH	Homes w/ Electric Heat Pump	ROB	0	0.000	0.000	0	0	0	0	0
83	Duct Sealing	MH	Homes w/ Electric Heat Pump	Retrofit	1,447	0.205	1.025	955	707	1,023,034	145	724
84	Air Infiltration	MH	Homes w/ Electric Heat & Cool	Retrofit	1,080	0.073	0.511	6,751	3,916	4,228,907	286	2,001
85	Insulation - Floor (R-11 to R-30)	MH	Homes w/ Electric Heat & Cool	Retrofit	938	0.000	0.489	6,751	2,700	2,532,319	0	1,320
86	Energy Star® Windows	MH	Homes w/ Electric Heat & Cool	ROB	0	0.000	0.000	0	0	0	0	0
87	Duct Sealing	MH	Homes w/ Electric Heat & Cool	Retrofit	1,962	0.206	1.029	6,751	4,996	9,801,148	1,029	5,143
88	HVAC Tune-Up	SF	Homes with Central AC or Heat Pump	Retrofit	561	0.268	0.000	70,791	63,712	35,724,979	17,064	0
89	Energy Star® Room A/C	SF	Homes w/ Electric Room AC	ROB	98	0.061	0.000	10,411	7,808	768,331	475	0
90	Second Energy Star® Room A/C	SF	Homes w/ more than one Room AC	ROB	0	0.000	0.000	0	0	0	0	0
91	High Efficiency Central AC	SF	Homes w/ Electric Central AC	ROB	0	0.000	0.000	0	0	0	0	0
92	High Efficiency Central AC/Early Retire	SF	Homes w/ Electric Central AC	Retrofit	0	0.000	0.000	0	0	0	0	0
93	High Efficiency Heat Pump (HP Upgrade)	SF	Homes with Electric Heat Pump (H&C)	ROB	0	0.000	0.000	0	0	0	0	0
94	High Efficiency Heat Pump/Early Retire (HP Upgrade)	SF	Homes with Electric Heat Pump (H&C)	Retrofit	0	0.000	0.000	0	0	0	0	0
95	Ground Source Heat Pump (HP Upgrade)	SF	Homes with Electric Heat Pump (H&C)	ROB	3,041	0.061	3.702	3,998	3,598	10,940,329	218	13,318
96	Ground Source Heat Pump/Early Retire (HP Upgrade)	SF	Homes with Electric Heat Pump (H&C)	Retrofit	0	0.000	0.000	0	0	0	0	0
97	Heat Pump (Replacing Electric Furnace)	SF	Homes with Electric Furnaces and CAC	ROB	0	0.000	0.000	0	0	0	0	0
98	Heat Pump/Early Retire (Replacing Electric Furnace)	SF	Homes with Electric Furnaces and CAC	Retrofit	0	0.000	0.000	0	0	0	0	0
99	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	SF	Homes with Electric Heat Pump (H&C)	ROB	2,695	0.114	5.523	3,998	3,598	9,695,279	411	19,870
100	Dual Fuel Heat Pump (Replacing Electric Furnace)	SF	Homes with Electric Furnaces and CAC	ROB	7,951	0.117	5.649	2,998	2,998	23,837,442	350	16,938
101	HVAC Tune-Up	MH	Homes with Central AC or Heat Pump	Retrofit	480	0.230	0.000	9,235	8,311	3,990,370	1,912	0

Measure Assumptions (Adjusted for Interactive Effects), Total # of Remaining Homes (100% Penetration*), and Economic Potential Savings - *Based on the TRC Test*

	Measure Name	Home Type	Measure/End Use Description	Replace-on-Burnout or Retrofit	Annual Savings - Economic Potential - TRC Test (kWh)	Annual Savings - Economic Potential (Summer kW)	Annual Savings - Economic Potential (Winter kW)	# of applicable homes (total number of homes where the measure is applicable)	Total # of homes remaining that can still receive efficiency measure	TRC Economic Potential total energy (kWh) savings potential if 100% penetration attained overnight	Economic Potential summer demand (kW) savings potential if 100% penetration attained overnight	Economic Potential winter demand (kW) savings potential if 100% penetration attained overnight
102	Energy Star® Room A/C	MH	Homes w/ Electric Room AC	ROB	0	0.000	0.000	0	0	0	0	0
103	Second Energy Star® Room A/C	MH	Homes w/ more than one Room AC	ROB	0	0.000	0.000	0	0	0	0	0
104	High Efficiency Central AC	MH	Homes w/ Electric Central AC	ROB	0	0.000	0.000	0	0	0	0	0
105	High Efficiency Central AC/Early Retire	MH	Homes w/ Electric Central AC	Retrofit	0	0.000	0.000	0	0	0	0	0
106	High Efficiency Heat Pump (HP Upgrade)	MH	Homes with Electric Heat Pump (H&C)	ROB	0	0.000	0.000	0	0	0	0	0
107	High Efficiency Heat Pump/Early Retire (HP Upgrade)	MH	Homes with Electric Heat Pump (H&C)	Retrofit	0	0.000	0.000	0	0	0	0	0
108	Heat Pump (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	ROB	0	0.000	0.000	0	0	0	0	0
109	Heat Pump/Early Retire (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	Retrofit	0	0.000	0.000	0	0	0	0	0
110	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	MH	Homes with Electric Heat Pump (H&C)	ROB	2,833	0.123	5.955	287	264	746,974	32	1,570
111	Dual Fuel Heat Pump (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	ROB	8,465	0.125	6.037	2,025	2,025	17,143,254	253	12,228
112	In Home Energy Display Monitor	SF	All Homes	Retrofit	0	0.000	0.000	0	0	0	0	0
113	Pre-Pay Metering	SF	All Homes	Retrofit	1,621	0.135	0.135	37,478	37,478	60,746,425	5,062	5,062
114	Pool Pump and Motor	SF	Homes with Pools	ROB	1,260	0.315	0.000	4,997	3,498	4,407,390	1,102	0
115	In Home Energy Display Monitor	MH	All Homes	Retrofit	0	0.000	0.000	0	0	0	0	0
116	Pre-Pay Metering	MH	All Homes	Retrofit	1,857	0.155	0.155	5,732	5,732	10,641,340	887	887
117	Multi-Family Homes Efficiency Kit	MF	All Multi-Family Homes	Retrofit	357	0.030	0.057	1,666	833	297,574	25	48
118	New Construction - 15% more efficient	SF	All Single Family New Homes w/ AC Only	NEW	1,392	0.584	0.073	2,767	1,992	2,772,237	1,163	145
119	New Construction - 15% more efficient	SF	All Single Family New Homes w/ Elec. HP	NEW	3,937	0.584	2.409	3,162	2,277	8,964,511	1,330	5,485
120	New Construction - 35% more efficient	SF	All Single Family New Homes w/ AC Only	NEW	3,479	0.876	0.438	922	664	2,310,198	582	291
121	New Construction - 35% more efficient	SF	All Single Family New Homes w/ Elec. HP	NEW	5,906	0.876	2.993	1,054	759	4,482,256	665	2,272
122	New Construction - 15% more efficient	MH	All Single Family New Homes w/ AC Only	NEW	1,682	0.584	0.073	242	174	292,799	102	13
123	New Construction - 15% more efficient	MH	All Single Family New Homes w/ Elec. HP	NEW	2,549	0.584	2.409	306	221	562,123	129	531

*Note: Solar Water Heating w/ Electric Back-Up and Geothermal systems only assumed a 30% technical potential penetration ; Radiant Barriers assumed a 70% technical potential penetration

	Energy	Summer Demand	Winter Demand
Total Residential Economic Potential:	538,754,369	89,284	189,836
Percent of 2020 Residential Forecast for Energy/Demand:	31.10%	21.89%	42.42%

Annual # of Achievable Homes (30% Penetration*) and Achievable Potential in 2020 *(based on the TRC Test)*

				Annual Savings - Achievable Potential - Energy (MWh)	Annual Savings - Achievable Potential - Summer Demand (MW)	Annual Savings - Achievable Potential - Winter Demand (MW)	Achievable Program Participants per year (30% penetration limit)*									The Test - Achievable Potential Savings by 2020 (30% penetration limit) (MWh)	The Test - Achievable Potential Summer Savings by 2020 (30% penetration limit) (MW)	The Test - Achievable Potential Winter Savings by 2020 (30% penetration limit) (MW)
	Measure Name	Home Type	Measure/Bundle Description				2011	2012	2013	2014	2015	2016	2017	2018	2019	2020		
1	Energy Star® Compliant Top-Mount Refrigerator	SF	Homes w/ Refrigerators	106	0.007	0.006	355	609	1,066	1,421	1,624	1,624	1,421	1,066	609	355	1,075,900	74	63
2	Energy Star® Compliant Side-by-Side Refrigerator	SF	Homes w/ Refrigerators	133	0.007	0.006	191	328	574	766	875	875	766	574	328	191	727,244	40	34
3	Energy Star® Compliant Chest Freezer	SF	Homes w/ Freezers	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Energy Star® Compliant Upright Freezer (Manual Def.)	SF	Homes w/ Freezers	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
5	Energy Star® Dehumidifer	SF	Homes w/ Dehumidifiers	213	0.131	0.131	40	73	113	117	106	88	73	55	37	29	155,703	96	96
6	Second Refrigerator Turn In	SF	Homes w/ more than one refrigerator	978	0.082	0.070	421	765	1,186	1,224	1,109	918	765	574	383	306	2,881,188	240	205
7	Second Freezer Turn In	SF	Homes w/ more than one freezer	774	0.065	0.055	50	90	140	144	131	108	90	68	45	36	268,578	22	19
8	Energy Star® Compliant Top-Mount Refrigerator	MH	Homes w/ Refrigerators	106	0.007	0.006	54	93	163	217	248	248	217	163	93	54	164,300	11	10
9	Energy Star® Compliant Side-by-Side Refrigerator	MH	Homes w/ Refrigerators	133	0.007	0.006	29	50	88	118	134	134	118	88	50	29	111,454	6	5
10	Energy Star® Compliant Chest Freezer	MH	Homes w/ Freezers	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Energy Star® Compliant Upright Freezer (Manual Def.)	MH	Homes w/ Freezers	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
12	Energy Star® Dehumidifer	MH	Homes w/ Dehumidifiers	213	0.131	0.131	6	11	17	18	16	13	11	8	6	4	23,430	14	14
13	Second Refrigerator Turn In	MH	Homes w/ more than one refrigerator	847	0.071	0.060	64	117	181	187	170	140	117	88	59	47	381,997	32	27
14	Second Freezer Turn In	MH	Homes w/ more than one freezer	774	0.065	0.055	8	14	22	22	20	17	14	11	7	6	42,570	4	3
15	Home Electronics	SF	All Homes	265	0.030	0.030	612	1,049	1,836	2,449	2,798	2,798	2,449	2,448	2,098	2,448	4,634,320	525	525
16	Televisions	SF	Homes w/ a TV	49	0.017	0.017	2,357	4,285	6,642	6,856	6,213	5,142	6,642	7,499	8,785	8,570	2,099,699	719	719
17	Energy Star® Desktop Computer	SF	Homes w/ a Desktop	42	0.005	0.005	818	1,487	2,305	2,379	2,974	3,271	3,792	3,494	3,718	3,866	624,540	71	71
18	Energy Star® Computer Monitor	SF	Homes w/ a Desktop	21	0.002	0.002	818	1,487	2,305	2,379	2,156	2,602	2,974	3,420	3,123	2,751	312,270	36	36
19	Energy Star® Laptop Computer	SF	Homes w/ a Laptop	13	0.001	0.001	154	280	434	448	560	616	714	658	700	728	36,400	4	4
20	Home Electronics	MH	All Homes	265	0.030	0.030	93	160	280	374	427	427	374	373	320	373	707,020	80	80
21	Televisions	MH	Homes w/ a TV	49	0.017	0.017	221	401	622	642	581	481	622	702	823	802	196,539	67	67
22	Energy Star® Desktop Computer	MH	Homes w/ a Desktop	42	0.005	0.005	125	227	352	363	454	499	579	533	568	590	95,340	11	11
23	Energy Star® Computer Monitor	MH	Homes w/ a Desktop	21	0.002	0.002	125	227	352	363	329	397	454	522	477	420	47,670	5	5
24	Energy Star® Laptop Computer	MH	Homes w/ a Laptop	13	0.001	0.001	24	43	67	69	86	95	110	101	108	112	5,603	1	1
25	CFL (vs. Incandescent) - 5 hours/day	SF	Sockets with Inc. bulbs (5hrs/day)	51	0.003	0.007	4,311	7,839	12,150	12,542	15,678	17,246	19,989	18,421	19,598	20,382	4,005,729	246	560
26	CFL (vs. Incandescent) - 3 hours/day	SF	Sockets with Inc. bulbs (3hrs/day)	31	0.003	0.007	13,555	24,646	38,201	39,434	35,737	29,575	24,646	32,040	36,969	48,059	7,556,464	773	1,760
27	CFL (vs. Incandescent) - 1 hours/day	SF	Sockets with Inc. bulbs (1hrs/day)	10	0.003	0.007	17,608	30,185	52,823	70,431	80,493	80,493	70,431	52,823	30,185	17,608	5,141,478	1,578	3,592
28	LED (vs. Incandescent)	SF	Sockets with Inc. bulbs	41	0.004	0.009	6,968	11,945	20,903	27,871	31,853	31,853	27,871	20,903	11,945	6,968	8,066,722	825	1,878
29	LED (vs. CFL)	SF	Sockets with CFL bulbs	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
30	CFL (vs. Incandescent) - 5 hours/day	MH	Sockets with Inc. bulbs (5hrs/day)	51	0.003	0.007	105	191	296	306	382	420	487	449	478	496	97,601	6	14
31	CFL (vs. Incandescent) - 3 hours/day	MH	Sockets with Inc. bulbs (3hrs/day)	31	0.003	0.007	466	847	1,313	1,355	1,228	1,016	847	1,101	1,271	1,652	259,690	27	60
32	CFL (vs. Incandescent) - 1 hours/day	MH	Sockets with Inc. bulbs (1hrs/day)	10	0.003	0.007	2,827	5,140	7,967	8,224	7,453	6,168	5,140	3,855	2,570	2,056	525,308	161	367
33	LED (vs. Incandescent)	MH	Sockets with Inc. bulbs	41	0.004	0.009	565	968	1,695	2,260	2,582	2,582	2,260	1,695	968	565	653,993	67	152
34	LED (vs. CFL)	MH	Sockets with CFL bulbs	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
35	Low Flow Faucets	SF	Homes w/ Electric WH	82	0.014	0.022	341	620	961	992	899	744	620	465	310	248	508,400	89	134
36	Low Flow Showerhead	SF	Homes w/ Electric WH	203	0.014	0.022	341	620	961	992	899	744	620	465	310	248	1,261,431	89	134
37	Water Heater Blanket	SF	Homes w/ Electric WH	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
38	Pipe Wrap	SF	Homes w/ Electric WH	108	0.010	0.014	724	1,317	2,041	2,107	1,910	1,580	1,317	988	659	527	1,422,218	125	188
39	Efficient Water Heater	SF	Homes w/ Electric WH	191	0.005	0.007	102	175	307	409	467	467	409	307	175	102	556,817	14	21
40	Heat Pump Water Heater	SF	Homes w/ Electric WH	2,033	0.184	0.276	102	131	175	219	263	321	365	438	467	438	5,935,232	537	806
41	Solar Water Heating	SF	Homes w/ Electric WH	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
42	Energy Star® Dishwasher (Electric Water Heating)	SF	Homes w/ Dishwashers & Electric WH	74	0.003	0.001	257	468	725	749	679	562	468	351	234	187	346,320	13	4
43	Energy Star® Dishwasher (Non-Electric WH)	SF	Homes w/ Dishwashers & Non-Elec. WH	33	0.003	0.001	158	287	445	459	416	344	287	215	144	115	94,710	8	2
44	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	SF	Homes w/ CW, Elec. WH and Elec. Dryer	224	0.026	0.007	281	361	481	602	722	882	1,003	1,203	1,283	1,203	1,796,704	207	56
45	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	SF	Homes w/ CW, NG WH and Elec. Dryer	97	0.026	0.007	172	221	295	369	443	541	615	738	787	738	477,143	127	34
46	Low Flow Faucets	MH	Homes w/ Electric WH	67	0.010	0.014	80	145	225	232	210	174	145	109	73	58	97,217	14	21
47	Low Flow Showerhead	MH	Homes w/ Electric WH	167	0.010	0.014	80	145	225	232	210	174	145	109	73	58	241,699	14	21
48	Water Heater Blanket	MH	Homes w/ Electric WH	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
49	Pipe Wrap	MH	Homes w/ Electric WH	88	0.010	0.014	170	309	479	494	448	371	309	232	155	124	272,652	29	44
50	Efficient Water Heater	MH	Homes w/ Electric WH	197	0.005	0.007	68	117	205	273	312	312	273	205	117	68	383,917	9	14
51	Energy Star® Dishwasher (Electric Water Heating)	MH	Homes w/ Dishwashers & Electric WH	74	0.003	0.001	61	110	171	176	160	132	110	83	55	44	81,548	3	1
52	Energy Star® Dishwasher (Non-Electric WH)	MH	Homes w/ Dishwashers & Non-Elec. WH	33	0.003	0.001	3	6	9	10	9	7	6	5	3	2	1,960	0	0
53	Energy Star® Clothes Washer (w/ Elec. WH & Elec. Dryer)	MH	Homes w/ CW, Elec. WH and Elec. Dryer	224	0.026	0.007	66	85	113	141	169	207	235	282	301	282	421,344	49	13
54	Energy Star® Clothes Washer (w/ NG WH & Elec. Dryer)	MH	Homes w/ CW, NG WH and Elec. Dryer	97	0.026	0.007	4	5	6	8	9	11	13	15	16	15	9,894	3	1
55	Insulation - Ceiling (R-0 to R-19)	SF	Homes w/ Electric AC Only (& Gas Heat)	1,949	1.241	0.000	55	94	165	220	251	251	220	165	94	55	3,059,930	1,948	0
56	Insulation - Floor (R-0 to R-19)	SF	Homes w/ Electric AC Only (& Gas Heat)	111	0.146	0.000	200	342	599	798	912	912	798	599	342	200	635,337	832	0
57	Energy Star® Windows	SF	Homes w/ Electric AC Only (& Gas Heat)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
58	Insulation -Ceilling (R-19 to R-38)	SF	Homes w/ Electric AC Only (& Gas Heat)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
59	Air Infiltration	SF	Homes w/ Electric AC Only (& Gas Heat)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
60	Duct Sealing	SF	Homes w/ Electric AC Only (& Gas Heat)	584	0.291	0.000	359	461	615	769	923	1,128	1,281	1,538	1,640	1,538	5,986,628	2,983	0
61	Radiant Barriers	SF	Homes w/ Electric AC Only (& Gas Heat)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
62	Insulation - Ceiling (R-0 to R-19)	SF	Homes w/ Electric Heat Pump	8,054	1.241	5.548	15	26	46	62	70	70	62	46	26	15	3,527,652	544	2,430
63	Insulation - Floor (R-0 to R-19)	SF	Homes w/ Electric Heat Pump	1,503	0.146	1.460	56	96	168	224	256	256	224	168	96	56	2,404,684	234	2,336
64	Energy Star® Windows	SF	Homes w/ Electric Heat Pump	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
65	Insulation -Ceilling (R-19 to R-38)	SF	Homes w/ Electric Heat Pump	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0

Annual # of Achievable Homes (30% Penetration*) and Achievable Potential in 2020 *(based on the TRC Test)*

Measure #	Measure Name	Home Type	Measure/End Use Description	Annual Savings Achievable Potential - Energy (kWh)	Savings Achievable Potential - Summer Demand (kW)	Savings Achievable Potential - Winter Demand (kW)	Achievable Program Participants by year (Max penetration limit)										TRC Test Achievable kWh Savings by 2020 (30% penetration limit)	TRC Test Achievable Summer kW Savings by 2020 (30% penetration limit)	TRC Test Achievable Winter kW Savings by 2020 (30% penetration limit)
							2011	2012	2013	2014	2015	2016	2017	2018	2019	2020			
66	Air Infiltration	SF	Homes w/ Electric Heat Pump	697	0.107	0.649	102	131	175	219	263	321	365	438	467	438	2,034,113	311	1,868
67	Duct Sealing	SF	Homes w/ Electric Heat Pump	1,644	0.282	1.409	101	130	173	216	259	317	360	432	461	432	4,736,635	812	4,060
68	Radiant Barriers	SF	Homes w/ Electric Heat Pump	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
69	Insulation - Ceiling (R-0 to R-19)	SF	Homes w/ Electric Furnace & AC	8,650	1.241	5.548	12	20	35	46	53	53	46	35	20	12	2,871,800	412	1,842
70	Insulation - Floor (R-0 to R-19)	SF	Homes w/ Electric Furnace & AC	2,201	0.146	1.460	42	72	126	168	192	192	168	126	72	42	2,641,083	175	1,752
71	Energy Star® Windows	SF	Homes w/ Electric Furnace & AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
72	Insulation -Ceiling (R-19 to R-38)	SF	Homes w/ Electric Furnace & AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
73	Air Infiltration	SF	Homes w/ Electric Furnace & AC	969	0.107	0.607	77	99	131	164	197	241	274	329	350	329	2,121,989	235	1,329
74	Duct Sealing	SF	Homes w/ Electric Furnace & AC	2,105	0.283	1.415	76	97	130	162	194	238	270	324	346	324	4,551,325	611	3,057
75	Radiant Barriers	SF	Homes w/ Electric Furnace & AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
76	Air Infiltration	MH	Homes w/ Electric AC Only (& Gas Heat)	103	0.073	0.000	19	24	32	40	48	59	66	80	85	80	54,935	39	0
77	Insulation - Floor (R-11 to R-30)	MH	Homes w/ Electric AC Only (& Gas Heat)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
78	Energy Star® Windows	MH	Homes w/ Electric AC Only (& Gas Heat)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
79	Duct Sealing	MH	Homes w/ Electric AC Only (& Gas Heat)	493	0.210	0.000	12	15	20	26	31	37	43	51	54	51	167,536	74	0
80	Air Infiltration	MH	Homes w/ Electric Heat Pump	739	0.073	0.511	6	8	10	13	15	19	21	26	27	26	126,377	12	87
81	Insulation - Floor (R-11 to R-30)	MH	Homes w/ Electric Heat Pump	638	0.000	0.503	4	7	12	15	18	18	15	12	7	4	71,446	0	56
82	Energy Star® Windows	MH	Homes w/ Electric Heat Pump	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
83	Duct Sealing	MH	Homes w/ Electric Heat Pump	1,516	0.215	1.074	7	9	13	16	19	23	26	32	34	32	319,956	45	227
84	Air Infiltration	MH	Homes w/ Electric Heat & Cool	1,080	0.073	0.511	41	53	70	88	105	129	146	176	187	176	1,264,722	85	598
85	Insulation - Floor (R-11 to R-30)	MH	Homes w/ Electric Heat & Cool	968	0.000	0.504	28	49	85	113	130	130	113	85	49	28	783,874	0	408
86	Energy Star® Windows	MH	Homes w/ Electric Heat & Cool	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
87	Duct Sealing	MH	Homes w/ Electric Heat & Cool	2,049	0.215	1.075	53	68	90	113	135	165	188	225	240	225	3,077,420	323	1,615
88	HVAC Tune-Up	SF	Homes with Central AC or Heat Pump	613	0.293	0.000	669	860	1,147	1,433	1,720	2,102	3,058	3,727	4,205	4,300	11,717,796	5,597	0
89	Energy Star® Room A/C	SF	Homes w/ Electric Room AC	108	0.067	0.000	82	140	246	328	374	374	328	246	140	164	251,781	156	0
90	Second Energy Star® Room A/C	SF	Homes w/ more than one Room AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
91	High Efficiency Central AC	SF	Homes w/ Electric Central AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
92	High Efficiency Central AC/Early Retire	SF	Homes w/ Electric Central AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
93	High Efficiency Heat Pump (HP Upgrade)	SF	Homes with Electric Heat Pump (H&C)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
94	High Efficiency Heat Pump/Early Retire (HP Upgrade)	SF	Homes with Electric Heat Pump (H&C)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
95	Ground Source Heat Pump (HP Upgrade)	SF	Homes with Electric Heat Pump (H&C)	3,462	0.069	4.214	32	41	54	68	81	99	113	135	144	135	3,122,713	62	3,801
96	Ground Source Heat Pump/Early Retire (HP Upgrade)	SF	Homes with Electric Heat Pump (H&C)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
97	Heat Pump (Replacing Electric Furnace)	SF	Homes with Electric Furnaces and CAC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
98	Heat Pump/Early Retire (Replacing Electric Furnace)	SF	Homes with Electric Furnaces and CAC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
99	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	SF	Homes with Electric Heat Pump (H&C)	3,209	0.136	6.576	32	41	54	68	81	99	113	135	144	135	2,894,333	123	5,932
100	Dual Fuel Heat Pump (Replacing Electric Furnace)	SF	Homes with Electric Furnaces and CAC	9,317	0.137	6.620	22	29	38	48	58	70	80	96	102	96	5,953,434	87	4,230
101	HVAC Tune-Up	MH	Homes with Central AC or Heat Pump	518	0.248	0.000	87	112	149	187	224	274	398	486	547	561	1,290,476	618	0
102	Energy Star® Room A/C	MH	Homes w/ Electric Room AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
103	Second Energy Star® Room A/C	MH	Homes w/ more than one Room AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
104	High Efficiency Central AC	MH	Homes w/ Electric Central AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
105	High Efficiency Central AC/Early Retire	MH	Homes w/ Electric Central AC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
106	High Efficiency Heat Pump (HP Upgrade)	MH	Homes with Electric Heat Pump (H&C)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
107	High Efficiency Heat Pump/Early Retire (HP Upgrade)	MH	Homes with Electric Heat Pump (H&C)	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
108	Heat Pump (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
109	Heat Pump/Early Retire (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
110	Dual Fuel Heat Pump Upgrade (Replacing New ASHP)	MH	Homes with Electric Heat Pump (H&C)	3,198	0.139	6.721	2	3	4	5	6	8	9	11	11	11	223,846	10	470
111	Dual Fuel Heat Pump (Replacing Electric Furnace)	MH	Homes with Electric Furnaces and CAC	9,461	0.139	6.748	15	19	26	32	39	47	54	65	69	65	4,077,696	60	2,908
112	In Home Energy Display Monitor	SF	All Homes	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
113	Pre-Pay Metering	SF	All Homes	1,621	0.135	0.135	393	674	1,180	1,574	1,798	1,798	1,574	1,180	674	393	3,642,081	304	304
114	Pool Pump and Motor	SF	Homes with Pools	1,260	0.315	0.000	37	47	63	79	95	116	131	158	168	158	1,325,520	331	0
115	In Home Energy Display Monitor	MH	All Homes	0	0.000	0.000	0	0	0	0	0	0	0	0	0	0	0	0	0
116	Pre-Pay Metering	MH	All Homes	1,857	0.155	0.155	60	103	181	241	275	275	241	181	103	60	638,640	53	53
117	Multi-Family Homes Efficiency Kit	MF	All Multi-Family Homes	357	0.030	0.057	9	15	26	35	40	40	35	26	15	9	86,109	7	14
118	New Construction - 15% more efficient	SF	All Single Family New Homes w/ AC Only	1,392	0.584	0.073	21	27	36	45	54	66	75	90	96	90	834,900	350	44
119	New Construction - 15% more efficient	SF	All Single Family New Homes w/ Elec. HP	3,937	0.584	2.409	24	31	41	51	61	75	85	102	109	102	2,681,233	398	1,641
120	New Construction - 35% more efficient	SF	All Single Family New Homes w/ AC Only	3,479	0.876	0.438	7	9	12	15	18	22	25	30	32	30	695,759	175	88
121	New Construction - 35% more efficient	SF	All Single Family New Homes w/ Elec. HP	5,906	0.876	2.993	8	10	14	17	21	25	29	35	37	35	1,364,240	202	691
122	New Construction - 15% more efficient	MH	All Single Family New Homes w/ AC Only	1,682	0.584	0.073	2	2	3	4	5	6	6	8	8	8	87,446	30	4
123	New Construction - 15% more efficient	MH	All Single Family New Homes w/ Elec. HP	2,549	0.584	2.409	2	3	4	5	6	8	9	11	11	11	178,416	41	169

	Energy	Summer Demand	Winter Demand
Total Residential TRC Achievable Potential:	136,311,827 kWh	25,355 kW	53,886 kW
Percent of 2020 Residential Forecast for Energy/Demand:	7.87%	16.23%	12.04%

Big Rivers Electric Corporation

2010 Integrated Resource Plan

Appendix B
Demand Side Management
Big Rivers Final Potential Study

Appendix 3
Commercial/Industrial Sector Data
(Energy Efficiency)

Big Rivers
ELECTRIC CORPORATION

Your Touchstone Energy® Cooperative

APPENDIX 3

COMMERCIAL/INDUSTRIAL SECTOR DATA
(ENERGY EFFICIENCY)

APPENDIX 3-1

COMMERCIAL/INDUSTRIAL MEASURE DESCRIPTIONS,
ASSUMPTIONS AND SOURCES

DESCRIPTIONS OF COMMERCIAL/INDUSTRIAL ENERGY EFFICIENCY MEASURES

This technical appendix describes a broad range of commercial and industrial sector energy efficiency measures and programs where GDS has assessed the technical and achievable potential for electric energy savings for Big Rivers.

1. HEATING AND AIR CONDITIONING

The following sections describe the energy efficiency measures included in the commercial sector analysis that fall into the categories of, space heating and space cooling.

(1) High Efficiency Heat Pump[1]*:* Electric heat pumps operate by transferring heat from one place to another. In the heating mode, a heat pump extracts heat from outside a structure and delivers it to the building. Like a furnace, most heat pumps work with forced warm-air delivery systems. Heat pumps can also be operated to cool a building during summer months. In the cooling mode, the cycle is reversed and heat is taken from the building and transferred to the outside air. Because heat pumps rely on the outside air as the heat source in the wintertime, they are much more common in warmer climates. Heat pumps are rated for both heating and cooling – both in terms of capacity and efficiency.

This analysis assumes that a single or poly-phase packaged or split system unitary heat pump meeting CEE Tier II efficiency criteria replaces a heat pump meeting CEE Tier I efficiency criteria. High efficiency and baseline levels reflect weighted averages by size and type of units.

(2) Packaged Terminal Heat Pumps and Air Conditioning: The efficient design of the PSC motor and airflow pattern help to reduce the energy consumption of the fan. Packaged terminal heat pumps tend to be more efficient than electric heat only. In fact, operating savings may result in a payback of less than one year. During heating operation, refrigerant in the heat pump runs in the reverse direction of the cooling operation. The outside air is cooled, thereby giving up heat to the refrigerant in the heat pump. This heat is then pumped back inside, resulting in up to three Btu's of heat for every Btu of energy consumed. During cooling operation, heat is removed from the building as the air is cooled. This heat proceeds through the compression cycle and is ultimately rejected to the outside air.

(3) Centrifugal Chiller[2,3]*:* Water chillers come in many different types (centrifugal, rotary, screw, scroll, reciprocating, and gas absorption) and typically reject waste heat either through air-cooled or water-cooled condensers. Centrifugal chillers are used in building types which normally use water-based cooling systems and have cooling requirements greater than 200 tons. Centrifugal chillers reject heat through a water cooled condenser or cooling tower. In general, efficiency levels for centrifugal chillers start at 0.80 kW/ton (for older units) and may go as high as 0.4 kW/ton. This measure involves installation of a high-efficiency chiller (0.51 kW per ton) versus a standard unit (0.58 kW per ton).

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[1] Nexant, 2005. NYSERDA Deemed Savings Measure Database. Prepared for NYSERDA

[2] California Statewide Commercial Sector Energy Efficiency Potential Study, July, 2002.

[3] Nexant, 2007. Arkansas Deemed Savings Quick Start Program Draft Report Commercial Measures. For Frontier Associates, LLC, March, 2007.

When a water-cooled chiller is replacing an air-cooled chiller, the additional auxiliary electrical loads for the condenser water pump and the cooling tower fan has to be considered, therefore a penalty factor of 0.109 kW needs to be used as the adjustment downward to account for the peak demand and energy savings.

(4) DX Packaged System, EER=10.9, 10 tons; Tier 2, <20 Tons; Tier 2, >20 Tons[4]: A single-package DX A/C unit consists of a single package (or cabinet housing) containing a condensing unit, a compressor, and an indoor fan/coil.

An additional benefit of package units is that there is no need for field-installed refrigerant piping, thus minimizing labor costs and the possibility of contaminating the system with dirt, metal, oxides or non-condensing gases. This measure involves installation of a TIER 2 high efficiency unit (EER=10.9) versus a standard unit (EER=10.3).

2. WATER HEATING

Standard electric water heaters use resistance heating elements to transfer heat to a reservoir in a storage tank system or instantaneously as the water passes through the heater in a point-of-use or on-demand water heater system. Thermal efficiency is relatively constant for electric resistance water heaters, with slight efficiency improvements available through improved insulation to minimize standby losses. Significant efficiency savings may be achieved through the installation of heat pump water heaters that capture heat from the air and transfer it to the water in the tank.

(1) Pre-Rinse Sprayer, Low Flow, Commercial Applications[5]: Pre-rinse sprayers are an essential component of kitchen operations—they are used to get the leftover food and grease off dishes, pots and pans before they go into a dishwasher. While conventional sprayers use between 2.5 and 4 gallons of water per minute (gpm), the low-flow sprayers use from 1.6 to 2.65 gallons per minute, according to the Energy Ideas Clearinghouse of the Washington State University Extension Energy Program in Olympia, Wash. Hot water is used in the sprayers and so low-flow spray valves lead to reduced water heating bills.

(2) Water Heater Blanket[6]*:* Water heater jackets are designed to wrap around an existing water heater tank to improve insulation, prevent heat loss, and save energy. Installing an insulating blanket can reduce water heating energy use by 3-9%.

(3) On Demand[7]: Demand (tankless or instantaneous) water heaters provide hot water only as it is needed. Demand water heaters heat water directly without the use of a storage tank. Therefore, they avoid the standby heat losses associated with storage water heaters. Typically, demand water heaters provide hot water at a rate of 2–5 gallons (7.6–15.2 liters) per minute.

(4) High Efficiency Storage Tank[8]: In a high efficiency storage tank, Water is kept hot and ready for use at all times in insulated storage tanks with capacities ranging from 20 to 80 gallons. Many

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[4] California Statewide Commercial Sector Energy Efficiency Potential Study, July, 2002.
[5] "PreRinseSprayers."http://www.focusonenergy.com/files/document_management_system/business_programs/prerinsesprayers_technicalsheet.pdf
[6] Consumer Guide to Home Energy Savings, 8th ed. ACEEE. Washington D.C. 2003.
[7] "Demand (tankless or instantaneous) Water Heaters." www.energysavers.gov/your_home/water_heating
[8] "High Efficiency Water Heaters." www.energystar.gov/ia/new_homes/features/WaterHtrs_062906.pdf

fuel options are available, including electricity, natural gas, oil, and propane. One drawback of these units is the energy used to keep the water hot at all times, otherwise known as "standby losses."

3. LIGHTING

Controls[9]*:* There are several varieties of automatic lighting controls, including wall or ceiling mounted occupancy sensors, integral occupancy sensors (including bi-level controls), photocells, and time clocks. Demand and Energy savings were reviewed for lighting control measures to confirm the appropriateness of current values.

(1) Occupancy Sensors - wall; ceiling; HID; bi-level controls[10]*:* Occupancy sensors (infrared or ultrasonic motion detection devices) turn lights on upon entry of a person into a room, and then turn the lights off from ½ minute to 20 minutes after they have left. Occupancy sensors in commercial buildings require proper installation and calibration. Their savings depend on the mounting type, but typical energy savings for these controls are 20% over lights not equipped with occupancy sensors.

Fixtures[11]*:* A variety of high efficiency fixtures, ballasts and lamps exist in the market today, producing the same amount of lumens, while consuming less electricity. Deemed lighting savings are mature components of utility sponsored DSM offerings around the country. The operating hours and demand factors for the different building types listed in this report are based on an in-depth research on a wide array of information available in the market.

(2) Super T8 Fixture - from 34W T12; from standard T8[12]*:* "High-Performance" or "Super" T8 lamp/ballast systems have higher lumens per watt than standard T8 systems. This results in lamp/ballast systems that produce equal or greater light than standard T8 systems, while using fewer watts. When used in a high-bay application, high-performance T8 fixtures can provide equal light to HID High-Bay fixtures, while using fewer watts.

(3) T5 Fluorescent High-Bay Fixtures; Troffer/Wrap; Industrial Strip; Indirect[13]*:* A T5 high-bay fixture has a fixture efficiency of over 91%, while a metal-halide fixture has a fixture efficiency of approximately 70%. By using a more efficient fixture, a space can be lit with fewer watts or fixtures. Typically, a 4-lamp F54T5HO system using 240 watts will provide as much light on a target surface as a standard 400 watt metal-halide fixture using 455 watts.

(4) CFL Fixture; CFL Screw-in[14]*:* An existing incandescent lamp is replaced with a lower wattage compact fluorescent lamp in either a hardwired fixture or screw-in fixture. CFLs have become an icon of energy efficiency and are commonly used as simple substitutes for incandescent lamps due to their significantly longer life and better energy efficiency. CFL's use approximately ¼ of the electricity as compared to a similar incandescent lamp and CFL's

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[9] Nexant, 2007. Arkansas Deemed Savings Quick Start Program Draft Report Commercial Measures. For Frontier Associates, LLC, March, 2007.
[10] California Statewide Commercial Sector Energy Efficiency Potential Study, July, 2002.
[11] Nexant, 2007. Arkansas Deemed Savings Quick Start Program Draft Report Commercial Measures. For Frontier Associates, LLC, March, 2007.
[12] Efficiency Vermont Technical Reference User Manual (TRM) No. 2006-41
[13] Ibid.
[14] Efficiency Vermont Technical Reference User Manual (TRM) No. 2006-41

last between 8 and 10 times longer than a typical incandescent lamp. Dimmable CFL lamps are available. Much of the original concern over the performance of CFL's has been addressed through instant-start lamps (no flicker) and the use of electronic ballasts that function at much higher frequencies than their magnetic counterparts (no noticeable strobe effect)

(5) LED Exit Sign[15]*:* Exit sign illuminated with light emitting diodes (LED).

(6) Pulse Start Metal Halide[16]*:* Unlike incandescent lamps, which generate lighting by heating a filament, discharge lamps ionize a vapor to produce light. Metal halide high-intensity discharge ("HID")lamps that provide an intense cone of light are widely used because they are about three times as efficient as incandescent lamps. Traditional probe-start metal halide lamps do not use an igniter and require three electrical contacts to ignite the gas and remain lit. Recently developed pulse-start metal halide lamps use only two contacts and use an igniter located inside the ballast pod. Pulse-start lamps offer several benefits: higher light output per unit of electric power, higher light output as lamps age, longer lamp life, more stable color rendering as lamps age, and quicker startup – pulse-start lamps can reach full brightness in two to four minutes instead the five to ten minutes needed by probe-start lamps.

4. COOKING

The cooking end-use measures used in this study were taken from the Arkansas *Food Service Deemed Savings* manual.[17] Although the manual only refers to gas-fired food service equipment replacing existing gas equipment, the deemed savings include interactive electricity savings associated with each technology. All of the potential savings associated with cooking measures in this study result from the interactive electricity savings listed in the manual.

(1) Energy Star Ovens[18]*:* Commercial convection ovens are the most widely used appliances in the foodservice industry. These are the workhorses of the commercial kitchen, with a wide variety of uses from baking and roasting to warming and reheating. In addition to traditional uses, convection ovens are used for nearly all types of food preparation, including foods typically prepared using other types of appliances (e.g., griddles, fryers, etc.). Commercial ovens that have earned the ENERGY STAR are about 20 percent more energy efficient than standard models.

(2) Energy Star Griddles[19]*:* ENERGY STAR qualified griddles include thermostatically controlled, gas and electric, single- and double-sided models. It must also be 10 percent more energy efficient than standard models.

(3) Energy Star Steamers[20]: Steam cookers, also known as "compartment steamers", that have earned the ENERGY STAR are up to 50 percent more energy efficient than standard models. ENERGY STAR qualified steam cookers include both electric and gas models. Steam cookers that earn the ENERGY STAR must meet a minimum cooking efficiency* of 50 percent

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[15] Ibid.
[16] Definition provided by Natural Resources Canada. www.nrcan.gc.ca
[17] Frontier Associates, LLC, 2007. Food Service Deemed Savings, Efficiency and Installation Standards for Arkansas Statewide Quick Start Programs. April 2007.
[18] www.energystar.gov
[19] Ibid.
[20] Ibid.

(electric) and 38 percent (gas) while also meeting maximum idle energy rates. Idle energy rates are given for 3-, 4-, 5-, and 6-pan sizes. Energy efficient steam cookers that have earned the ENERGY STAR offer shorter cook times, higher production rates, and reduced heat loss due to better insulation and more efficient steam delivery system.

(4) Energy Star Fryers[21]*:* Fryers that have earned the ENERGY STAR are up to 30 percent more energy efficient than standard models. ENERGY STAR qualified fryers include both gas and electric open deep-fat models. Fryers that earn the ENERGY STAR must meet a minimum cooking efficiency of 50 percent (gas) and 80 percent (electric) while also meeting a maximum idle energy rate of 9,000 Btu/hr (gas) and 1,000 watts (electric). Energy efficient fryers that have earned the ENERGY STAR offer shorter cook times and higher production rates through advanced burner and heat exchanger designs. Fry pot insulation reduces standby losses resulting in a lower idle energy rate.

(5) Energy Star Hot Food Holding Cabinets[22]*:* Hot food holding cabinets that have earned the ENERGY STAR are 65 percent more energy efficient than standard models. Hot food holding cabinet models that earn the ENERGY STAR must meet a maximum idle energy rate of 40 watts/ft^3. This means that ENERGY STAR qualified hot food holding cabinets are more efficient at maintaining food temperature while using less energy. Models that meet this requirement incorporate better insulation, reducing heat loss, and may also offer additional energy saving devices such as magnetic door gaskets, auto-door closures, or dutch doors. The insulation of the cabinet also offers better temperature uniformity within the cabinet from top to bottom.

5. REFRIGERATION

Commercial refrigerators and freezers are commonly found in restaurants and other food service industries. Reach in, solid door refrigerators and freezers are significantly more efficient than regular refrigerators and freezers due to better insulation and higher efficiency components. There are recognized high-efficiency designations, Tier 1 or Tier 2, for these types of refrigerators and freezers, which relate the volume of the appliance to its daily energy consumption. Tier 1 corresponds to Energy Star minimum efficiency levels while Tier 2 is the minimum efficiency level set by the Consortium for Energy Efficiency (CEE). Tier 2 refrigerators and freezers are 40% and 30% more efficient than Tier 1 refrigerators and freezers respectively. The three most common size refrigerators and freezers, one, two and three door, at both Tier 1 and Tier 2 levels, were analyzed for this report.[23]

(1) High Efficiency Refrigerators[24]*:* The measure described here is a high-efficiency packaged commercial reach-in refrigerator with solid doors, typically used by foodservice establishments. This includes one, two and three solid door reach-in, roll-in/through and pass-through commercial refrigerators. Beverage merchandisers – a special type of reach-in refrigerator with glass doors – are not included in this characterization. A high efficiency reach-in refrigerator can fall into one of two tiers: Tier 1 – those meeting the ENERGY STAR specifications, or Tier 2 – those meeting ENERGY STAR plus 40% more efficient.

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[21] Ibid
[22] Ibid
[23] Nexant, 2007. Arkansas Deemed Savings Quick Start Program Draft Report Commercial Measures. For Frontier Associates, LLC, March, 2007.
[24] Efficiency Vermont Technical Reference User Manual (TRM) No. 2006-41

(2) High Efficiency Freezers[25]*:* The measure described here is a high-efficiency packaged commercial reach-in freezer with solid doors, typically used by foodservice establishments. This includes one, two and three solid door reach-in, roll-in/through and pass-through commercial freezers. A high efficiency reach-in freezer can fall into one of two tiers: Tier 1 – those meeting the ENERGY STAR specifications, or Tier 2 – those meeting ENERGY STAR plus 40% more efficient.

(3) Night Covers for Refrigerator and Freezer Display Cases[26]*:* Installing film or blanket type night covers on display cases can significantly reduce the infiltration of warm ambient air into the refrigerated space. This reduction in display case loads in turn reduces the electric use of the central plant, including compressors and condensers, thus saving energy. The target market for this measure is small, independently owned grocery stores and other stores that are typically closed at night and restock their shelves during the day. The target cases are vertical displays, with a single- or double-air curtain, and tub (coffin) type cases. [CA pg A-20].

(4) Vender Miser[27]*:* The Vending Miser is an energy control device for refrigerated vending machines. Using an occupancy sensor, during times of inactivity the Vending Miser turns off the machine's lights and duty cycles the compressor based on the ambient air temperature. The Vending Miser is applicable for conditioned indoor installations. The Baseline is a soft-drink vending machine without a Vending Miser device (typical usage of 3555 kWh).

(5) Demand Defrost Controls[28]*:* Defrost of evaporator coils in freezer displays is normally completed on a timed basis, but this is wasteful, as the time interval is designed to remove ice around the coil under worst case humidity levels. Demand defrost sensor and control systems are designed to optimize coil defrost. Demand defrost controls can work in conjunction with both electric heat defrost and hot gas defrost systems. Unfortunately, at the time, industry experts suggest that this technology is still in an early stage of design and not yet ready for the market. However, in the near future this technology should be viewed as a substantial opportunity for energy savings.

(6) Humidistat Controls[29]*:* A humidistat control is a control device to turn refrigeration display case anti-sweat heaters off when ambient relative humidity is low enough that sweating will not occur. Anti-sweat heaters evaporate moisture by heating the door rails, case frame and glass of display cases. Savings result from reducing the operating hours of the anti-sweat heaters, which without a humidistat control generally run continuously. There are various types of control strategies including cycling on a fixed schedule.

(7) High Efficiency Fan and Compressor Motors[30]*:* Packaged refrigeration equipment is estimated to account for more than half of the electricity used by refrigeration systems in the commercial sector. In the U.S., the ENERGY STAR-labeled commercial refrigerators and freezers are generally at least 25% more efficient than some products in the market. However, the existing

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[25] Efficiency Vermont Technical Reference User Manual (TRM) No. 2006-41
[26] California Statewide Commercial Sector Energy Efficiency Potential Study, July, 2002.
[27] Efficiency Vermont Technical Reference User Manual (TRM) No. 2006-41
[28] California Statewide Commercial Sector Energy Efficiency Potential Study, July, 2002.
[29] Ibid.
[30] Efficient Fan Motor Options for Commercial Refrigeration, Emerging Technologies & Practices, ACEEE, 2004
http://www.aceee.org/pubs/a042_r3.pdf#search=%22fan%20motors%20measure%20description%22

stock of packaged refrigeration equipment is considered very inefficient due to the focus by most purchasers on first cost and the lack of effort from manufacturers to differentiate equipment on the basis of energy efficiency.

Fans and fan motors used in the condensers and evaporators account for 20% of the annual energy use and operate at overall efficiencies as low as 7 to 15%. These low efficiencies are due to both inefficient fans and low cost shaded pole (SP) motors with low efficiencies. New axial fan designs enable improved fan performance and advanced electric motors such as brushless DC or electronically commutated motors (ECM) offer motor performance solutions.

It appears that the majority of currently installed evaporator and condenser fan-motor sets can be replaced with advanced units that can achieve energy savings as high as 70% of the fan-motor energy. The input fan power of an evaporator and condenser in a typical 48 ft3 two-door reach-in commercial refrigerator can be reduced from 70W (35W per component) to 20W (10W per component) with use of the energy-efficient fans and motors. Incremental costs range from a low of approximately $20 for a better fan with a brushless DC motor to $50 for an ECM motor. The total incremental cost for a commercial fridge would be in the range of $40 to $100.

(8) Compressor VSD Retrofit[31]*:* A variable speed compressor is a screw or reciprocating compressor whose current is modulated by a frequency inverter. A controller senses the compressor suction pressure and modulates the current and therefore the motor speed in response to changes in this pressure. When low load conditions exist, the current to the compressor motor is decreased, decreasing the compressor work done on the refrigerant.

(9) Walk-in Cooler/Freezer Controls and Economizers[32]*:* Economizers save energy in walk-in coolers by bringing in outside air when it is sufficiently cool, rather than operating the compressor. High efficiency is a walk-in refrigeration system with an outside air economizer.

(10) Ice Machine, Energy Star, Self-Contained[33]: Ice makers are also classified as batch or continuous in operation. Batch models tend to produce ice that is purer than its source water, because the freezing process separates out the impurities. In continuous units, chemicals tend to remix in an ice/water combination. Controls for batch ice makers are more complicated—they must end the freezing process at the proper time to start a thawing cycle, and resume the freezing process after the ice has been harvested.

(11) Zero Energy Doors and Frames[34]: doors/frames are highly insulated, with either double- or triple-pane units and low-E glass coatings or low-conductivity filler gas (e.g., argon). They are also doors and frames that are completely free of electric resistance heating (i.e., no heaters in door frames).

(12) Commercial Refrigeration Tune Up: Operational maintenance of commercial refrigeration unit that includes cleaning of dirty coils, re-lubricating refrigeration lines, and making sure connections to the unit are not faulty. The tune up extends the elascity and the durability of the refrigeration unit.

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[31] California Statewide Commercial Sector Energy Efficiency Potential Study, July, 2002.
[32] Efficiency Vermont Technical Reference User Manual (TRM) No. 2006-41
[33] "Ice Makers." http://www.mge.com/business/saving/BEA
[34] "2009 Rebate Application: Commercial Refrigeration Equipment.", Efficiency Vermont

(13) Advanced Refrigeration Technologies Fan Controller[35]: the Advanced Refrigeration Technologies (ART) Fan Controller can reduce the costs of using these refrigeration units up to 50%. The ART Evaporator Fan Controller is inexpensive and easy to install. It regulates the speed of the evaporator fan motors to meet the need of each phase of the refrigeration cycle. Just as energy is saved by turning off the lights in an unoccupied room, this controller saves energy by running the fans only as fast as the refrigerator needs at the time.

(14) LED Case Lighting[36]: Higher energy efficiency and better performance at low temperatures allows LED case lighting to use up to 50 percent less energy than fluorescent systems. Additionally, LED systems emit less heat, which means the refrigeration compressor does not have to work as hard to remove heat as with fluorescent systems. LED fixtures efficiently direct the light where it is truly needed, eliminating wasteful light that spills out onto the floor. LEDs are also able to illuminate shelves in a more uniform manner. LED lighting contains no mercury. Also, its reduced energy consumption will aid in preventing unnecessary green house gas emissions associated with energy production.

6. OFFICE EQUIPMENT

(1) Plug Sensors[37]: Plug load occupancy sensors are devices that control low wattage devices (<150 watts) using an occupancy sensor. Common applications are computer monitors, desk lamps, printers, and other desktop equipment. Two size tiers were analyzed based on available products in the market: 50 and 150 watt.

7. MOTORS (VENTILATION AND NON-VENTILATION)

(1) Motors - Variable Frequency Drives[38]: Installation of Variable Speed Drives (VSDs) will ensure that pumps are performing at maximum efficiency at partial-load conditions. The power required to operate a pump motor is proportional to the cube of the operating speed. For example, in a pump system with a VSD, a load reduction that results in a 10-percent reduction in motor speed reduces energy consumption by 27 percent [0.9 x 3 = 0.27].

(2) NEMA Premium Efficiency Motors[39]: NEMA motors (National Electrical Manufacturers Association) for the North American market distinguish themselves as a result of their new design – and especially as a result of their efficiency. NEMA motors are suitable in all types of industries, in sectors such as the automobile, textile, printing, chemical branches as well as in cross-industry applications – for example in conveyor technology. The HVAC sector (Heating, Ventilating & Air Conditioning), which requires extremely light motors are typical applications for our so-called General Purpose motors – either with gray cast iron or aluminum frames. Severe duty motors in a full gray cast iron design are suitable for use in tough ambient conditions – for instance in the pulp and paper industry. The Severe Duty SD100 IEEE 841 motor version even exceeds the stringent IEEE 841 Standards applicable in the crude oil and chemical industries.

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[35] "Inventions and Innovation: EVAPORATOR FAN CONTROLLER FOR MEDIUM-TEMPERATURE WALK-IN REFRIGERATORS." http://www.e3energy.org/schrum.pdf

[36] "LED Refrigerated Case Lighting Display." http://www.pge.com/mybusiness

[37] Nexant, 2007. Arkansas Deemed Savings Quick Start Program Draft Report Commercial Measures. For Frontier Associates, LLC, March, 2007.

[38] http://www.energystar.gov/ia/business/BUM_heat_cool.pdf

[39] "Motors acc. to NEMA." http://www.automation.siemens.com/mcms/large-drives/en/motors/low-voltage-motors/nema-motors/Pages/nema-motors.aspx

8. COMPRESSED AIR

(1) Compressed Air Leaks[40]: Leaks are a significant source of wasted energy in a compressed air system, often wasting as much as 20-30% of the compressor's output. Compressed air leaks can also contribute to problems with system operations, including fluctuating system pressure, which can cause air tools and other air-operated equipment to function less efficiently, possibly affecting production, excess compressor capacity, resulting in higher than necessary costs, and decreased service life and increased maintenance of supply equipment (including the compressor package) due to unnecessary cycling and increased run time.

(2) Engineered Nozzles[41]*:* Engineered Nozzles reduce air consumption and noise levels; ordinary nozzles cannot compete. Engineered Nozzles maintain safety features and can qualify for an energy savings rebate from a local utility; ordinary nozzles fall short. Open blow off or homemade blow off applications typically violate OSHA safety standards; Engineered Nozzles do not.

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[40] "Energy Tips: Minimize Compressed Air Leaks." www.energystar.gov/ia/business/industry/compressed_air3.pdf

[41] "Engineered vs. Ordinary." http://www.docstoc.com/docs/42121280/Engineered-Vs-Ordinary-Air-Nozzles

Commercial and Industrial Measure Assumptions and B/C Test Results

Discount Rate 6.33%

	Measure Name	Unit Notes	Annual kWh Saved	Percent Savings (kWh)	Winter kW Savings	Summer kW Savings	Incremental Cost	Measure Useful Life	Annual Amortized Cost Per Unit	Levelized Cost (+Admin)	TRC Test	Utility Test	Part. Test	RIM Test
1	*Lighting*													
1-1	Compact Fluorescent	bulb	202.00	74.00%	0.049	0.046	$3.00	2	$1.64	$0.01	6.97	19.93	9.53	0.73
1-2	LED Exit Sign	exit sign	201.00	87.00%	0.023	0.023	$25.00	15	$2.63	$0.01	5.74	16.39	6.86	0.84
1-3	Standard T8 (vs T12) 4ft	fixture	96.00	43.00%	0.024	0.011	$45.00	12	$5.46	$0.06	1.46	4.16	1.80	0.81
1-4	High Performance T8 (vs T12) 4ft	fixture	115.00	51.57%	0.113	0.113	$51.75	12	$6.28	$0.05	2.66	7.59	1.86	1.42
1-5	High Performance T8HO (vs T12) 8ft	fixture	138.00	43.00%	0.034	0.034	$69.00	12	$8.38	$0.06	1.36	3.89	1.71	0.79
1-6	Occupancy Sensor (under 500W)	sensor	397.00	41.00%	0.099	0.099	$100.00	10	$13.80	$0.03	2.28	6.52	2.69	0.85
1-7	Occupancy Sensor (over 500W)	sensor	994.00	41.00%	0.243	0.243	$200.00	10	$27.60	$0.03	2.84	8.12	3.27	0.87
1-8	Pulse Start Metal Halide 100W - 300W	fixture	220.50	9.00%	0.059	0.049	$23.00	15	$2.42	$0.01	8.07	23.06	8.11	1.00
1-9	Pulse Start Metal Halide > 300W	fixture	315.00	20.00%	0.084	0.070	$38.00	15	$4.00	$0.01	6.98	19.94	7.06	0.99
1-10	High performance T5 (replacing T8)	fixture	84.00	28.00%	0.000	0.000	$40.00	15	$4.21	$0.05	1.46	4.18	2.05	0.71
1-11	CFL Hard Wired Fixture	fixture	236.00	74.00%	0.043	0.036	$12.00	15	$1.26	$0.01	12.10	34.58	13.64	0.89
1-12	CFL High Wattage 31-115	bulb	572.50	68.00%	0.104	0.087	$35.00	15	$3.68	$0.01	10.75	30.71	11.40	0.94
1-13	CFL High Wattage 150-199	bulb	614.50	49.00%	0.112	0.094	$175.00	15	$18.41	$0.03	2.60	7.42	3.10	0.84
2	*Space Cooling*													
2-1	Split AC (10 SEER, 7.7 HSPF to 14.5 SEER, 8.5 HSPF)	5 ton	4,533.57	15.00%	0.000	0.089	$575.00	15	$60.49	$0.01	4.32	12.33	6.73	0.64
2-2	Split AC (10 SEER, 7.7 HSPF to 15 SEER, 8.5 HSPF)	5 ton	4,700.59	15.00%	0.000	0.091	$860.00	15	$90.47	$0.02	2.99	8.55	4.77	0.63
2-3	Split AC (10 SEER, 7.7 HSPF to 16 SEER, 8.5 HSPF)	5 ton	5,003.31	15.00%	0.000	0.096	$1,000.00	15	$105.19	$0.02	2.74	7.83	4.40	0.62
2-4	Split AC (10 SEER, 7.7 HSPF to 14.5 SEER, 8.5 HSPF)	8.3 ton	7,555.95	15.00%	0.000	0.125	$954.50	15	$100.41	$0.01	4.33	12.38	6.76	0.64
2-5	Split AC (10 SEER, 7.7 HSPF to 15 SEER, 8.5 HSPF)	8.3 ton	7,834.32	15.00%	0.000	0.128	$1,427.60	15	$150.18	$0.02	3.00	8.58	4.79	0.63
2-6	Split AC (10 SEER, 7.7 HSPF to 16 SEER, 8.5 HSPF)	8.3 ton	8,338.85	15.00%	0.000	0.132	$1,660.00	15	$174.62	$0.02	2.75	7.86	4.42	0.62
2-7	DX Packaged System (EER=10.9)	10 ton	4,439.00	17.43%	0.000	4.035	$607.00	15	$63.85	$0.01	4.00	11.44	6.27	0.64
2-8	DX Packaged System (CEE Tier 2)	< 20 ton	9,550.00	7.00%	0.000	8.682	$910.00	15	$95.73	$0.01	5.75	16.41	8.84	0.65
2-9	DX Packaged System (CEE Tier 2)	> 20 ton	12,733.00	18.00%	0.000	11.575	$1,813.00	15	$190.72	$0.01	3.84	10.99	6.03	0.64
2-10	Air Cooled Chiller	5 ton	4,720.06	15.00%	0.000	0.260	$575.00	23	$48.13	$0.01	6.30	18.00	9.20	0.68
2-11	Air Cooled Chiller	8 ton	7,313.31	15.00%	0.000	0.260	$920.00	23	$77.00	$0.01	6.10	17.43	8.92	0.68
2-12	PTAC	1/2 ton	201.20	31.91%	0.000	0.119	$50.00	15	$5.26	$0.03	2.20	6.29	3.61	0.61
2-13	PTAC	3/4 ton	178.23	21.13%	0.000	0.105	$75.00	15	$7.89	$0.04	1.30	3.72	2.27	0.57
2-14	PTAC	1 ton	352.85	31.76%	0.000	0.208	$100.00	15	$10.52	$0.03	1.93	5.52	3.21	0.60
2-15	PTAC	1 1/4 ton	469.25	28.90%	0.000	0.277	$150.00	15	$15.78	$0.03	1.71	4.89	2.88	0.59
3	*Space Heating*													
3-1	PTHP	1/2 ton	785.41	19.15%	0.071	0.000	$50.00	15	$5.26	$0.01	10.20	29.14	13.06	0.78
3-2	PTHP	3/4 ton	1,004.29	25.87%	0.131	0.000	$75.00	15	$7.89	$0.01	8.80	25.13	11.19	0.79
3-3	PTHP	1 ton	1,445.84	35.16%	0.241	0.000	$100.00	15	$10.52	$0.01	9.60	27.42	12.05	0.80
3-4	PTHP	1 1/4 ton	1,712.61	30.45%	0.285	0.000	$150.00	15	$15.78	$0.01	7.58	21.66	14.21	0.79
4	*Ventilation*													
4-1	Motors	1 to 5 HP	204.00	2.89%	0.056	0.062	$88.00	15	$9.26	$0.05	1.93	5.50	2.89	0.87
4-2	Motors	7.5 to 20 HP	737.92	9.68%	0.201	0.223	$227.00	15	$23.88	$0.03	2.70	7.72	4.05	0.91
4-3	Motors	25 to 100 HP	2,092.19	11.58%	0.569	0.631	$558.00	15	$58.70	$0.03	3.11	8.90	4.67	0.92
4-4	Motors	125 to 250 HP	6,276.56	12.32%	1.706	1.894	$1,079.00	15	$113.50	$0.02	4.83	13.80	7.24	0.96
4-5	Variable Frequency Drives	<2 HP	598.72	25.00%	0.154	0.170	$200.00	15	$21.04	$0.04	6.57	18.76	9.96	0.96
4-6	Variable Frequency Drives	3 to 10 HP	3,592.31	25.00%	0.921	1.022	$1,000.00	15	$105.19	$0.03	4.27	12.20	6.47	0.94
4-7	Variable Frequency Drives	11 to 50 HP	16,764.11	25.00%	4.298	4.771	$3,000.00	15	$315.58	$0.02	7.23	20.64	10.96	0.97
5	*Motors (Non-Ventilation)*													
5-1	Motors	1 to 5 HP	113.00	2.89%	0.031	0.031	$88.00	15	$9.26	$0.08	1.07	3.05	1.60	0.77
5-2	Motors	7.5 to 20 HP	408.00	9.68%	0.111	0.111	$227.00	15	$23.88	$0.06	1.49	4.27	2.24	0.83
5-3	Motors	25 to 100 HP	1,056.00	11.58%	0.287	0.287	$558.00	15	$58.70	$0.06	1.57	4.49	2.36	0.84
5-4	Motors	125 to 250 HP	2,435.00	12.32%	0.662	0.662	$1,079.00	15	$113.50	$0.05	1.87	5.36	2.81	0.86
5-5	Variable Frequency Drives	<2 HP	598.72	25.00%	0.154	0.154	$200.00	15	$21.04	$0.04	2.46	7.03	3.73	0.89
5-6	Variable Frequency Drives	3 to 10 HP	3,592.31	25.00%	0.921	0.921	$1,000.00	15	$105.19	$0.03	2.95	8.43	4.47	0.91

	Measure Name	Unit Notes	Annual kWh Saved	Percent Savings (kWh)	Winter kW Savings	Summer kW Savings	Incremental Cost	Measure Useful Life	Annual Amortized Cost Per Unit	Levelized Cost (-Admin)	TRC Test	Utility Test	Part. Test	RIM Test
5-7	Variable Frequency Drives	11 to 50 HP	16,764.11	25.00%	4.298	4.298	$3,000.00	15	$315.58	$0.02	4.59	13.11	6.96	0.94
6	*Water Heating*													
6-1	High Efficiency Storage (tank)		256.00	15.00%	0.054	0.045	$70.00	10	$9.66	$0.04	1.83	5.22	3.31	0.73
6-2	Pre-Rinse Sprayer, Low flow, Commercial Application		1,396.00	45.00%	0.233	0.196	$35.00	5	$8.38	$0.01	9.46	27.04	19.75	0.72
6-3	On Demand (tankless)		345.00	7.00%	0.072	0.061	$350.00	20	$31.34	$0.09	0.89	2.56	1.50	0.68
6-4	Tank Insulation		512.00	30.00%	0.108	0.091	$60.00	12	$7.29	$0.01	5.06	14.47	8.95	0.82
7	*Cooking*													
7-1	Electric Energy Star Fryers		983.00	6.50%	0.200	0.252	$4,252.00	15	$447.29	$0.46	0.18	0.51	0.29	0.33
7-2	Electric Energy Star Steamers,3-6 pan		13,162.00	51.00%	2.500	3.150	$4,150.00	15	$436.56	$0.03	2.41	6.88	3.95	0.83
7-3	Energy Star Hot Food Holding Cabinet		4,654.00	60.00%	0.638	0.803	$1,783.00	15	$187.56	$0.04	1.88	5.36	3.25	0.76
7-4	Energy Star Convection Ovens		1,879.00	15.40%	0.500	0.630	$2,928.50	10	$404.13	$0.22	0.36	1.04	0.58	0.50
7-5	Energy Star Griddles		651.00	11.00%	0.149	0.188	$4,089.50	15	$430.19	$0.66	0.13	0.36	0.20	0.26
8	*Refrigeration*													
8-1	Glass Door Freezer, <15-49 cu ft, Energy Star		2,759.00	24.17%	0.315	0.397	$100.00	9	$14.91	$0.01	11.42	32.63	22.87	0.75
8-2	Glass Door Freezer, 50+ cu ft, Energy Star		7,643.00	24.17%	0.873	1.099	$100.00	9	$14.91	$0.00	31.64	90.39	63.36	0.76
8-3	Solid Door Freezer, <15-49 cu ft, Energy Star		1,160.00	20.94%	0.132	0.167	$100.00	9	$14.91	$0.01	4.80	13.72	9.62	0.73
8-4	Solid Door Freezer, 50+ cu ft, Energy Star		4,181.00	20.94%	0.477	0.601	$100.00	9	$14.91	$0.00	17.31	49.45	34.66	0.76
8-5	Glass Door Refrigerator, <15 - 49 cu ft		724.33	25.07%	0.083	0.104	$100.00	9	$14.91	$0.02	3.00	8.57	6.00	0.70
8-6	Glass Door Refrigerator, 50+ cu ft, Energy Star		919.00	25.07%	0.105	0.132	$100.00	9	$14.91	$0.02	3.80	10.87	7.62	0.72
8-7	Solid Door Refrigerator, <15 cu ft, Energy Star		545.33	33.70%	0.062	0.078	$100.00	9	$14.91	$0.03	2.26	6.45	4.52	0.69
8-8	*Solid Door Refrigerator, 50+ cu ft, Energy Star*		1,218.00	33.72%	0.139	0.175	*$100.00*	9	$14.91	$0.01	5.04	14.40	10.10	0.73
8-9	Commercial Refrigeration Tune-Up, Medium Temp ,not self contained		537.00	7.00%	0.099	0.125	$75.00	1	$79.75	$0.15	0.33	0.93	0.77	0.39
8-10	Commercial Refrigeration Tune-Up, Low Temp, not self contained		1,388.00	7.00%	0.191	0.241	$75.00	1	$79.75	$0.06	0.82	2.33	1.98	0.50
8-11	Anti-sweat heater controls on freezers		1,745.50	16.46%	0.027	0.033	$170.00	12	$20.65	$0.01	4.95	14.15	10.77	0.67
8-12	Anti-sweat heater controls, on refrigerators		1,039.50	33.14%	0.028	0.035	$170.00	12	$20.65	$0.02	2.99	8.55	6.41	0.66
8-13	Vending Miser, Cold Beverage		1,694.00	48.50%	0.193	0.244	$160.00	15	$16.83	$0.01	6.97	19.93	13.18	0.78
8-14	Brushless DC Motors for freezers and coolers		1,050.00	8.79%	0.012	0.015	$25.00	5	$5.99	$0.01	8.46	24.18	20.80	0.61
8-15	Humidity Door Heater Controls for freezers and coolers		3,500.00	55.00%	0.094	0.118	$300.00	10	$41.40	$0.01	4.82	13.77	10.56	0.67
8-16	Refrigerated Case Covers		2,900.00	6.00%	0.331	0.417	$120.00	4	$34.89	$0.01	4.30	12.30	9.75	0.64
8-17	Zero Energy Doors for freezers and coolers		800.00	20.00%	0.165	0.208	$538.00	10	$74.24	$0.09	0.75	2.15	1.35	0.62
8-18	Evaporator Coil Defrost Control		600.00	43.60%	0.405	0.510	$500.00	10	$69.00	$0.12	0.90	2.58	1.09	0.85
8-19	Evaporator Fan Motor Control for freezers and coolers		2,600.00	35.77%	0.059	0.074	$2,254.00	13	$259.54	$0.10	0.60	1.72	1.29	0.51
8-20	Permanent Split Capacitor Motor		385.00	33.33%	0.044	0.055	$125.00	15	$13.15	$0.03	2.03	5.80	3.83	0.71
8-21	Ice Machine, Energy Star, Self-Contained		270.00	10.15%	0.029	0.037	$56.00	9	$8.35	$0.03	1.98	5.66	4.00	0.67
8-22	LED Case Lighting (5 door case)		398.00	61.00%	0.006	0.007	$190.00	8	$31.00	$0.08	0.45	1.28	0.87	0.49
9	*Office Equipment/Appliances*													
9-1	Watt Sensors on Office Electronics	50 Watt	129.00	59.00%	0.100	0.100	$75.00	10	$10.35	$0.08	0.91	2.59	1.56	0.67
9-2	Watt Sensors on Office Electronics	150 Watt	321.00	58.00%	0.200	0.200	$82.00	10	$11.32	$0.04	1.96	5.60	3.54	0.74
10	*Compressed Air*													
10-1	Fix Air Leaks	<5HP	262.50	15.00%	0.063	0.063	$75.00	1	$79.75	$0.30	0.18	0.50	0.37	0.30
10-2	Fix Air Leaks	10-50HP	2,009.67	15.00%	0.483	0.483	$75.00	1	$79.75	$0.04	1.35	3.86	2.86	0.61
10-3	Fix Air Leaks	50-100HP	6,134.50	15.00%	1.475	1.475	$75.00	1	$79.75	$0.01	4.12	11.78	8.74	0.68
10-4	Engineered Nozzles for blow-off		7,343.00	39.00%	3.680	3.680	$80.00	15	$8.42	$0.00	89.21	254.88	114.28	1.20

	Measure Name	Annual kWh Saved	Winter kW Savings	Summer kW Savings	Incremental Cost	Measure Useful Life
1	*Lighting*					
1-1	Compact Fluorescent	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan
1-2	LED Exit Sign	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan
1-3	Standard T8 (vs T12) 4ft	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan
1-4	High Performance T8 (vs T12) 4ft	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan
1-5	High Performance T8HO (vs T12) 8ft	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan
1-6	Occupancy Sensor (under 500W)	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan
1-7	Occupancy Sensor (over 500W)	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan	1 - Michigan
1-8	Pulse Start Metal Halide 100W - 300W	17 - Vermont	17 - Vermont	4 - GDS	17 - Vermont	17 - Vermont
1-9	Pulse Start Metal Halide > 300W	17 - Vermont	17 - Vermont	4 - GDS	17 - Vermont	17 - Vermont
1-10	High performance T5 (replacing T8)	17 - Vermont	17 - Vermont	4 - GDS	17 - Vermont	17 - Vermont
1-11	CFL Hard Wired Fixture	7 - Wisconsin	7 - Wisconsin	4 - GDS	14 - Maine	17 - Vermont
1-12	CFL High Wattage 31-115	7 - Wisconsin	7 - Wisconsin	4 - GDS	18 - Green Elec	17 - Vermont
1-13	CFL High Wattage 150-199	7 - Wisconsin	7 - Wisconsin	4 - GDS	18 - Green Elec	17 - Vermont
2	*Space Cooling (Unitary and Split AC)*					
2-1	Split AC (10 SEER, 7.7 HSPF to 14.5 SEER, 8.5 HSPF)	4 - GDS	4 - GDS	4 - GDS	13 - ActOnEnergy	15 - Measure Life
2-2	Split AC (10 SEER, 7.7 HSPF to 15 SEER, 8.5 HSPF)	4 - GDS	4 - GDS	4 - GDS	13 - ActOnEnergy	15 - Measure Life
2-3	Split AC (10 SEER, 7.7 HSPF to 16 SEER, 8.5 HSPF)	4 - GDS	4 - GDS	4 - GDS	13 - ActOnEnergy	15 - Measure Life
2-4	Split AC (10 SEER, 7.7 HSPF to 14.5 SEER, 8.5 HSPF)	4 - GDS	4 - GDS	4 - GDS	13 - ActOnEnergy	15 - Measure Life
2-5	Split AC (10 SEER, 7.7 HSPF to 15 SEER, 8.5 HSPF)	4 - GDS	4 - GDS	4 - GDS	13 - ActOnEnergy	15 - Measure Life
2-6	Split AC (10 SEER, 7.7 HSPF to 16 SEER, 8.5 HSPF)	4 - GDS	4 - GDS	4 - GDS	13 - ActOnEnergy	15 - Measure Life
2-7	DX Packaged System (EER=10.9)	4 - GDS	4 - GDS	4 - GDS	19 - Connecticut	19 - Connecticut
2-8	DX Packaged System (CEE Tier 2)	4 - GDS	4 - GDS	4 - GDS	19 - Connecticut	19 - Connecticut
2-9	DX Packaged System (CEE Tier 2)	4 - GDS	4 - GDS	4 - GDS	19 - Connecticut	19 - Connecticut
2-10	Air Cooled Chiller	4 - GDS	4 - GDS	4 - GDS	14 - Maine	15 - Measure Life
2-11	Air Cooled Chiller	4 - GDS	4 - GDS	4 - GDS	14 - Maine	15 - Measure Life
2-12	PTAC	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
2-13	PTAC	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
2-14	PTAC	4 - GDS	4 - GDS	4 - GDS	13 - ActOnEnergy	14 - Maine
2-15	PTAC	4 - GDS	4 - GDS	4 - GDS	13 - ActOnEnergy	14 - Maine
3	*Space Heating*					
3-1	PTHP	4- GDS	4- GDS	4- GDS	13 - ActOnEnergy	4- GDS
3-2	PTHP	4- GDS	4- GDS	4- GDS	13 - ActOnEnergy	4- GDS
3-3	PTHP	4- GDS	4- GDS	4- GDS	13 - ActOnEnergy	4- GDS
3-4	PTHP	4- GDS	4- GDS	4- GDS	13 - ActOnEnergy	4- GDS
4	*Ventilation*					
4-1	Motors 1 to 5 HP	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
4-2	Motors 7.5 to 20 HP	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
4-3	Motors 25 to 100 HP	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
4-4	Motors 125 to 250 HP	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
4-5	Variable Frequency Drives(<2HP)	16 - Alliant	4 - GDS	4 - GDS	14 - Maine	17 - Vermont
4-6	Variable Frequency Drives(3 to 10 HP)	16 - Alliant	4 - GDS	4 - GDS	14 - Maine	17 - Vermont
4-7	Variable Frequency Drives(11 to 50 HP)	16 - Alliant	4 - GDS	4 - GDS	14 - Maine	17 - Vermont
5	*Motors (Non-Ventilation)*					
5-1	Motors 1 to 5 HP	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
5-2	Motors 7.5 to 20 HP	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
5-3	Motors 25 to 100 HP	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
5-4	Motors 125 to 250 HP	4 - GDS	4 - GDS	4 - GDS	14 - Maine	14 - Maine
5-5	Variable Frequency Drives(<2HP)	16 - Alliant	4 - GDS	4 - GDS	14 - Maine	17 - Vermont
5-6	Variable Frequency Drives(3 to 10 HP)	16 - Alliant	4 - GDS	4 - GDS	14 - Maine	17 - Vermont
5-7	Variable Frequency Drives(11 to 50 HP)	16 - Alliant	4 - GDS	4 - GDS	14 - Maine	17 - Vermont
6	*Water Heating*					
6-1	High Efficiency Storage (tank)	9 - MPRP	9 - MPRP	17 - Vermont/4 -GDS	9 - MPRP	10 - Construction
6-2	Pre-Rinse Sprayer, Low flow, Commercial Application	1 - Michigan	1 - Michigan	17 - Vermont/4 -GDS	1 - Michigan	1 - Michigan
6-3	On Demand (tankless)	11 - New York	11 - New York	17 - Vermont/4 -GDS	10 - Construction	10 - Construction
6-4	Tank Insulation	.2 - Energy Expert	12 - Energy Experts	17 - Vermont/4 -GDS	4 - GDS	12 - Energy Experts
7	*Cooking*					
7-1	Electric Energy Star Fryers	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	1 - Michigan	8 - Northwest
7-2	Electric Energy Star Steamers,3-6 pan	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	1 - Michigan	8 - Northwest
7-3	Energy Star Hot Food Holding Cabinet	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	1 - Michigan	8 - Northwest
7-4	Energy Star Convection Ovens	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	1 - Michigan	8 - Northwest
7-5	Energy Star Griddles	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	1 - Michigan	8 - Northwest
8	*Refrigeration*					
8-1	Glass Door Freezer, <15-49 cu ft, Energy Star	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 -Vermont	17 -Vermont
8-2	Glass Door Freezer, 50+ cu ft, Energy Star	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 -Vermont	17 -Vermont

	Measure Name	Annual kWh Saved	Winter kW Savings	Summer kW Savings	Incremental Cost	Measure Useful Life
B-3	Solid Door Freezer, <15-49 cu ft, Energy Star	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 -Vermont	17 -Vermont
B-4	Solid Door Freezer, 50+ cu ft, Energy Star	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 -Vermont	17 -Vermont
B-5	Glass Door Refrigerator, <15 - 49 cu ft	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 -Vermont	17 -Vermont
B-6	Glass Door Refrigerator, 50+ cu ft, Energy Star	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 -Vermont	17 -Vermont
B-7	Solid Door Refrigerator, <15 cu ft, Energy Star	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 -Vermont	17 -Vermont
B-8	Solid Door Refrigerator, 50+ cu ft, Energy Star	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 -Vermont	17 -Vermont
B-9	Commercial Refrigeration Tune-Up, Medium Temp ,not self cor	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	19 - Refrig	19 - Refrig
B-10	Commercial Refrigeration Tune-Up, Low Temp, not self contair	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	19 - Refrig	19 - Refrig
B-11	Anti-sweat heater controls on freezers	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	20 - NW Council	20 - NW Council
B-12	Anti-sweat heater controls, on refrigerators	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	20 - NW Council	20 - NW Council
B-13	Vending Miser, Cold Beverage	17 - Vermont	4 - GDS	22 - Arkansas	17 - Vermont	17 - Vermont
B-14	Brushless DC Motors for freezers and coolers	17 - Vermont	17 - Vermont	22 - Arkansas	17 - Vermont	17 - Vermont
B-15	Humidity Door Heater Controls for freezers and coolers	17 - Vermont	17 - Vermont	22 - Arkansas	17 - Vermont	17 - Vermont
B-16	Refrigerated Case Covers	17 - Vermont	17 - Vermont	22 - Arkansas	17 - Vermont	17 - Vermont
B-17	Zero Energy Doors for freezers and coolers	17 - Vermont	17 - Vermont	22 - Arkansas	17 - Vermont	17 - Vermont
B-18	Evaporator Coil Defrost Control	17 - Vermont	17 - Vermont	22 - Arkansas	17 - Vermont	17 - Vermont
B-19	Evaporator Fan Motor Control for freezers and coolers	17 - Vermont	17 - Vermont	22 - Arkansas	17 - Vermont	17 - Vermont
B-20	Permanent Split Capacitor Motor	17 - Vermont	7 - Wisconsin	22 - Arkansas	17 - Vermont	17 - Vermont
B-21	Ice Machine, Energy Star, Self-Contained	7 - Wisconsin	7 - Wisconsin	22 - Arkansas	17 - Vermont	17 - Vermont
B-22	LED Case Lighting (5 door case)	21 - PG&E	21 - PG&E	22 - Arkansas	13 - ActOnEnergy	4 -GDS
9	*Office Equipment/Appliances*					
9-1	Watt Sensors on Office Electronics (50W)	5 - Nexant	4 - GDS	4 - GDS	6 - DEER	6 - DEER
9-2	Watt Sensors on Office Electronics (150W)	5 - Nexant	4 - GDS	4 - GDS	6 - DEER	6 - DEER
10	*Compressed Air*					
10-1	Fix Air Leaks (<5HP)	2 - Alliant	4 - GDS	4 - GDS	23 - GA Tech	4 - GDS
10-2	Fix Air Leaks (10-50HP)	2 - Alliant	4 - GDS	4 - GDS	23 - GA Tech	4 - GDS
10-3	Fix Air Leaks (50-100HP)	2 - Alliant	4 - GDS	4 - GDS	23 - GA Tech	4 - GDS
10-4	Engineered Nozzles for blow-off	3 - Energy Star	3 - Energy Star	4 - GDS	1 - Michigan	3 - Energy Star

1 - Michigan Master Measure Savings Database, January 2009

2 - Alliant Energy Calculator for Variable Frequency Drives - http://www alliantenergy com/UtilityServices/ForYourBusiness/EnergyExpertise/EnergySafety/010794

3 - Energy Star

4 - GDS Calculation/Estimation

5 - Nexant, 2005 NYSERDA Deemed Savings Measure Database Prepared for NYSERDA

6 - Database for Energy Efficient Resources - http://www energy ca gov/deer/

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8 - http://www northwestern edu/equipment-inventory/propertycodes html

9 - MPRP Commercial Energy Efficiency and Demand Response Update Spreadsheet, June 2009

10 - http://www construction-today com/cms1/content/view/1931/31/

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20 - NorthWest Council Industrial Conservation Data Catalogue

21 - Demonstration Assessment of Light-Emitting Diode (LED) Freezer Case Lighting - Oct 2009 Report by PG&E

22- Arkansas Deemed Savings Manual Coincidence factor calculation

23 - GA Tech, Energy and Environmental Management Center, PLANT-WIDE ASSESS for Shaw Industries (Plant #78) PREPARED BY: Michael Brown, P E , C E M April 2006

APPENDIX 3-2

TECHNICAL, ECONOMIC, AND ACHIEVABLE POTENTIAL

Total Potential by Measure

Measure Name	Technical Potential	Economic Potential	Achievable Potential
Lighting			
Compact Fluorescent	18,011,221	18,011,221	5,403,366
LED Exit Sign	1,750,371	1,750,371	525,111
Standard T8 (vs T12) 4ft	27,176,243	27,176,243	8,152,873
High Performance T8 (vs T12) 4ft	16,239,722	16,239,722	4,871,917
High Performance T8HO (vs T12) 8ft	13,541,104	13,541,104	4,062,331
Occupancy Sensor (under 500W)	149,077,520	149,077,520	44,723,256
Occupancy Sensor (over 500W)	5,140,604	5,140,604	1,542,181
Pulse Start Metal Halide 100W - 300W	4,000,005	4,000,005	1,200,002
Pulse Start Metal Halide > 300W	9,768,023	9,768,023	2,930,407
High performance T5 (replacing T8)	23,773,676	23,773,676	7,132,103
CFL Hard Wired Fixture	19,435,666	19,435,666	5,830,700
CFL High Wattage 31-115	21,898,050	21,898,050	6,569,415
CFL High Wattage 150-199	18,348,229	18,348,229	5,504,469
Space Cooling (Unitary and Split AC)			
Split AC (10 SEER, 7.7 HSPF to 14.5 SEER, 8.5 HSPF)	1,001,794	1,001,794	300,538
Split AC (10 SEER, 7.7 HSPF to 15 SEER, 8.5 HSPF)	1,001,794	1,001,794	300,538
Split AC (10 SEER, 7.7 HSPF to 16 SEER, 8.5 HSPF)	1,001,794	1,001,794	300,538
Split AC (10 SEER, 7.7 HSPF to 14.5 SEER, 8.5 HSPF)	1,001,794	1,001,794	300,538
Split AC (10 SEER, 7.7 HSPF to 15 SEER, 8.5 HSPF)	1,001,794	1,001,794	300,538
Split AC (10 SEER, 7.7 HSPF to 16 SEER, 8.5 HSPF)	1,001,794	1,001,794	300,538
DX Packaged System (EER=10.9)	11,367,726	11,367,726	3,410,318
DX Packaged System (CEE Tier 2)	5,148,940	5,148,940	1,544,682
DX Packaged System (CEE Tier 2)	13,240,131	13,240,131	3,972,039
Air Cooled Chiller	15,006,359	15,006,359	4,501,908
Air Cooled Chiller	15,006,359	15,006,359	4,501,908
PTAC	3,717,693	3,717,693	1,115,308
PTAC	2,461,854	2,461,854	738,556
PTAC	3,700,198	3,700,198	1,110,059
PTAC	3,365,918	3,365,918	1,009,775
Space Heating			
PTHP	698,039	698,039	209,412
PTHP	942,929	942,929	282,879
PTHP	1,281,485	1,281,485	384,445
PTHP	1,110,047	1,110,047	333,014
Ventilation			
Motors	699,473	699,473	209,842
Motors	2,259,232	2,259,232	677,770
Motors	12,152,652	12,152,652	3,645,796
Motors	10,779,048	10,779,048	3,233,714
Variable Frequency Drives	1,107,201	1,107,201	332,160
Variable Frequency Drives	7,957,877	7,957,877	2,387,363
Variable Frequency Drives	18,227,308	18,227,308	5,468,192
Motors (Non-Ventilation)	**26,810,421**	**26,810,421**	**8,043,126**
Motors	352,617	352,617	105,785
Motors	1,138,920	1,138,920	341,676
Motors	6,126,375	6,126,375	1,837,912
Motors	5,433,916	5,433,916	1,630,175

Measure Name	Technical Potential	Economic Potential	Achievable Potential
Variable Frequency Drives	558,160	558,160	167,448
Variable Frequency Drives	4,011,712	4,011,712	1,203,514
Variable Frequency Drives	9,188,721	9,188,721	2,756,616
Water Heating	**16,805,244**	**16,603,044**	**4,980,913**
High Efficiency Storage (tank)	4,585,779	4,585,779	1,375,734
Pre-Rinse Sprayer, Low flow, Commercial Application	5,482,897	5,482,897	1,644,869
On Demand (tankless)	202,200	0	0
Tank Insulation	6,534,367	6,534,367	1,960,310
Cooking	**1,985,921**	**1,373,989**	**412,197**
Electric Energy Star Fryers	108,974	0	0
Electric Energy Star Steamers,3-6 pan	505,244	505,244	151,573
Energy Star Hot Food Holding Cabinet	868,745	868,745	260,624
Energy Star Convection Ovens	410,749	0	0
Energy Star Griddles	92,209	0	0
Refrigeration	**86,885,716**	**65,143,035**	**19,542,911**
Glass Door Freezer, <15-49 cu ft, Energy Star	1,028,659	1,028,659	308,598
Glass Door Freezer, 50+ cu ft, Energy Star	1,028,659	1,028,659	308,598
Solid Door Freezer, <15-49 cu ft, Energy Star	1,179,352	1,179,352	353,806
Solid Door Freezer, 50+ cu ft, Energy Star	1,179,352	1,179,352	353,806
Glass Door Refrigerator, <15 - 49 cu ft	2,396,124	2,396,124	718,837
Glass Door Refrigerator, 50+ cu ft, Energy Star	2,396,124	2,396,124	718,837
Solid Door Refrigerator, <15 cu ft, Energy Star	3,565,675	3,565,675	1,069,703
Solid Door Refrigerator, 50+ cu ft, Energy Star	3,567,958	3,567,958	1,070,387
Commercial Refrigeration Tune-Up, Medium Temp ,not self cor	1,544,218	0	0
Commercial Refrigeration Tune-Up, Low Temp, not self contair	2,145,150	0	0
Anti-sweat heater controls on freezers	3,329,891	3,329,891	998,967
Anti-sweat heater controls, on refrigerators	10,683,041	10,683,041	3,204,912
Vending Miser, Cold Beverage	3,917,612	3,917,612	1,175,284
Brushless DC Motors for freezers and coolers	6,845,723	6,845,723	2,053,717
Humidity Door Heater Controls for freezers and coolers	8,807,905	8,807,905	2,642,371
Refrigerated Case Covers	837,336	837,336	251,201
Zero Energy Doors for freezers and coolers	1,459,315	0	0
Evaporator Coil Defrost Control	7,573,846	0	0
Evaporator Fan Motor Control for freezers and coolers	6,732,168	0	0
Permanent Split Capacitor Motor	13,975,831	13,975,831	4,192,749
Ice Machine, Energy Star, Self-Contained	403,796	403,796	121,139
LED Case Lighting (5 door case)	2,287,982	0	0
Office Equipment/Appliances	**17,833,669**	**8,840,622**	**2,652,187**
Watt Sensors on Office Electronics	8,993,047	0	0
Watt Sensors on Office Electronics	8,840,622	8,840,622	2,652,187
Compressed Air	**2,426,762**	**1,601,090**	**480,327**
Fix Air Leaks	825,672	0	0
Fix Air Leaks	800,902	800,902	240,270
Fix Air Leaks	454,119	454,119	136,236
Engineered Nozzles for blow-off	346,069	346,069	103,821
	Technical Potential	Economic Potential	Achievable Potential
	617,149,402	***584,773,871***	***175,432,161***

Big Rivers Electric Corporation

2010 Integrated Resource Plan

Appendix B
Demand Side Management
Big Rivers Final Potential Study

Appendix 4
Demand Response Data

Big Rivers
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APPENDIX 4

DEMAND RESPONSE DATA

DEMAND RESPONSE ANALYSIS – SECONDARY RESOURCE LIST

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Big Rivers Electric Corporation

2010 Integrated Resource Plan

Appendix B
Demand Side Management
Big Rivers Final Potential Study

Appendix 5
Supporting Documents for
Recommended Programs

Big Rivers
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APPENDIX 5

SUPPORTING DOCUMENTS FOR
RECOMMENDED PROGRAMS

APPENDIX 5-1

RESIDENTIAL AND COMMERCIAL/INDUSTRIAL
ASSUMPTIONS BY MEASURE

Residential Program Measures and Assumptions

	Annual		Summer			Useful			Summer	Summer
Lighting	kWh	Winter kW	kW	Cost	Incentive	Life	Winter On	Winter Off	On	Off
CFL (vs. Incandescent)	30.66	0.01	0.00	$1.85	$1.85	7	31%	36%	15%	18%
LED (vs. Incandescent)	40.52	0.01	0.00	$30.00	$10.00	20	31%	36%	15%	18%
Residential Efficient Appliances										
Efficient Water Heater (SF)	193.94	0.01	0.00	$50.00	$35.00	13	50%	20%	21%	9%
Heat Pump Water Heater	2,067.90	0.28	0.19	$850.00	$350.00	10	50%	20%	21%	9%
Efficient Water Heater (MH)	200.09	0.01	0.00	$50.00	$35.00	13	50%	20%	21%	9%
Energy Star Compliant Top-Mount Refrigerator	106.00	0.01	0.01	$30.00	$25.00	12	35%	33%	16%	16%
Energy Star Compliant Side-by-Side Refrigerator	133.00	0.01	0.01	$30.00	$25.00	12	35%	33%	16%	16%
Energy Star Clothes Washer (Electric WH)	224.00	0.01	0.03	$258.00	$100.00	11	52%	17%	26%	6%
Energy Star Clothes Washer (Non-Electric WH)	97.00	0.01	0.03	$258.00	$100.00	11	52%	17%	26%	6%
Residential Advanced Technologies										
Heat Pump Water Heater	2,067.90	0.28	0.19	$850.00	$350.00	10	50%	20%	21%	9%
Geothermal Heat Pump Systems	3,658.00	4.45	0.07	$8,300.00	$1,500.00	22	34%	38%	15%	13%
Weatherization										
Ceiling Insualtion (R19-R38)	261.29	0.13	0.07	$882.30	$350.00	20	15%	16%	37%	33%
Ceiling Insualtion (R9-R38)	848.98	0.42	0.29	$1,159.10	$450.00	20	15%	16%	37%	33%
Floor Insualtion (R0-R19)	668.08	0.48	0.15	$1,366.70	$550.00	20	15%	16%	37%	33%
Floor Insualtion (R0-R19) - MH	680.29	0.37	0.00	$821.60	$350.00	20	26%	29%	24%	21%
Air Sealing	343.08	0.21	0.11	$529.00	$200.00	11	15%	16%	37%	33%
Air Sealing - MH	772.05	0.37	0.07	$326.00	$200.00	11	26%	29%	24%	21%
Duct Sealing	1,020.45	0.48	0.29	$500.00	$200.00	18	15%	16%	37%	33%
Duct Sealing - MH	1,586.67	0.79	0.22	$500.00	$200.00	18	26%	29%	24%	21%
Weatherization Care Pkg.	433.16	0.08	0.04	$60.00	$60.00	9	31%	36%	15%	18%
New Construction										
New Construction - 15% more efficient - Gas Heat	1,391.50	0.07	0.58	$2,563.00	$1,400.00	20	25%	24%	27%	25%
New Construction - 15% more efficient - ASHP	3,937.20	2.41	0.88	$2,563.00	$1,400.00	20	32%	34%	17%	16%
New Construction - 30% more efficient - Gas Heat	3,478.75	0.44	0.58	$5,100.00	$2,300.00	20	25%	24%	27%	25%
New Construction - 30% more efficient - ASHP	5,905.80	2.99	0.88	$5,100.00	$2,300.00	20	32%	34%	17%	16%

Commercial Program Measures and Assumptions

	Annual		Summer			Useful			Summer	Summer
Commercial/Industrial Lighting Program	kWh	Winter kW	kW	Cost	Incentive	Life	Winter On	Winter Off	On	Off
Lighting	23,400	5.72	5.35	7,000	2,450	10	28%	5%	42%	25%
Commercial/Industrial HVAC Program										
HVAC	16,400	1.24	6.62	7,800	2,800	15	34%	38%	15%	13%

APPENDIX 5-2

PROGRAM PARTICIPANTS BY MEASURE
(2011 – 2025)

Residential Cumulative Annual Participants

Lighting	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
CFL (vs. Incandescent)	23,000	46,000	69,000	69,000	69,000	69,000	69,000	46,000	23,000	0	0	0	0	0	0
LED (vs. Incandescent)	0	0	0	4,000	8,100	12,300	16,600	21,000	25,500	30,125	34,875	39,725	44,700	49,800	55,025
Residential Efficient Appliances															
Efficient Water Heater (SF)	610	1,280	1,965	2,665	3,385	4,120	4,875	5,650	6,445	7,260	8,095	8,950	9,825	10,110	10,360
Heat Pump Water Heater	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Efficient Water Heater (MH)	90	190	290	395	500	610	725	840	960	1,080	1,205	1,335	1,465	1,510	1,545
Energy Star Compliant Top-Mount Refrigerator	635	1,335	2,050	2,785	3,535	4,305	5,095	5,905	6,735	7,585	8,455	9,350	9,630	9,870	10,115
Energy Star Compliant Side-by-Side Refrigerator	345	720	1,105	1,500	1,905	2,320	2,745	3,180	3,625	4,085	4,555	5,035	5,185	5,315	5,450
Energy Star Clothes Washer (Electric WH)	145	300	460	625	795	970	1,145	1,325	1,510	1,700	1,895	1,950	2,000	2,050	2,100
Energy Star Clothes Washer (Non-Electric WH)	65	140	215	290	370	450	535	620	710	800	890	920	940	965	990
Residential Advanced Technologies															
Heat Pump Water Heater	125	260	400	545	695	845	1,000	1,160	1,325	1,490	1,535	1,575	1,615	1,655	1,695
Geothermal Heat Pump Systems	30	60	95	130	165	200	235	270	310	350	390	430	470	515	560
Weatherization															
Ceiling Insualtion (R19-R38)	55	115	180	245	310	380	450	520	595	670	745	825	905	990	1,075
Ceiling Insualtion (R9-R38)	45	95	145	195	245	300	355	410	465	525	585	645	710	775	840
Floor Insualtion (R0-R19)	70	150	230	315	400	485	575	665	760	855	955	1,055	1,160	1,265	1,375
Floor Insualtion (R0-R19) - MH	15	35	55	75	95	115	135	155	175	200	225	250	275	300	325
Air Sealing	195	410	630	855	1,090	1,330	1,575	1,825	2,080	2,345	2,615	2,695	2,765	2,835	2,910
Air Sealing - MH	45	95	145	195	245	300	355	410	470	530	590	605	620	635	650
Duct Sealing	195	410	630	855	1,090	1,330	1,575	1,825	2,080	2,345	2,615	2,890	3,175	3,465	3,765
Duct Sealing - MH	45	95	145	195	245	300	355	410	470	530	590	650	715	780	845
Weatherization Care Pkg.	745	1,570	2,415	3,285	4,175	5,090	6,030	6,990	7,975	8,240	8,450	8,670	8,890	9,115	9,345
New Construction															
New Construction - 15% more efficient - Gas Heat	15	31	48	65	82	100	118	137	156	176	196	217	238	260	282
New Construction - 15% more efficient - ASHP	17	36	55	75	95	116	137	159	181	204	228	252	277	302	328
New Construction - 30% more efficient - Gas Heat	3	6	9	12	16	20	24	28	32	36	40	44	48	52	57
New Construction - 30% more efficient - ASHP	4	8	12	16	20	24	28	32	37	42	47	52	57	62	67

Commercial and Industrial Cumulative Annual Participants

Commercial/Industrial Lighting Program	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Lighting	30	64	100	140	180	222	264	308	354	400	416	432	446	458	470
Commercial/Industrial HVAC Program															
HVAC	26	56	86	120	156	192	230	268	308	348	390	432	476	520	566

APPENDIX 5-3

PROGRAM BUDGET BREAKDOWNS (ADMINISTRATIVE, INCENTIVES, PARTICIPANT COSTS)
(2011 – 2025)

1. Total Program Budget Breakdown

Recommended Program Budgets	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Residential	$670,000	$686,500	$703,500	$721,000	$739,000	$757,500	$776,500	$796,000	$816,000	$836,500	$857,500	$879,000	$901,000	$923,500	$946,500
Commercial/Industrial	$330,000	$338,000	$346,500	$355,000	$364,000	$373,000	$382,500	$392,000	$402,000	$412,000	$422,500	$433,000	$444,000	$455,000	$466,500
Total	*$1,000,000*	*$1,025,000*	*$1,050,500*	*$1,077,000*	*$1,104,000*	*$1,131,500*	*$1,160,000*	*$1,189,000*	*$1,218,500*	*$1,249,000*	*$1,280,000*	*$1,312,000*	*$1,345,000*	*$1,378,500*	*$1,413,000*

2. Residential Program Total Budget Breakdown

Recommended Residential Programs	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Residential Lighting Program	$50,000	$50,000	$50,000	$50,000	$51,250	$52,500	$53,750	$55,000	$56,250	$57,750	$59,250	$60,750	$62,250	$63,750	$65,250
Residential Efficient Appliances	$100,000	$102,500	$105,000	$107,500	$110,250	$113,000	$115,750	$118,750	$121,750	$124,750	$127,750	$131,000	$134,250	$137,500	$141,000
Residential Advanced Technologies	$125,000	$128,000	$131,250	$134,500	$137,750	$141,250	$144,750	$148,250	$152,000	$155,750	$159,750	$163,750	$167,750	$172,000	$176,250
Residential Weatherization	*$320,000*	*$329,000*	$338,250	$348,000	$356,750	$365,750	$375,250	$384,750	$394,500	$404,500	$414,750	$425,000	$435,750	$446,750	$458,000
Residential New Construction	$75,000	$77,000	$79,000	$81,000	$83,000	$85,000	$87,000	$89,250	$91,500	$93,750	$96,000	$98,500	$101,000	$103,500	*$106,000*
	$670,000	$686,500	$703,500	$721,000	$739,000	$757,500	$776,500	$796,000	$816,000	$836,500	$857,500	$879,000	$901,000	$923,500	$946,500

3. Residential Program Incentive and Administration Breakdown

Incentives	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Residential Lighting Program	$42,500	$42,500	$42,500	$40,000	$41,000	$42,000	$43,000	$44,000	$45,000	$46,200	$47,400	$48,600	$49,800	$51,000	$52,200
Residential Efficient Appliances	$70,000	$76,875	$78,750	$80,625	$82,688	$84,750	$86,813	$89,063	$91,313	$93,563	$95,813	$98,250	$100,688	$103,125	$105,750
Residential Advanced Technologies	$87,500	$96,000	$98,438	$100,875	$103,313	$105,938	*$108,563*	*$111,188*	*$114,000*	$116,813	$119,813	$122,813	$125,813	$129,000	$132,188
Residential Weatherization	$224,000	$246,750	$253,688	$261,000	$267,563	$274,313	$281,438	$288,563	$295,875	$303,375	$311,063	$318,750	$326,813	$335,063	$343,500
Residential New Construction	$60,000	$65,450	$67,150	$68,850	$70,550	$72,250	$73,950	$75,863	$77,775	$79,688	$81,600	$83,725	$85,850	$87,975	$90,100
Administration	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Residential Lighting Program	$7,500	$7,500	$7,500	$10,000	$10,250	$10,500	$10,750	$11,000	$11,250	$11,550	$11,850	$12,150	*$12,450*	*$12,750*	$13,050
Residential Efficient Appliances	$30,000	$25,625	$26,250	$26,875	$27,563	$28,250	$28,938	$29,688	$30,438	$31,188	$31,938	$32,750	$33,563	$34,375	$35,250
Residential Advanced Technologies	$37,500	$32,000	$32,813	$33,625	$34,438	$35,313	$36,188	$37,063	$38,000	$38,938	$39,938	$40,938	$41,938	$43,000	$44,063
Residential Weatherization	$96,000	$82,250	$84,563	$87,000	*$89,188*	*$91,438*	$93,813	$96,188	$98,625	$101,125	$103,688	$106,250	$108,938	$111,688	$114,500
Residential New Construction	$15,000	$11,550	$11,850	$12,150	$12,450	$12,750	$13,050	$13,388	$13,725	$14,063	$14,400	$14,775	$15,150	$15,525	$15,900

4. Residential Program Budget Breakdown

Lighting	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Incentives	$42,550	$42,550	$42,550	$40,000	$41,000	$42,000	$43,000	$44,000	$45,000	$46,250	$47,500	$48,500	$49,750	$51,000	$52,250
Administration	$7,500	$7,500	$7,500	$10,000	$10,250	$10,500	$10,750	$11,000	$11,250	$11,550	$11,850	$12,100	$12,450	$12,750	$13,050
Participant Costs	*$0*	*$0*	*$0*	$80,000	$82,000	$84,000	$86,000	$88,000	$90,000	$92,500	$95,000	$97,000	$99,500	$102,000	$104,500
Residential Efficient Appliances															
Incentives	$70,000	$76,825	$78,475	$80,425	$82,750	$84,700	$86,825	$88,775	$91,400	$93,475	$95,600	$98,350	$100,425	$103,175	$105,425
Administration	$30,000	$25,600	$26,150	$26,800	$27,600	$28,250	$28,950	$29,600	$30,450	$31,150	$31,850	$32,800	$33,500	$34,400	$35,150
Participant Costs	$48,580	$53,265	$54,405	$55,645	$57,650	$58,890	*$60,205*	*$61,445*	*$63,550*	$64,815	$66,130	$68,260	$69,525	$71,655	$72,995
Residential Advanced Technologies															
Incentives	$88,750	$92,250	$101,500	$103,250	$105,000	$105,000	$106,750	$108,500	$117,750	$117,750	$119,500	$121,250	$123,000	$132,250	$134,000
Administration	*$38,050*	$30,750	$33,850	$34,400	$35,000	$35,000	$35,600	$36,150	$39,250	$39,250	$39,850	$40,400	$41,000	$44,100	$44,650
Participant Costs	$266,500	$271,500	$308,000	$310,500	$313,000	$313,000	$315,500	$318,000	$354,500	$354,500	$357,000	$359,500	$362,000	*$398,500*	*$401,000*
Weatherization															
Incentives	$223,950	$250,000	$254,950	$261,200	$266,400	$275,900	$282,150	$285,350	$295,350	$304,850	$311,100	$316,650	$329,150	$334,400	$342,950
Administration	*$96,000*	*$83,350*	*$85,000*	*$87,050*	*$88,800*	$91,950	$94,050	$95,100	$98,450	$101,600	$103,700	$105,550	$109,700	$111,450	$114,300
Participant Costs	$267,254	$298,696	$304,503	$311,731	$318,021	$329,503	$336,732	$339,877	$351,897	$364,090	$371,319	$377,125	$393,174	$398,981	$409,354
New Construction															
Incentives	$60,900	$65,100	$66,500	$67,900	$70,200	$73,000	$73,000	$75,800	$78,100	$80,900	$82,300	$83,700	$85,100	$86,500	$90,200
Administration	$15,200	$11,500	$11,750	$12,000	$12,400	$12,900	$12,900	$13,400	$13,800	*$14,300*	*$14,500*	$14,750	$15,000	$15,250	$15,900
Participant Costs	$56,816	$60,305	$61,468	$62,631	$65,431	$67,757	$67,757	$70,083	$72,883	$75,209	$76,372	$77,535	$78,698	$79,861	$83,824

1. Total Program Budget Breakdown

Recommended Program Budgets	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Residential	$670,000	$686,500	$703,500	$721,000	$739,000	$757,500	$776,500	$796,000	$816,000	$836,500	$857,500	$879,000	$901,000	$923,500	$946,500
Commercial/Industrial	$330,000	$338,000	$346,500	$355,000	$364,000	$373,000	$382,500	$392,000	$402,000	$412,000	$422,500	$433,000	$444,000	$455,000	$466,500
Total	*$1,000,000*	*$1,025,000*	*$1,050,500*	*$1,077,000*	*$1,104,000*	*$1,131,500*	*$1,160,000*	*$1,189,000*	*$1,218,500*	*$1,249,000*	*$1,280,000*	*$1,312,000*	*$1,345,000*	*$1,378,500*	*$1,413,000*

2. Commercial/Industrial Program Budget Breakdown

Recommended Commercial/Industrial Programs	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Commercial/Industrial Lighting Program	$165,000	$169,000	$173,250	$177,500	$182,000	$186,500	$191,250	$196,000	$201,000	$206,000	$211,250	$216,500	$222,000	$227,500	$233,250
Commercial/Industrial HVAC Program	$165,000	$169,000	$173,250	$177,500	$182,000	$186,500	$191,250	$196,000	$201,000	$206,000	$211,250	$216,500	$222,000	$227,500	$233,250
	$330,000	$338,000	$346,500	$355,000	$364,000	$373,000	$382,500	$392,000	$402,000	$412,000	$422,500	$433,000	$444,000	$455,000	$466,500

3. Commercial Program Incentive and Administrative Breakdown

Incentives	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Commercial/Industrial Lighting Program	$74,250	$84,500	$86,625	$97,625	$100,100	$102,575	$105,188	$107,800	$110,550	$113,300	$116,188	$119,075	$122,100	$125,125	$128,288
Commercial/Industrial HVAC Program	$74,250	$84,500	$86,625	$97,625	$100,100	$102,575	$105,188	$107,800	$110,550	$113,300	$116,188	$119,075	$122,100	$125,125	$128,288
Administration	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Commercial/Industrial Lighting Program	$90,750	$84,500	$86,625	$79,875	$81,900	$83,925	$86,063	$88,200	$90,450	$92,700	$95,063	$97,425	$99,900	$102,375	$104,963
Commercial/Industrial HVAC Program	$90,750	$84,500	$86,625	$79,875	$81,900	$83,925	$86,063	$88,200	$90,450	$92,700	$95,063	$97,425	$99,900	$102,375	$104,963

4. C&I Program Budget Breakdown (Incremental Annual)

Commercial/Industrial Lighting Program	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Incentives	$73,500	$83,300	$88,200	$98,000	$98,000	$102,900	$102,900	$107,800	$112,700	$112,700	$117,600	$117,600	$122,500	$127,400	$127,400
Administration	$89,850	$83,300	$88,200	$80,200	$80,200	$84,200	$84,200	$88,200	$92,200	$92,200	$96,200	$96,200	$100,250	$104,250	$104,250
Participant Costs	$136,500	$154,700	$163,800	$182,000	$182,000	$191,100	$191,100	$200,200	$209,300	$209,300	$218,400	$218,400	$227,500	$236,600	$236,600
Commercial/Industrial HVAC Program															
Incentives	$72,800	$84,000	$84,000	$95,200	$100,800	$100,800	$106,400	$106,400	$112,000	$112,000	$117,600	$117,600	$123,200	$123,200	$128,800
Administration	$89,000	$84,000	$84,000	$77,900	$82,450	$82,450	$87,050	$87,050	$91,650	$91,650	$96,200	$96,200	$100,800	$100,800	$105,400
Participant Costs	$130,000	$150,000	$150,000	$170,000	$180,000	$180,000	$190,000	$190,000	$200,000	$200,000	$210,000	$210,000	$220,000	$220,000	$230,000

APPENDIX 5-3

ENERGY AND DEMAND SAVINGS PER PROGRAM
(2011 – 2025)

Residential Program Annual kWh Breakdown (Cumulative Annual)

Lighting	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter On Peak	215,926	431,852	647,778	697,401	748,264	800,368	853,713	692,372	532,271	373,722	432,649	492,816	554,534	617,804	682,623
Winter Off Peak	253,512	507,024	760,537	818,797	878,514	939,688	1,002,318	812,892	624,923	438,775	507,959	578,600	651,062	725,344	801,447
Summer On Peak	108,457	216,913	325,370	350,295	375,843	402,014	428,808	347,769	267,352	187,715	217,313	247,535	278,535	310,314	342,872
Summer Off Peak	127,285	254,570	381,855	411,107	441,090	471,804	503,250	408,142	313,765	220,303	255,039	290,507	326,889	364,185	402,395
Total Annual kWh	705,180	1,410,360	2,115,540	2,277,600	2,443,712	2,613,875	2,788,089	2,261,175	1,738,313	1,220,514	1,412,961	1,609,458	1,811,021	2,017,647	2,229,338
Residential Efficient Appliances															
Winter On Peak	128,242	268,813	412,447	559,834	711,024	865,968	1,024,825	1,187,420	1,354,508	1,525,564	1,700,863	1,860,807	1,983,647	2,038,003	2,088,339
Winter Off Peak	70,909	148,655	228,128	309,704	393,282	478,962	566,830	656,795	749,136	843,792	940,743	1,033,783	1,091,227	1,120,372	1,148,165
Summer On Peak	56,952	119,357	183,135	248,581	315,728	384,543	455,067	527,252	601,433	677,386	755,210	825,148	877,469	901,379	923,654
Summer Off Peak	32,185	67,480	103,559	140,593	178,526	217,414	257,306	298,151	340,065	383,038	427,051	469,895	495,765	508,985	521,617
Total Annual kWh	288,288	604,304	927,268	1,258,712	1,598,560	1,946,887	2,304,028	2,669,618	3,045,142	3,429,780	3,823,867	4,189,633	4,448,108	4,568,739	4,681,776
Residential Advanced Technologies															
Winter On Peak	167,577	345,591	535,010	729,648	929,503	1,129,359	1,334,433	1,544,725	1,766,422	1,988,119	2,084,576	2,175,814	2,267,052	2,364,477	2,461,902
Winter Off Peak	93,516	191,139	297,846	406,605	517,419	628,232	741,099	856,019	980,023	1,104,026	1,178,748	1,251,416	1,324,084	1,403,782	1,483,480
Summer On Peak	70,385	145,082	224,683	306,439	390,352	474,264	560,333	648,557	741,685	834,813	876,203	915,436	954,670	996,652	1,038,634
Summer Off Peak	36,749	75,322	117,132	159,854	203,488	247,121	291,667	337,125	385,820	434,514	461,322	487,218	513,114	541,336	569,557
Total Annual kWh	368,228	757,134	1,174,670	1,602,546	2,040,761	2,478,977	2,927,531	3,386,425	3,873,949	4,361,473	4,600,848	4,829,884	5,058,920	5,306,246	5,553,573
Weatherization															
Winter On Peak	182,936	386,254	593,430	805,428	1,022,100	1,246,960	1,476,641	1,709,987	1,951,386	2,100,816	2,244,458	2,371,762	2,503,238	2,636,329	2,772,345
Winter Off Peak	208,218	439,628	675,448	916,785	1,163,412	1,419,343	1,680,789	1,946,438	2,221,246	2,387,780	2,547,371	2,689,016	2,835,264	2,983,314	3,134,580
Summer On Peak	211,051	445,517	684,285	928,432	1,178,896	1,438,376	1,703,234	1,971,918	2,249,286	2,486,040	2,722,844	2,930,495	3,145,298	3,362,778	3,586,169
Summer Off Peak	202,075	426,512	655,165	889,089	1,129,028	1,377,453	1,631,149	1,888,634	2,154,309	2,370,247	2,585,201	2,774,404	2,969,972	3,168,023	3,371,446
Total Annual kWh	804,280	1,697,911	2,608,328	3,539,733	4,493,437	5,482,132	6,491,814	7,516,977	8,576,227	9,344,883	10,099,874	10,765,677	11,453,773	12,150,444	12,864,540
New Construction															
Winter On Peak	37,078	77,050	117,367	158,959	201,412	245,485	289,557	335,250	382,855	432,079	482,578	533,422	585,541	638,005	692,605
Winter Off Peak	38,578	80,196	122,142	165,444	209,568	255,376	301,184	348,676	398,203	449,413	501,980	554,875	609,126	663,706	720,463
Summer On Peak	24,149	50,041	76,306	103,256	131,139	160,080	189,021	219,021	250,047	282,131	314,901	348,043	381,870	416,071	451,890
Summer Off Peak	22,060	45,708	69,702	94,317	119,794	146,239	172,683	200,094	228,438	257,748	287,679	317,956	348,854	380,097	412,824
Total Annual kWh	121,864	252,995	385,516	521,975	661,913	807,179	952,446	1,103,041	1,259,542	1,421,371	1,587,138	1,754,297	1,925,392	2,097,879	2,277,782
	1,529,810	**1,549,351**	**1,566,383**	**1,585,820**	**1,608,140**	**1,629,692**	**1,657,057**	**1,683,558**	**1,710,391**	**1,732,071**	**1,759,572**	**1,784,980**	**1,809,956**	**1,837,134**	**1,864,311**

Residential Program Annual kW Breakdown (Cumulative Annual)

Lighting	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter Peak kW	164	328	493	530	569	609	649	527	405	284	329	375	422	470	519
Summer Peak kW	72	144	216	233	250	267	285	231	178	125	145	165	185	206	228
Residential Efficient Appliances															
Winter Peak kW	13	26	41	55	70	85	101	117	133	150	167	184	194	199	204
Summer Peak kW	16	33	51	70	88	108	128	148	169	190	212	229	238	245	251
Residential Advanced Technologies															
Winter Peak kW	169	340	535	732	930	1,128	1,327	1,528	1,752	1,977	2,168	2,357	2,546	2,758	2,970
Summer Peak kW	26	53	82	112	142	173	204	237	271	304	316	326	337	347	358
Weatherization															
Winter Peak kW	312	659	1,011	1,372	1,741	2,124	2,515	2,910	3,321	3,684	4,049	4,361	4,685	5,011	5,347
Summer Peak kW	148	312	480	651	827	1,009	1,195	1,384	1,578	1,749	1,920	2,070	2,224	2,381	2,542
New Construction															
Winter Peak kW	55	116	176	239	302	367	433	501	572	646	722	798	876	955	1,036
Summer Peak kW	29	60	92	125	158	193	227	264	301	339	379	419	460	501	544

C&I Program Annual kWh Breakdown (Cumulative Annual)

Commercial/Industrial Lighting Program	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter On Peak	194,454	414,835	648,180	907,452	1,166,724	1,438,960	1,711,195	1,996,394	2,294,557	2,592,720	2,709,392	2,800,138	2,890,883	2,968,664	3,046,446
Winter Off Peak	37,908	80,870	126,360	176,904	227,448	280,519	333,590	389,189	447,314	505,440	528,185	545,875	563,566	578,729	593,892
Summer On Peak	295,542	630,490	985,140	1,379,196	1,773,252	2,187,011	2,600,770	3,034,231	3,487,396	3,940,560	4,117,885	4,255,805	4,393,724	4,511,941	4,630,158
Summer Off Peak	174,096	371,405	580,320	812,448	1,044,576	1,288,310	1,532,045	1,787,386	2,054,333	2,321,280	2,425,738	2,506,982	2,588,227	2,657,866	2,727,504
Total Annual kWh	702,000	1,497,600	2,340,000	3,276,000	4,212,000	5,194,800	6,177,600	7,207,200	8,283,600	9,360,000	9,781,200	10,108,800	10,436,400	10,717,200	10,998,000
Commercial/Industrial HVAC Program															
Winter On Peak	144,226	310,641	477,056	665,660	865,358	1,065,056	1,275,848	1,486,641	1,708,527	1,930,414	2,163,395	2,396,376	2,640,451	2,884,527	3,139,696
Winter Off Peak	163,894	353,003	542,112	756,435	983,365	1,210,296	1,449,833	1,689,371	1,941,516	2,193,661	2,458,413	2,723,165	3,000,525	3,277,884	3,567,851
Summer On Peak	64,074	138,007	211,939	295,728	384,447	473,165	566,813	660,460	759,036	857,612	961,117	1,064,622	1,173,056	1,281,490	1,394,852
Summer Off Peak	54,205	116,749	179,293	250,177	325,230	400,283	479,506	558,728	642,121	725,513	813,075	900,637	992,368	1,084,100	1,180,001
Total Annual kWh	426,400	918,400	1,410,400	1,968,000	2,558,400	3,148,800	3,772,000	4,395,200	5,051,200	5,707,200	6,396,000	7,084,800	7,806,400	8,528,000	9,282,400
	743,153	755,211	766,768	780,131	794,941	810,225	825,595	841,103	856,804	872,627	888,554	904,551	920,575	934,398	948,221

C&I Program Annual kW Breakdown (Cumulative Annual)

Commercial/Industrial Lighting Program	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter Peak kW	172	366	572	801	1,030	1,270	1,511	1,762	2,025	2,289	2,392	2,472	2,552	2,621	2,689
Summer Peak kW	160	342	535	748	962	1,187	1,411	1,646	1,892	2,138	2,234	2,309	2,384	2,448	2,512
Commercial/Industrial HVAC Program															
Winter Peak kW	32	70	107	149	194	238	286	333	383	432	484	537	591	646	703
Summer Peak kW	172	371	570	795	1,033	1,272	1,524	1,775	2,040	2,305	2,583	2,862	3,153	3,444	3,749

Big Rivers Electric Corporation

2010 Integrated Resource Plan

Appendix C
Detailed DSM Tables

Big Rivers
ELECTRIC CORPORATION

Your Touchstone Energy® Cooperative

Residential Program Seasonal kWh Breakdown (Cumulative Annual)

Lighting	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter	469,438	938,877	1,408,315	1,516,198	1,626,779	1,740,056	1,856,031	1,505,264	1,157,195	812,496	940,608	1,071,416	1,205,596	1,343,148	1,484,070
Summer	235,742	471,483	707,225	761,402	816,933	873,818	932,058	755,911	581,118	408,018	472,353	538,042	605,424	674,499	745,268
Efficient Appliances															
Winter	199,151	417,467	640,575	869,538	1,104,306	1,344,929	1,591,656	1,844,216	2,103,644	2,369,357	2,641,607	2,894,590	3,074,874	3,158,375	3,236,505
Summer	89,137	186,837	286,693	389,174	494,254	601,958	712,373	825,403	941,499	1,060,424	1,182,261	1,295,043	1,373,234	1,410,364	1,445,271
Advanced Technologies															
Winter	261,093	536,731	832,856	1,136,253	1,446,922	1,757,591	2,075,531	2,400,744	2,746,445	3,092,145	3,263,323	3,427,230	3,591,136	3,768,259	3,945,382
Summer	107,134	220,404	341,815	466,293	593,839	721,386	852,000	985,682	1,127,505	1,269,327	1,337,525	1,402,655	1,467,784	1,537,987	1,608,191
Weatherization															
Winter	391,154	825,882	1,268,878	1,722,212	2,185,512	2,666,303	3,157,431	3,656,425	4,172,631	4,488,596	4,791,829	5,060,778	5,338,503	5,619,643	5,906,925
Summer	413,126	872,029	1,339,450	1,817,521	2,307,924	2,815,829	3,334,383	3,860,552	4,403,595	4,856,287	5,308,045	5,704,900	6,115,271	6,530,801	6,957,615
New Construction															
Winter	75,655	157,246	239,509	324,403	410,980	500,860	590,741	683,926	781,057	881,492	984,558	1,088,298	1,194,668	1,301,711	1,413,068
Summer	46,209	95,749	146,008	197,572	250,933	306,319	361,705	419,115	478,485	539,879	602,580	665,999	730,724	796,168	864,714

Commercial Program Seasonal kWh Breakdown (Cumulative Annual)

Lighting	2011	2012	2013		2015					2020					2025
Winter	232,362	495,706	774,540	1,084,356	1,394,172	1,719,479	2,044,786	2,385,583	2,741,872	3,098,160	3,237,577	3,346,013	3,454,448	3,547,393	3,640,338
Summer	469,638	1,001,894	1,565,460	2,191,644	2,817,828	3,475,321	4,132,814	4,821,617	5,541,728	6,261,840	6,543,623	6,762,787	6,981,952	7,169,807	7,357,662
HVAC															
Winter	308,121	663,644	1,019,168	1,422,095	1,848,723	2,275,352	2,725,682	3,176,012	3,650,043	4,124,075	4,621,808	5,119,541	5,640,976	6,162,411	6,707,547
Summer	118,279	254,756	391,232	545,905	709,677	873,448	1,046,318	1,219,188	1,401,157	1,583,125	1,774,192	1,965,259	2,165,424	2,365,589	2,574,853

Combined Program Seasonal kWh Breakdown (Cumulative Annual)

Residential	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter	1,396,493	2,876,202	4,390,133	5,568,604	6,774,499	8,009,739	9,271,390	10,090,574	10,960,971	11,644,086	12,621,925	13,542,312	14,404,777	15,191,135	15,985,949
Summer	891,348	1,846,502	2,821,191	3,631,963	4,463,884	5,319,310	6,192,519	6,846,662	7,532,201	8,133,936	8,902,763	9,606,638	10,292,437	10,949,820	11,621,059
Total Annual kWh	2,287,840	4,722,703	7,211,324	9,200,567	11,238,382	13,329,049	15,463,908	16,937,236	18,493,172	19,778,022	21,524,688	23,148,950	24,697,214	26,140,955	27,607,008
Commercial															
Winter	540,483	1,159,350	1,793,708	2,506,451	3,242,895	3,994,830	4,770,467	5,561,595	6,391,915	7,222,235	7,859,385	8,465,554	9,095,424	9,709,804	10,347,885
Summer	587,917	1,256,650	1,956,692	2,737,549	3,527,505	4,348,770	5,179,133	6,040,805	6,942,885	7,844,965	8,317,815	8,728,046	9,147,376	9,535,396	9,932,515
Total Annual kWh	1,128,400	2,416,000	3,750,400	5,244,000	6,770,400	8,343,600	9,949,600	11,602,400	13,334,800	15,067,200	16,177,200	17,193,600	18,242,800	19,245,200	20,280,400
Residential & Commercial															
Winter	1,936,975	4,035,552	6,183,841	8,075,055	10,017,394	12,004,570	14,041,857	15,652,169	17,352,886	18,866,321	20,481,310	22,007,866	23,500,202	24,900,939	26,333,834
Summer	1,479,265	3,103,152	4,777,883	6,369,512	7,991,389	9,668,079	11,371,651	12,887,467	14,475,086	15,978,901	17,220,578	18,334,684	19,439,813	20,485,216	21,553,574
Total Annual kWh	3,416,240	7,138,703	10,961,724	14,444,567	18,008,782	21,672,649	25,413,508	28,539,636	31,827,972	34,845,222	37,701,888	40,342,550	42,940,014	45,386,155	47,887,408

Residential Program Seasonal Peak KW Breakdown (Cumulative Annual)

Lighting	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter Peak kW	164	328	493	530	569	609	649	527	405	284	329	375	422	470	519
Summer Peak kW	72	144	216	233	250	267	285	231	178	125	145	165	185	206	228
Efficient Appliances															
Winter Peak kW	13	26	41	55	70	85	101	117	133	150	167	184	194	199	204
Summer Peak kW	16	33	51	70	88	108	128	148	169	190	212	229	238	245	251
Advanced Technologies															
Winter Peak kW	169	340	535	732	930	1,128	1,327	1,528	1,752	1,977	2,168	2,357	2,546	2,758	2,970
Summer Peak kW	26	53	82	112	142	173	204	237	271	304	316	326	337	347	358
Weatherization															
Winter Peak kW	312	659	1,011	1,372	1,741	2,124	2,515	2,910	3,321	3,684	4,049	4,361	4,685	5,011	5,347
Summer Peak kW	148	312	480	651	827	1,009	1,195	1,384	1,578	1,749	1,920	2,070	2,224	2,381	2,542
New Construction															
Winter Peak kW	55	116	176	239	302	367	433	501	572	646	722	798	876	955	1,036
Summer Peak kW	29	60	92	125	158	193	227	264	301	339	379	419	460	501	544

Commercial Program Seasonal Peak KW Breakdown (Cumulative Annual)

Lighting	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter Peak kW	172	366	572	801	1,030	1,270	1,511	1,762	2,025	2,289	2,392	2,472	2,552	2,621	2,689
Summer Peak kW	160	342	535	748	962	1,187	1,411	1,646	1,892	2,138	2,234	2,309	2,384	2,448	2,512
HVAC															
Winter Peak kW	32	70	107	149	194	238	286	333	383	432	484	537	591	646	703
Summer Peak kW	172	371	570	795	1,033	1,272	1,524	1,775	2,040	2,305	2,583	2,862	3,153	3,444	3,749

Combined Program Seasonal Peak KW Breakdown (Cumulative Annual)

Residential	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Winter	712	1,469	2,256	2,928	3,611	4,313	5,025	5,583	6,183	6,741	7,435	8,074	8,723	9,393	10,076
Summer	291	603	921	1,190	1,465	1,750	2,039	2,263	2,496	2,707	2,971	3,208	3,444	3,681	3,923
Commercial															
Winter	204	436	679	950	1,224	1,509	1,796	2,095	2,408	2,721	2,876	3,008	3,143	3,266	3,392
Summer	333	713	1,104	1,543	1,996	2,459	2,935	3,422	3,933	4,443	4,818	5,171	5,537	5,893	6,262
Residential & Commercial															
Winter	916	1,905	2,935	3,878	4,835	5,821	6,821	7,678	8,591	9,462	10,311	11,083	11,866	12,660	13,468
Summer	623	1,316	2,025	2,733	3,461	4,208	4,974	5,685	6,428	7,151	7,789	8,379	8,981	9,573	10,185

All Combined Program Costs

All Residential Programs Combined	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Incentives	$486,150	$526,725	$543,975	$552,775	$565,350	$580,600	$591,725	$602,425	$627,600	$643,225	$656,000	$668,450	$687,425	$707,325	$724,825
Administration	$186,750	$158,700	$164,250	$170,250	$174,050	$178,600	$182,250	$185,250	$193,200	$197,850	$201,750	$205,600	$211,650	$217,950	$223,050
Total Big Rivers Cost	$672,900	$685,425	$708,225	$723,025	$739,400	$759,200	$773,975	$787,675	$820,800	$841,075	$857,750	$874,050	$899,075	$925,275	$947,875
All C&I Programs Combined															
Incentives	$146,300	$167,300	$172,200	$193,200	$198,800	$203,700	$209,300	$214,200	$224,700	$224,700	$235,200	$235,200	$245,700	$250,600	$256,200
Administration	$178,850	$167,300	$172,200	$158,100	$162,650	$166,650	$171,250	$175,250	$183,850	$183,850	$192,400	$192,400	$201,050	$205,050	$209,650
Total Big Rivers Cost	$325,150	$334,600	$344,400	$351,300	$361,450	$370,350	$380,550	$389,450	$408,550	$408,550	$427,600	$427,600	$446,750	$455,650	$465,850
All Programs Combined															
Incentives	$632,450	$694,025	$716,175	$745,975	$764,150	$784,300	$801,025	$816,625	$852,300	$867,925	$891,200	$903,650	$933,125	$957,925	$981,025
Administration	$365,600	$326,000	$336,450	$328,350	$336,700	$345,250	$353,500	$360,500	$377,050	$381,700	$394,150	$398,000	$412,700	$423,000	$432,700
Total Big Rivers Cost	$998,050	$1,020,025	$1,052,625	$1,074,325	$1,100,850	$1,129,550	$1,154,525	$1,177,125	$1,229,350	$1,249,625	$1,285,350	$1,301,650	$1,345,825	$1,380,925	$1,413,725

Residential Program Costs

Lighting	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Incentives	$42,550	$42,550	$42,550	$40,000	$41,000	$42,000	$43,000	$44,000	$45,000	$46,250	$47,500	$48,500	$49,750	$51,000	$52,250
Administration	$7,500	$7,500	$7,500	$10,000	$10,250	$10,500	$10,750	$11,000	$11,250	$11,550	$11,850	$12,100	$12,450	$12,750	$13,050
Total Big Rivers Cost	$50,050	$50,050	$50,050	$50,000	$51,250	$52,500	$53,750	$55,000	$56,250	$57,800	$59,350	$60,600	$62,200	$63,750	$65,300
Residential Efficient Appliances															
Incentives	$70,000	$76,825	$78,475	$80,425	$82,750	$84,700	$86,825	$88,775	$91,400	$93,475	$95,600	$98,350	$100,425	$103,175	$105,425
Administration	$30,000	$25,600	$26,150	$26,800	$27,600	$28,250	$28,950	$29,600	$30,450	$31,150	$31,850	$32,800	$33,500	$34,400	$35,150
Total Big Rivers Cost	$100,000	$102,425	$104,625	$107,225	$110,350	$112,950	$115,775	$118,375	$121,850	$124,625	$127,450	$131,150	$133,925	$137,575	$140,575
Residential Advanced Technologies															
Incentives	$88,750	$92,250	$101,500	$103,250	$105,000	$105,000	$106,750	$108,500	$117,750	$117,750	$119,500	$121,250	$123,000	$132,250	$134,000
Administration	$38,050	$30,750	$33,850	$34,400	$35,000	$35,000	$35,600	$36,150	$39,250	$39,250	$39,850	$40,400	$41,000	$44,100	$44,650
Total Big Rivers Cost	$126,800	$123,000	$135,350	$137,650	$140,000	$140,000	$142,350	$144,650	$157,000	$157,000	$159,350	$161,650	$164,000	$176,350	$178,650
Weatherization															
Incentives	$223,950	$250,000	$254,950	$261,200	$266,400	$275,900	$282,150	$285,350	$295,350	$304,850	$311,100	$316,650	$329,150	$334,400	$342,950
Administration	$96,000	$83,350	$85,000	$87,050	$88,800	$91,950	$94,050	$95,100	$98,450	$101,600	$103,700	$105,550	$109,700	$111,450	$114,300
Total Big Rivers Cost	$319,950	$333,350	$339,950	$348,250	$355,200	$367,850	$376,200	$380,450	$393,800	$406,450	$414,800	$422,200	$438,850	$445,850	$457,250
New Construction															
Incentives	$60,900	$65,100	$66,500	$67,900	$70,200	$73,000	$73,000	$75,800	$78,100	$80,900	$82,300	$83,700	$85,100	$86,500	$90,200
Administration	$15,200	$11,500	$11,750	$12,000	$12,400	$12,900	$12,900	$13,400	$13,800	$14,300	$14,500	$14,750	$15,000	$15,250	$15,900
Total Big Rivers Cost	$76,100	$76,600	$78,250	$79,900	$82,600	$85,900	$85,900	$89,200	$91,900	$95,200	$96,800	$98,450	$100,100	$101,750	$106,100

C&I Program Costs

Commercial/Industrial Lighting Program	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Incentives	$73,500	$83,300	$88,200	$98,000	$98,000	$102,900	$102,900	$107,800	$112,700	$112,700	$117,600	$117,600	$122,500	$127,400	$127,400
Administration	$89,850	$83,300	$88,200	$80,200	$80,200	$84,200	$84,200	$88,200	$92,200	$92,200	$96,200	$96,200	$100,250	$104,250	$104,250
Total Big Rivers Cost	$163,350	$166,600	$176,400	$178,200	$178,200	$187,100	$187,100	$196,000	$204,900	$204,900	$213,800	$213,800	$222,750	$231,650	$231,650
Commercial/Industrial HVAC Program															
Incentives	$72,800	$84,000	$84,000	$95,200	$100,800	$100,800	$106,400	$106,400	$112,000	$112,000	$117,600	$117,600	$123,200	$123,200	$128,800
Administration	$89,000	$84,000	$84,000	$77,900	$82,450	$82,450	$87,050	$87,050	$91,650	$91,650	$96,200	$96,200	$100,800	$100,800	$105,400
Total Big Rivers Cost	$161,800	$168,000	$168,000	$173,100	$183,250	$183,250	$193,450	$193,450	$203,650	$203,650	$213,800	$213,800	$224,000	$224,000	$234,200

All Combined Program Costs

All Residential Programs Combined	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Incentives	$486,150	$526,725	$543,975	$552,775	$565,350	$580,600	$591,725	$602,425	$627,600	$643,225	$656,000	$668,450	$687,425	$707,325	$724,825
Administration	$186,750	$158,700	$164,250	$170,250	$174,050	$178,600	$182,250	$185,250	$193,200	$197,850	$201,750	$205,600	$211,650	$217,950	$223,050
Total Big Rivers Cost	$672,900	$685,425	$708,225	$723,025	$739,400	$759,200	$773,975	$787,675	$820,800	$841,075	$857,750	$874,050	$899,075	$925,275	$947,875
All C&I Programs Combined															
Incentives	$146,300	$167,300	$172,200	$193,200	$198,800	$203,700	$209,300	$214,200	$224,700	$224,700	$235,200	$235,200	$245,700	$250,600	$256,200
Administration	$178,850	$167,300	$172,200	$158,100	$162,650	$166,650	$171,250	$175,250	$183,850	$183,850	$192,400	$192,400	$201,050	$205,050	$209,650
Total Big Rivers Cost	$325,150	$334,600	$344,400	$351,300	$361,450	$370,350	$380,550	$389,450	$408,550	$408,550	$427,600	$427,600	$446,750	$455,650	$465,850
All Programs Combined															
Incentives	$632,450	$694,025	$716,175	$745,975	$764,150	$784,300	$801,025	$816,625	$852,300	$867,925	$891,200	$903,650	$933,125	$957,925	$981,025
Administration	$365,600	$326,000	$336,450	$328,350	$336,700	$345,250	$353,500	$360,500	$377,050	$381,700	$394,150	$398,000	$412,700	$423,000	$432,700
Total Big Rivers Cost	$998,050	$1,020,025	$1,052,625	$1,074,325	$1,100,850	$1,129,550	$1,154,525	$1,177,125	$1,229,350	$1,249,625	$1,285,350	$1,301,650	$1,345,825	$1,380,925	$1,413,725

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 12. *Identify the energy savings in MWhs and peak demand reduction in MWs that Big Rivers achieved through DSM, including demand-response, interruptible load, and efficiency programs, in 2012.*

Response) Please see the attached DSM Report which was submitted to the Public Service Commission in January 2013.

Witness) Lindsay N. Barron

Big Rivers
ELECTRIC CORPORATION

Your Touchstone Energy® Cooperative

Big Rivers Electric Corporation

Demand Side Management (DSM) Report January 31, 2013

Provided to the Kentucky Public Service Commission
Pursuant to Ordering Paragraph No. 9
of
The Commission's Order dated November 17, 2011
in
Case No. 2011-00036

Big Rivers Electric Corporation
Demand Side Management ("DSM") Report
January 31, 2013

Table of Contents

Big Rivers Electric Corporation
Demand Side Management ("DSM") Report
January 31, 2013

Program Summary

Big Rivers Electric Corporation has taken a proactive approach to advance the goal of Strategy 1 of the 2008 Governor's Intelligent Energy Choices plan "to improve the efficiency of Kentucky's homes, buildings, industries and transportation fleet by establishing a goal of offsetting at least 18 percent of Kentucky's projected 2025 energy demand."

The purpose of this DSM report is to provide descriptions and data about DSM programs currently being offered.

DSM/Energy Efficiency Programs

1. Residential Lighting Replacement Program (CFL distribution)
2. Residential ENERGY STAR® Clothes Washer Replacement
3. Residential ENERGY STAR® Refrigerator Replacement
4. Residential ENERGY STAR® Heating, Ventilation and Air Conditioning (HVAC) Program
5. Residential Weatherization Program - Primary Heating Electric
6. Residential Weatherization Program - Primary Heating Gas
7. Residential Touchstone Energy® New Home Construction Program
8. Residential and Commercial HVAC & Refrigeration Tune-Up Program
9. Commercial/Industrial High Efficiency Lighting Replacement Program
10. Commercial/Industrial General Energy Efficiency Program

2012 DSM/Energy Efficiency Results

The 2012 Year-End DSM Program Results are shown in the table at the top of the following page.

Big Rivers Electric Corporation
Demand Side Management ("DSM") Report
January 31, 2013

Big Rivers Electric Corporation
2012 Demand Side Management/Energy Efficiency Program Results

DSM Program	Units	Total Meas.	Total Spend
Residential Lighting Program	Lamps	51,792	$101,914.00
Residential Energy Star (ES) Appliances	-	-	-
Energy Star Clothes Washer	Washers	563	56,300
Energy Star Refrigerator	Refrigerators	383	38,300
ES Heating, Ventilation and Air Conditioning (HVAC) Program	HVAC Units	100	41,450
Residential Weatherization Program - Electric Heat	Homes	9	48,221
Residential Weatherization Program - Gas Heat	Homes	1	3,690
Residential Touchstone Energy New Construction Program	New Homes	71	56,250
HVAC Tune-Up Program	HVAC Units	332	10,350
Commercial/Industrial Efficient Lighting Program	KW	420	147,113
Commercial/Industrial Efficient Equipment Program	KW	27	9,495
Promotional Expense	-	-	75,013
Total			$588,096

The Energy Efficiency programs are being offered at all three of Big Rivers' Member Cooperatives. Meade County Rural Electric Cooperative Corporation ("MCRECC") has been offering the programs since January 2012. Kenergy Corp. ("Kenergy") began program offerings in May 2012. Jackson Purchase Energy Corporation ("Jackson Purchase") began offering programs to retail members in July 2012. Many of the programs have significant lead times, such as commercial programs, new home construction and residential weatherization and the delayed start reduced the spend in 2012 in many of the programs.

The actual spend for 2012 was $588,096 or slightly less that 59% of projected. Promotional expenses were $75,013 or 37% of projected.

The programs are currently under review and will be evaluated for potential improvements. The DSM/EE working group will examine the recommended changes, which may result in modifications to the current programs and potential new programs in 2013.

2012 Budget

The table on the following page shows the 2012 energy efficiency program targets and spending levels for each program. This table also quantifies the deemed impact of each target on energy consumption and peak kW. Appendix A of this report shows the year-end results of 2012 and descriptions of each program.

The 2012 budget of $1,000,000 was split into two segments. The first segment addresses incentives or direct payments to Members when a measure is implemented. The total incentive budget was $800,000. The second segment involves the additional $200,000 set aside for promotional and regulatory administrative costs associated with the program.

Specific program budgets are flexible and are tailored to retail member response to each program. Member Cooperatives are able to adjust or shift budgets to address successful programs. Program requirements for each individual program plans are minimum standards; Member Cooperatives may establish more stringent requirements at their discretion.

Member Cooperatives collect required documentation and submit an invoice, with a summary spreadsheet for each program to Big Rivers for reimbursement monthly. The invoice contains the following information for each incentive paid:

1. Date
2. Account Number
3. Name
4. Service Address
5. City
6. Zip Code
7. Incentive Description Details
8. Incentive Amount

Each program has a separate summary spreadsheet. Multiple program summary spreadsheets may be combined on the same invoice. Promotional reimbursement requires a copy of the advertisement used in printed media. Radio advertising is submitted with a script.

Big Rivers 2012 DSM/Energy Efficiency Program Targets

Residential Programs	Annual kWh Savings Per Unit	Winter kW Savings Per Unit	Summer kW Savings Per Unit	Unit Quantity	Total Annual kWh Savings	Total Winter kW Savings	Total Summer kW Savings	Target Spend 2012
Residential Lighting Program								
CFL bulbs	31	0.007	0.003	57,143	1,752,004	408.0	179.2	$100,000
Residential Efficient Appliances								
Clothes Washer Rebate	224	0.007	0.026	400	89,600	2.8	10.4	$40,000
Energy Star Refrigerator + Recycling	1,084	0.076	0.089	400	433,600	30.4	35.6	$40,000
HVAC Program								
Dual Fuel	3,448	7.066	0.146	50	172,400	353.3	7.3	$25,000
Air Source Heat Pump	692	0.000	0.146	35	24,220	0.0	5.1	$7,000
Goethermal	3,658	4.453	0.365	24	87,792	106.9	8.8	$18,000
Weatherization Program								
Stick-Built Home	6,980	4.950	0.890	75	523,500	371.3	66.8	$150,000
Manufactured Home	4,680	2.200	0.300	25	117,000	55.0	7.5	$50,000
New Construction								
Gas Heat	2,435	0.260	0.580	48	116,880	12.5	27.8	$36,000
Air Source Heat Pump	4,922	2.700	0.580	20	98,430	54.0	11.6	$20,000
Dual Fuel Heat Pump (w/ Gas)	8,370	9.766	0.580	20	167,390	195.3	11.6	$24,000
Geothermal Heat Pump	8,580	7.150	0.799	10	85,795	71.5	8.0	$20,000
Tune-Up								
HVAC Tune-Up	636	0.000	0.304	1,320	839,520	0.0	400.9	$33,000

Commercial/Industrial (C/I) Programs	Annual kWh Savings Per $	Winter kW Savings Per $	Summer kW Savings Per $	Total kW Reduced	Total Annual kWh Savings	Total Winter kW Savings	Total Summer kW Savings	Target Spend 2012
C&I Lighting								
Lighting Projects	12	0.0029	0.0027	543	2,219,784	543.0	507.3	$190,000
C&I Products								
Misc. Efficient Projects	7	0.0005	0.0029	86	213,452	16.1	86.0	$30,000
	Annual kWh Savings Per Unit	**Winter kW Savings Per Unit**	**Summer kW Savings Per Unit**	**Unit Quantity**	**Total Annual kWh Savings**	**Total Winter kW Savings**	**Total Summer kW Savings**	**Target Spend 2012**
Tune-Up								
HVAC Tune-Up*	5,268	0.000	1.200	340	1,791,120	0.0	408.0	$17,000.00
** Assumed 6 tons/unit*								
				Total DSM Program Savings:	8,732,487	2,220.1	1,781.8	$800,000

Appendix A:
DSM Program Plans

Big Rivers 2012 DSM/Energy Efficiency Program Actual

Residential Programs	Annual kWh Savings Per Unit	Winter kW Savings Per Unit	Summer kW Savings Per Unit	Unit Quantity	Total Annual kWh Savings	Total Winter kW Savings	Total Summer kW Savings	Spend 2012
Residential Lighting Program								
CFL bulbs	31	0.007	0.003	51,792	1,587,943	369.8	162.4	$101,914
Residential Efficient Appliances								
Clothes Washer Rebate	224	0.007	0.026	563	126,112	3.9	14.6	$56,300
Energy Star Refrigerator + Recycling	1,084	0.076	0.089	383	415,172	29.1	34.1	$38,300
HVAC Program								
Dual Fuel	3,448	7.066	0.146	33	113,784	233.2	4.8	$16,500
Air Source Heat Pump	692	0.000	0.146	46	31,832	0.0	6.7	$9,200
Goethermal	3,658	4.453	0.365	21	76,818	93.5	7.7	$15,750
Weatherization Program								
Stick-Built Home	6,980	4.950	0.890	9	62,820	44.6	8.0	$46,720
Manufactured Home	4,680	2.200	0.300	1	4,680	2.2	0.3	$5,190
New Construction								
Gas Heat	2,435	0.260	0.580	67	163,145	17.4	38.9	$50,250
Air Source Heat Pump	4,922	2.700	0.580	2	9,843	5.4	1.2	$2,000
Dual Fuel Heat Pump (w/ Gas)	8,370	9.766	0.580	0	0	0.0	0.0	$0
Geothermal Heat Pump	8,580	7.150	0.799	2	17,159	14.3	1.6	$4,000
Tune-Up								
HVAC Tune-Up	636	0.000	0.304	260	165,360	0.0	79.0	$6,500

Commercial/Industrial (C/I) Programs	Annual kWh Savings Per $	Winter kW Savings Per $	Summer kW Savings Per $	Total kW Reduced	Total Annual kWh Savings	Total Winter kW Savings	Total Summer kW Savings	Spend 2012
C&I Lighting								
Lighting Projects	12	0.0028	0.0027	418	1,710,419	418.4	390.9	$147,113
C&I Products								
Misc. Efficient Projects	8	0.0006	0.0032	31	76,446	5.8	30.8	$9,495
	Annual kWh Savings Per Unit	**Winter kW Savings Per Unit**	**Summer kW Savings Per Unit**	**Unit Quantity**	**Total Annual kWh Savings**	**Total Winter kW Savings**	**Total Summer kW Savings**	**Spend 2012**
Tune-Up								
HVAC Tune-Up*	5,268	0.000	1.200	77	405,636	0.0	92.4	$3,850.00
Total DSM Program Savings:					4,967,169	1,237.8	873.3	$513,082

** Assumed 6 tons/unit*

Program: Residential Lighting Replacement Program (CFL Distribution)

Overview

This program promotes increased use of ENERGY STAR® rated Compact Fluorescent Light ("CFL") lamps among the retail members of Big Rivers' Member Cooperatives by providing reimbursement to Member Cooperatives for CFL lamps distributed to their retail members.

Target Participants

Target participants of this program for Big Rivers include its three Member Cooperatives. The target end users are the retail members of the Member Cooperatives taking service under the Big Rivers Rural Delivery Service ("RDS") tariff.

Member Incentives

Big Rivers will reimburse the Member Cooperatives for the purchase of CFL lamps that the Member Cooperative buys and distributes to its retail members for use in the Member Cooperative's service area. Member Cooperatives must submit invoices to Big Rivers and must include proper documentation of the purchase from the CFL supplier and of the distribution to retail members. Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Annual Budget

The 2012 budget for this program is $100,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Evaluation, Measurement and Verification ("EM&V")

Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

Program: Residential ENERGY STAR® Clothes Washer Replacement Program

Overview
This program promotes increased use of ENERGY STAR® rated clothes washing machines.

Target Participants
Target participants of this program for Big Rivers include its three Member Cooperatives. The target end users are the retail members of the Member Cooperatives taking service under the Big Rivers Rural Delivery Service ("RDS") tariff.

Member Incentives
Big Rivers will provide an incentive payment of $100 for each ENERGY STAR® rated clothes washer that is purchased and installed in the Member Cooperative's system. Member Cooperatives must submit invoices to Big Rivers and must include proper documentation of the purchase and installation from a legitimate retail appliance supplier. Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Annual Budget
The 2012 budget for this program is $40,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Evaluation, Measurement and Verification ("EM&V")
Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

Program: Residential ENERGY STAR® Refrigerator Replacement Program

Overview
This program promotes increased use of ENERGY STAR® rated refrigerators and the removal from operation of existing older, low-efficiency refrigerators.

Target Participants
Target participants of this program for Big Rivers include its three Member Cooperatives. The target end users are the retail members of the Member Cooperatives taking service under the Big Rivers Rural Delivery Service ("RDS") tariff.

Member Incentives
Big Rivers will provide an incentive payment of $100 for each ENERGY STAR® rated refrigerator that is purchased and installed in the Member Cooperative's system. Member Cooperatives must submit invoices to Big Rivers and must include proper documentation of the purchase and installation of the new appliance, and the removal of the old appliance from legitimate retail appliance suppliers. Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Annual Budget
The 2012 budget for this program is $40,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Evaluation, Measurement and Verification ("EM&V")
Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

Program: Residential ENERGY STAR® Heating, Ventilation and Air Conditioning ("HVAC") Program

Overview
This program promotes increased use of high efficiency HVAC systems among the retail members of the member cooperatives by providing reimbursement to member cooperative members for upgrading their HVAC systems beyond contractor grade minimums to one of three ENERGY STAR®-rated HVAC systems.

Target Participants
Target participants of this program for Big Rivers include its three member cooperatives. The target end users are the retail members of the member cooperatives taking service under the Big Rivers Rural Delivery Service ("RDS") tariff.

Member Incentives
Big Rivers will reimburse the member cooperatives for the HVAC efficiency upgrades by a retail member on the member cooperative's system. Member cooperatives must submit invoices to Big Rivers and must include proper documentation. Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

The following is the program administrative process:

1. The retail consumer will provide a receipt of installation and purchase of equipment from a licensed contractor dated within the eligibility timeframe of the program selected by the member cooperative.
2. The member cooperative will be responsible for verification of installation.
3. The initial incentives shall be the following per replacement unit installed:

   - Geothermal $750
   - Dual Fuel $500
   - Air Source $200

Annual Budget
The 2012 budget for this program is $50,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Program: Residential ENERGY STAR® Heating, Ventilation and Air Conditioning ("HVAC") Program (*continued*)

Evaluation, Measurement and Verification ("EM&V")

Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

Program: Residential Weatherization Programs – Primary Heating Electric and Primary Heating Gas

Overview
This program promotes the implementation of weatherization measures among the retail members of the member cooperatives by providing reimbursement to member cooperatives for undertaking weatherization improvements at their homes.

Target Participants
Target participants of this program for Big Rivers include its three Member Cooperatives. The target end users are the retail members of the Member Cooperatives. This program is available to any retail residential member of the Member Cooperative taking service under the Big Rivers Rural Delivery Service ("RDS") tariff, with an all-electric home to maximize the benefit of the program.

Member Incentives
Sherlock Homes is a weatherization contractor headquartered in Bloomington Indiana, which has been performing weatherization projects for Hoosier Energy for the last two years with tremendous success. To-date Sherlock Homes has weatherized nearly 2,000 site-built and manufactured homes in Indiana.

Big Rivers will provide 50% of the cost of the weatherization for residential members with an electric primary heating system (Primary Heating Electric), or 25% of the cost for members with a non-electric primary heating system (Primary Heating Gas). Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Annual Budget
The 2012 budget for this program is $200,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Evaluation, Measurement and Verification ("EM&V")
Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

Program: Residential Touchstone Energy® New Home Construction Program

Overview
This program provides incentives to home owners and builders to use energy efficient building standards as outlined in the Touchstone Energy® certification program, which requires a Home Energy Rating System ("HERS") rating of 85 or lower.

Target Participants
Target participants of this program for Big Rivers include its three Member Cooperatives. The target end users are the retail members of the Member Cooperatives taking service under the Big Rivers Rural Delivery Service ("RDS") tariff.

Member Incentives
The incentive is based on the HVAC system installed in the retail member's Touchstone Energy® Certified Home. The following incentives apply:

Geothermal Heat Pump (ground coupled heat pump)	$2,000
Air Source Heat Pump	$1,000
Dual Fuel Heat Pump (ASHP w/ Gas back-up)	$1,200
Gas Heat	$ 750

The Member Cooperative will provide a copy of the original certification document and the analysis form used to determine the HERS score and a copy of the receipt from a licensed HVAC contractor specifying the HVAC system installed in the home of the retail member. Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Annual Budget
The 2012 budget for this program is $100,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Evaluation, Measurement and Verification ("EM&V")
Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

Program: Residential and Commercial HVAC & Refrigeration Tune-Up Program

Overview
This program promotes the initiation of annual maintenance on heating and air conditioning equipment among the retail members of the Member Cooperatives by providing reimbursement to Member Cooperative retail members that have their heating and cooling systems professionally cleaned and serviced.

Target Participants
Target participants of this program for Big Rivers include its three Member Cooperatives. The target end users are the residential and commercial retail members of the Member Cooperatives taking service under the Big Rivers Rural Delivery Service ("RDS") tariff.

Member Incentives

Big Rivers will offer incentives to Member Cooperatives for retail member homeowners and commercial businesses that have their heating and cooling systems professionally cleaned and serviced.

Member Cooperatives will receive a $25 incentive for each residential unit and $50 for each commercial unit that is cleaned and serviced.

For retail members with multiple units, each incentive paid will require an individual receipt from a licensed HVAC contractor.

Member Cooperatives must submit invoices to Big Rivers and must include proper documentation. Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Annual Budget
The 2012 budget for this program is $50,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Evaluation, Measurement and Verification ("EM&V")
Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

Program: Commercial / Industrial High Efficiency Lighting Replacement Program

Overview
This program provides an incentive to commercial and industrial retail member consumers for whom service is taken under Big Rivers' RDS tariff to upgrade poorly designed and low efficiency lighting systems.

Target Participants
Target participants of this program for Big Rivers include its three Member Cooperatives. The target end users are the commercial and industrial retail members of the Member Cooperatives taking service under the Big Rivers Rural Delivery Service ("RDS") tariff.

Member Incentives
The following are the project steps:

1. The lighting contractor, supplier, electrical contractor or electrician will provide to the retail member the documented changes made to the facility lighting system. The retail member will also be required to provide an invoice for materials and installation services associated with the project.
2. The Member Cooperative will verify the installation of the new lighting system and collect a copy of the specification of the lighting system conversion impact, signed by the retail member, with the following information:

    - Lamp and ballast (or fixture) specifications prior to conversion including total wattage
    - New fixture specifications including total wattage
    - Estimated hours of operation
    - Estimated kWh saved per year
    - Total kW demand reduction

3. The Member Cooperative shall submit an invoice to Big Rivers with copies of individual lighting project specification documents with the following information:

    - Member Name
    - Account Number
    - Service Address
    - kW Reduction Total
    - Annual Hours of Operation
    - Incentive Amount

Program: Commercial / Industrial High Efficiency Lighting Replacement Program (*continued*)

4. The initial incentive shall be set at $350 per kW reduction. This amount will be evaluated continuously and adjusted depending on reaction by retail members qualifying.

Each of the incentive payments will require the fixture/lamp change be verified by the Member Cooperative personnel or third party. A worksheet is provided to determine the change in demand of the lighting system The retail member will also be required to provide the project costs for planning purposes. Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Annual Budget
The 2012 budget for this program is $190,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Evaluation, Measurement and Verification ("EM&V")
Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

Program: Commercial / Industrial General Energy Efficiency Program

Overview
This program provides an incentive to retail commercial and industrial retail member-consumers served under the Big Rivers RDS tariff to upgrade all aspects of cost-effective energy efficiency achievable in individual facilities.

Target Participants
Target participants of this program for Big Rivers include its three Member Cooperatives. The target end users are the commercial and industrial retail members of the Member Cooperatives taking service under the Big Rivers Rural Delivery Service ("RDS") tariff.

Member Incentives
The requirements of the program are:

1. The retail member, contractor, supplier, electrical contractor or electrician will provide to the retail member the documented changes made to the facility equipment resulting in the demand reduction. The retail member will also be required to provide an invoice for materials and installation services associated with the project.
2. The Member Cooperative will verify the installation of the new equipment and collect a copy of the specification of the equipment conversion impact, signed by the retail member, with the following information:
    - Equipment specifications of existing equipment, including total wattage
    - Replacement equipment specifications, including total wattage
    - Estimated hours of operation
    - Estimated kWh saved per year
    - Total kW demand reduction
3. The Member Cooperative shall submit an invoice to Big Rivers with copies of individual project specification documents and a printed summary excel spreadsheet with the following information:

    - Member Name
    - Account Number
    - Service Address
    - kW Reduction Total
    - Annual Hours of Operation
    - Incentive Amount

Program: Commercial / Industrial General Energy Efficiency Program (*continued*)

4. The initial incentive shall be set at $350 per kW reduction with a maximum incentive of $10,000 per project unless approved by Big Rivers on an individual basis. This amount will be assessed continuously and adjusted depending on reaction by retail commercial members qualifying under this program.

Each of the incentive payments will require that equipment changes be verified by a Member Cooperative's personnel or third party. A worksheet is provided to determine the change in demand resulting in equipment upgrades. The retail member will also be required to provide the project costs for planning purposes. Big Rivers will also reimburse a Member's reasonable costs of promoting this program, if the promotional program and its costs are pre-approved by Big Rivers.

Annual Budget
The 2012 budget for this program is $30,000. Budget levels for future years may vary based upon the experience gained after program implementation.

Evaluation, Measurement and Verification ("EM&V")
Big Rivers will initiate a process of Evaluation, Measurement and Verification for the program. The EM&V process will ensure the quality and effectiveness of the program and optimal use of resources.

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 13. *Refer to p. 14 lines 13-16 of the testimony submitted by Albert Yockey.*

a. Explain how Big Rivers selected an annual budget for DSM programs of $1 million, rather than some other amount.

b. State whether the $1 million annual DSM budget is adequate to achieve all cost-effective energy savings from DSM.

c. If not, explain why not and identify the annual budget level that would be needed to do so.

Response)

a. The 2012 budget, similar to the DSM Potential Study was established at $1 million spending, which was selected to represent approximately 1% of revenue from the rural load, since the energy efficiency programs apply only to the rural load. The rural load does not include large industrials, which have the statutory right to opt out of any DSM programs.

b. The $1 million annual DSM budget is not adequate to achieve all cost-effective energy savings from DSM defined in the study as the economic potential.

c. The DSM Potential Study did not calculate total costs for economic potential (all cost-effective measures) because it is a hypothetical savings that assumes every standard measure is upgraded to an

efficient measure (100% market penetration) and does not account for market barriers. However, the study did calculate a cost associated with the achievable potential (a subset of the economic potential that represents the attainable savings if the market penetration of high efficiency electric appliances and equipment reaches 30%) over the 10-year study period. Total NPV 10-years costs in the residential sector are $56 million ($23 million of which would be paid by Big Rivers). In the C&I sector, the NPV 10-year costs are $35.1 million ($14.8 million paid by Big Rivers). This sums to approximately $91 million (NPV) over 10 years in total costs, or $37.8 million to Big Rivers. (Totals taken from Tables 6.6 & 7.8 of the DSM Potential Study)

Witness) Lindsay N. Barron

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Sierra Club's First Request for Information
dated February 14, 2013

April 25, 2013

Item 14) *For each of the years 2013 through 2030:*

a. Identify Big Rivers' projected DSM budget.

b. Identify the projected level of energy savings to be achieved through DSM programs

c. Identify the projected level of peak demand reduction to be achieved through DSM programs

d. Produce any analyses or documents evaluating the projected levels of energy savings and/or peak demand reduction identified in response to requests 13b and 13c

Response)

a. Big Rivers only has available 2013 through 2016, as shown below:

YEAR	DSM BUDGET
2013	$1,300,000
2014	$1,094,400
2015	$1,127,232
2016	$1,149,776

In the 2011 Big Rivers' rate case, Big Rivers was approved to collect $1,000,000 annually for the purpose of DSM. A proforma adjustment to the budget was made to ensure only $1,000,000 was included in the request associated with this rate case. Please see Reference Schedule 1.12 of Exhibit Wolfram-2.

b. Please refer to Table 1.1 on page 9 of the DSM Potential Study provided in response to Item 11.

c. Please refer to Table 1.1 on page 9 of the DSM Potential Study provided in response to Item 11.

d. Please refer to the documents provided in Big Rivers' response to Items 10 and 11.

Witness) Lindsay N. Barron

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 15 ***Refer to p. 7 lines 1-4 of the testimony of Robert Berry. Produce the five year benchmarking study referenced therein.***

Response) Please see Big Rivers' response to AG 1-87.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 16) *Refer to p. 7 line 14 through p. 8 line 4 of the testimony of Robert Berry. With regards to the twenty two maintenance outages that have been delayed, deferred, reduced in scope and duration, or completely cancelled, identify :*

a. Each project that was planned to occur during the outage

b. The cost of each project

c. The expected benefit of each project

d. The impact on unit reliability, availability, EFOR, and heat rate of the delay, deferral, reduction in scope or duration, or cancellation of each such outage

Response)

a. The twenty-two outages referenced in this question reflected Big Rivers' outage plans prior to the Unwind Transaction. Two of the outages were planned and completed and detailed plans had been prepared for an additional eleven. Subsequent to the Unwind Transaction, Big Rivers has revised its maintenance outage schedule. Please see Exhibit Berry – 1 and the attached Planned Outage Schedule, which shows the two completed outages and the other eleven outages where detailed project plans, had been prepared.

b. Mr. Berry's testimony referenced above referred to outages that were included in the 2009 through 2011 business plan that was prepared in

2008. The outage plans have been revised following the Unwind Transaction in 2009. While Big Rivers has information available for expected outages during the current plan period, costs for the original plan are unavailable as the three-year records retention has passed and plan budget data is no longer available.

c. The expected benefit of each scheduled outage is to clean, inspect and repair selected components of the power plant to maintain reliability and availability of the equipment.

d. See Big Rivers' response to PSC 2-30.

Witness) Robert W. Berry

d) Planned Outage Schedule

Outage planning is an important part of the Big Rivers 2009 — 2011 work plan. The Big Rivers system performs scheduled outages as identified below:

Coleman units 1, 2, and 3

- FGD outages — 2 year interval
- Boiler and turbine valve outages — 3 year interval
- Turbine generator major inspections — 9 year interval

Wilson, Henderson 1, Henderson 2, Green 1 and Green 2

- Boiler outages — 2 year interval
- Turbine valve outages — 4 year interval
- Turbine generator major inspections — 8 year interval

The following table reflects the 2009 outage plan

Unit	I Start Date	End Date	Days	Hours
HMPL 1	February 21, 2009	March 23, 2009	31	744
Green 2	March 28, 2009	April 29, 2009	33	792
Coleman 3	May, 2, 2009	June 2, 2009	32	768
Wilson	September 26, 2009	November 13, 2009	49	1176

2009 Outages / Major Objectives

Henderson Unit 1, February 21, 2009 through March 23, 2009 (744 hours)

- Boiler Inspection
  - Replace High Temperature Reheater
  - Replace Selected High Energy Pipe Hangers
  - Replace Selected Combustion Steam Coils
  - Replace Boiler Slag Grinders
  - Inspect Boiler Casing and Repair Gas Leaks
  - Replace Selected Boiler Soot blowers
  - Replace Wet bottom Drains
  - Replace Plant Phone & PA System
  - Inspect (NDE) Main Steam and Reheat Steam Piping

- Inspect (NDE) Selected Boiler Steam Collection Headers

- Turbine/Generator Inspection
  - Replace Cooling Tower Hot Water Distribution Deck
  - Re tube #5 Feed water Heater

- FGD/SCR Inspection
  - Replace WDPF, FGD, & SCR Controls
  - Replace Booster Fan Blade Erosion Covers
  - Clean ME Wash and Recycle Header Nozzles
  - Clean ME Panels, Reaction Tanks & Piping
  - Remove Catalyst Sample Logs

- Balance of Plant
  - Classify Mill Balls
  - Critical Motor PM's
  - Rebuild Selected 4160 Breakers
  - Fan and Ductwork Inspection Repair

Green Unit 2, March 28, 2009 through April 29, 2009 (792 hours)

- Boiler
  - Replace precipitator field (4th and 5th).
  - Replace fly ash hoppers.
  - Replace economizer expansion joints (2).
  - Replace west SH spray venturi.
  - Replace FD fan inlet vanes.
  - Replace air heater baskets.
  - Replace reheater tubes.
  - Replace DA trays.
  - Replace bottom ash controls.
  - Replace fly ash hopper isolation gates.
  - Replace boiler drains.
  - Replace steam coils (4).
  - Chemical clean boiler.
  - Repair wet bottom refractory.
  - Inspect and repair OHA/burner nozzles.
  - Inspect igniter rods and scanners.
  - Inspect boiler walls.
  - Inspect burners.
  - High energy pipe inspection.
  - Rebuild feed water and condensate control valves.
  - Inspect ID, FD, and PA bearings, shafts, and blades.
  - Inspect and repair air heater seals.
  - Repair precipitator outlet ducts.

- Inspect soot blowers.

- Turbine
  - Replace EH fluid.
  - Clean hydrogen and lube oil coolers.
  - Inspect 4160-480 volt breakers and repair.
  - Inspect voltage regulator and field breaker.
  - Turbine instrument inspection and calibration.

- Balance of Plant
  - Replace thickener rake drive.
  - Replace cooling tower deck.
  - Replace B water service pump.
  - Upgrade CEM's.
  - Replace coal handling controls.
  - Replace scrubber controls.
  - Replace mist eliminators.
  - Replace scrubber inlet ducts.
  - Replace cooling tower fan shrouds.
  - Precipitator and outer housing repairs.
  - Recondition mill motors.
  - Recondition recycle pump motors.
  - Clean scrubber reaction tank, headers, nozzles, and screens.
  - Inspect cooling tower structure, fan gear boxes, and pumps.

Coleman Unit 3, May 2, 2009 through June 2, 2009 (768 hours)

- Boiler
  - Inspection
  - Replace rear furnace deflector wall
  - Replace primary superheater
  - Sootblower replacement
  - Boiler tube overlay
  - Boiler chemical clean
  - Furnace scaffolding
  - Penthouse casing repair
  - Insulation and lagging repairs
  - Expansion joint replacement
  - Gas leak repairs
  - Fan inspections

- Turbine
  - Valve inspection
  - Replace condenser vacuum pump

- FGD
  - Maintenance inspection of all equipment that requires a FGD shutdown
  - Scaffold absorber
  - Booster fan inspection and repair
    - Replacement of C1 & C2 fan blades
  - Storage tank inspection and repair
  - Agitator inspection and replacement
    - Replacement of B and D blades
  - Recycle pump overhaul
  - Oxidation Air Blower inspection and PM
  - Limestone mill liner replacement
  - Motor PMs
  - Limestone mill liner replacement

- Balance of Plant
  - Replace A & B mill liners
  - Reclassify A & B mill balls
  - Precipitator controls replacement
  - Motor PMs
  - Replace cold end airheater baskets
  - "B:" side 4160 volt switch gear replacement
  - A and C 480 volt MCC replacement
  - Boiler feed pump overhaul

Wilson Unit 1, September 26, 2009 through November 12, 2009 (1176 hours)

- Boiler
  - Replace **"B"** platen superheat section
  - Repair finishing superheat section
  - Boiler high temperature header inspection
  - High Energy pipe inspection
  - Replace 12 burners
  - Replace precipitator outlet dampers
  - Chemical clean boiler
  - Perform condition assessment of Furnace area

- Turbine / Generator
  - HP turbine inspection
  - HP rotor blade replacement
  - Generator inspection
  - Test hardness of HP rotor to determine if replacement is needed

- FGD
  - Refurbish absorber modules

- Replace FGD inlet and outlet dampers
- Stack inspection and cleaning
- Replace recycle pump discharge valves
- Ductwork inspection and repairs

The following table reflects the 2010 outage plan

Unit	Start Date	End Date	Days	Hours
Wilson	February 27, 2010	March 5, 2010	7	168
Coleman 2	March 6, 2010	March 30, 2010	25	600
HMPL 2	April 3, 2010	April 23, 2010	21	504
Green 1	April 24, 2010	May 21, 2010	28	672
Reid 1	May 1, 2010	May 21, 2010	21	504

2010 Outages / Major Obtectives

Wilson Unit 1, February 27, 2010 through March 5, 2010 (168 hours)

- **Boiler**
  - Open and inspect boiler
  - Wash airheaters
  - Inspect burners
  - Boiler valve replacement
- FGD
  - Open and inspect FGD
  - Stack cleaning

Coleman Unit 2, March 6, 2010 through March 30, 2010 (600 hours)

- Boiler
  - Replace reheater hot end
  - Install alloy weld overlay on waterwalls
  - Soot blower replacement
  - Chemical clean
  - Penthouse casing repair

- Insulation and lagging repair
- Expansion joint replacement
- FD fan housings, silencers and hoods replacement

- Turbine
  - Valve inspection
  - Replace condenser vacuum pump
  - Repair HP / IP steam seals

- Balance of Plant
  - 480 volt MCC replacement
  - Motor PM's
  - Boiler feed pump overhaul
  - Precipitator controls replacement

Henderson Unit 2, April 3, 2010 through April 23, 2010 (504 hours)

- Boiler Inspection
  - Replaced Selected High Energy Pipe Hangers
  - Replace Selected Combustion Steam Coils
  - Replace Boiler Slag Grinders
  - Replace Selected Boiler Soot Blowers
  - Inspect Boiler Casing and Repair Gas Leaks
  - Inspect (NDE) Main Steam and Reheat Steam Piping
  - Inspect (NDE) Selected Boiler Steam Collection Headers
  - Replace 480 Volt MCC
  - Replace River Intake 480 Volt MCC

- Turbine/Generator Inspection
  - Replace #6 Feedwater Heater
  - Install MOV's on Feedwater Heater Extraction Valves

- FGD/SCR Inspection
  - Replace Booster Fan Blade Erosion Covers
  - Clean ME Wash and Recycle Header Nozzles
  - Remove Catalyst Sample Logs
  - Clean Ammonia Injection Nozzles

- Balance of Plant
  - Classify Mill Balls
  - Perform Critical Motor PM's
  - Rebuild Selected 4160 Breakers
  - Fan and Ductwork Inspection and Repairs

Green Unit 1, April 24, 2010 through May 21, 2010 (672 hours)

- Boiler
  - Replace ash grinder.
  - Replace economizer expansion joint.
  - Replace FD fan inlet vanes.
  - Replace air heater baskets.
  - Inspect soot blowers.
  - Wet bottom refractory repair.
  - Inspect boiler walls.
  - High energy pipe inspection.
  - Inspect FD, PA and ID fan bearings, shafts, and blades.
  - Inspect and repair igniters and scanners.
  - Inspect and repair OFA burner nozzles.
- Turbine
  - Replace generator rectifier.
  - Replace voltage regulator.
  - Replace sequence of events recorder.
  - DCS power supply upgrade.
  - Inspect and test 4160/480 volt breakers.
  - Clean hydrogen lube oil and stator coolers.
- Balance of Plant
  - Replace precipitator field (1st and 2nd)
  - Replace scrubber Dupont.
  - Repair scrubber structural component.
  - Replace thickener rake drive.
  - Replace cooling tower deck.
  - Replace B service water pump.
  - Replace one slaker.
  - Replace USS transformer (Scrubber).
  - Clean scrubber reaction tank headers, nozzles, and screens.
  - Inspect cooling tower structure, fan gear boxes, and pumps.

The following table reflects the 2011 outage plan

Unit	Start Date	End Date	Days	Hours
Coleman 1	February 19, 2011	March 15, 2011	25	600
Green 2	March 19, 2011	May 6, 2011	49	1176
HMPL 1	May 7, 2011	June 24, 2011	49	1176
Wilson 1	September 3, 2011	September 30, 2011	28	672

Coleman 1, February 19, 2011 through March 15, 2011 (25 days) 600 hour outage

- Boiler
  - Inspection
  - Replace re-heater hot end
  - Boiler tube overlay
  - Boiler chemical clean
  - Penthouse casing repair
  - Insulation and lagging repair
  - Expansion joint replacement
  - Gas leak repairs
  - Fan inspections
  - FD fan housings, silencers and hoods replacement
  - Sootblower replacement
  - Drum enclosure replacement
- Turbine
  - Valve inspection
  - Replace condenser vacuum pump
  - Balance of Plant
  - 480 volt MCC replacement
  - Motor PM' S
  - Boiler feed pump overhaul
- FGD
  - Maintenance inspection of equipment that requires a FGD shutdown, etc
  - Scaffold absorber
  - Booster fan inspection & repair
  - Replace C3 blades
  - Storage tank inspection & repair
  - Agitator inspection & replacement
  - Replacement of A, C, and E blades
  - Recycle pump overhaul
  - Oxidation Air Blower inspection & PM
  - Motor PMs
  - Limestone mill liner replacement

Green Unit 2, March 19, 2011 through May 6, 2011 (1176 hours)

- **Boiler**
  - Precipitator repair.
  - Replace boiler drains.
  - Replace steam coils (4).
  - Repair wet bottom refractory.
  - Inspect and repair OHA/burner nozzles.
  - Inspect igniter rods and scanners.
  - Inspect boiler walls.
  - Inspect burners.
  - High energy pipe inspection.
  - Replace B ID fan shaft.
  - Replace ID fan dampers
  - Replace FD fan inlet vanes
  - Inspect and repair air heater seals.
  - Repair precipitator outlet ducts.
  - Inspect soot blowers.
- Turbine
  - Replace voltage regulator
  - Turbine / Generator overhaul
  - Replace Turbine packing (HP, IP & LP rows)
  - Replace Generator retaining rings
- Balance of Plant
  - Replace slaker and controls
  - Replace water plant controls.
  - Replace 7A Stacker
  - Replace A telescopic chute
  - Replace controls at dewatering plant
  - Recondition mill motors.
  - Recondition recycle pump motors.
  - Clean scrubber reaction tank, headers, nozzles, and screens.
  - Inspect cooling tower structure, fan gear boxes, and pumps.

Henderson Unit 1, May 7, 2011 through June 24, 2011 (1176 hours)

- Boiler Inspection
  - Replace Selected High Energy Pipe Hangers
  - Replace Selected Combustion Steam Coils
  - Replace Boiler Slag Grinders

- Inspect Boiler Casing and Repair Gas Leaks
- Replace Selected Boiler Soot blowers
- Replace Wet bottom Drains
- Replace Plant Phone & PA System
- Inspect (NDE) Main Steam and Reheat Steam Piping
- Inspect (NDE) Selected Boiler Steam Collection Headers

- Turbine/Generator Inspection
  - Replace Turbine Packing
  - Replace Cooling Tower Controls
  - Replace 480 volt MCC at Cooling Tower
- FGD/SCR Inspection
  - Replace Booster Fan Blade Erosion Covers
  - Clean ME Wash and Recycle Header Nozzles
  - Clean ME Panels, Reaction Tanks & Piping
  - Remove Catalyst Sample Logs

- Balance of Plant
  - Classify Mill Balls
  - Critical Motor PM's
  - Rebuild Selected 4160 Breakers
  - Fan and Ductwork Inspection Repair
  - Replace Burners
  - Stack Liner Replacement

Wilson Unit 1, September 3, 2011 through September 30, 2011 (672 hours)

- Boiler
  - Replace finishing superheat section
  - Replace 13 burners
  - Perform condition assessment of Furnace area
  - Continue high energy pipe inspection
  - Boiler high temperature header inspection

- Turbine / Generator
  - General L.P. crawl through inspection
  - Hydrogen, exciter and lube oil cooler cleaning

- FGD
  - FGD Refurbishment
  - Ductwork inspection and repairs
  - Replace FGD inlet and outlet dampers
  - Stack inspection and cleaning

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 17. *Refer to p. 13 lines 1-10 of the testimony of Robert Berry.*

a. Explain the basis for the budgeted off-system sales market prices for 2013 and 2014 identified therein

a. (i) Identify and produce any analysis, report, or other document upon which those budgeted off-system market prices are based.

a. (ii) Identify the date that the budgeted off-system sales market price projections were made.

b. Identify and explain each reason that the actual off-system sales market prices for 2011 and 2012 were different than the budgeted off-system sales market prices.

c. In light of the differences between the budgeted and actual off-system sales market prices in 2011 and 2012, identify and explain any steps you took to try to improve the accuracy of your budgeted off-system sales market prices for 2013 and 2014.

d. Identify the projected off-system sales market price for each year of 2015 through 2030.

d. (i) Identify and produce any analysis, report, or other document upon which those projected off-system sales market prices are based.

Response)

a. Please see Big Rivers' response to Item 21b.

a.(i.). Please see Big Rivers' response to PSC 1-57. The forecasted market prices can be found on the prices tab of the production cost model.

a.(ii.) The Production Cost model was completed in September 2012.

b. The 2011 actual off-system sales market price was different than budgeted for two reasons; the overall market price dropped in 2011 and Big Rivers' off-system sales volume nearly doubled, indicating that more sales were occurring in non-peak hours. The 2012 actual off-system sales market price was different than budgeted because the MISO market continued to significantly decline throughout 2012.

c. It is often difficult to predict market prices in a rising or falling market environment. The years 2010, 2011, and 2012 encompassed drastic economic changes throughout our country and the wholesale power market was significantly impacted. Big Rivers believes that we have reached a steady state in the market and projections indicate that there will be no major drivers of change in market prices in the next several years.

d. The off-system sales prices Big Rivers relied on for its forecasts are included in the Big Rivers Financial Model provided in response to PSC 1-57. The fully forecasted test period in this case is based on the Company's approved budget and financial plan, which only includes 2013 through

2016. The annual average off-system sales prices for 2015 and 2016 are provided below.

2015 [redacted]

2016 [redacted]

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 18) *Refer to p. 14 lines 4-6 of the testimony of Robert Berry.*

a. State whether Big Rivers projects that its margins will continue to be "derived almost exclusively from off-system sales."

(i) If so, explain why.

(ii) If not, explain why not and identify how such margins will be derived.

Response)

a. Yes.

(i) For the fully-forecasted test period September 1, 2013 through August 31, 2014, Big Rivers is targeting a Contract TIER of 1.24 or a net margin of approximately $9.4 million. The targeted Contract TIER of 1.24 during the test period allows Big Rivers to meet its minimum 1.10 MFIR requirement for the 2013 budgeted year. This minimum 1.10 MFIR is required for Big Rivers to meet its debt covenants. As such, for the fully-forecasted period off-system sales margins comprise approximately 85% of operating margins and approximately 43% percent of the net margin.

(ii) Not applicable.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 19) ***Refer to p. 16 line 17 through p. 17 line 2 of the testimony of Robert Berry. Produce any report memorializing Big Rivers' current capital work plan, and any analyses, reports, or other documents upon which that plan is based.***

Response) Big Rivers' capital work plan is developed using a combination of in-house expertise; a computerized maintenance management system; third party inspections, studies and reports; and maintenance history information. Please see the files on the Confidential CD accompanying these responses for a sample of the reports, analyses, and documentation on which the plan is based.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 20) *Refer to p. 19 lines 8-13 of the testimony of Robert Berry. Produce the Load Concentration Mitigation Plan referenced therein, and any attendant modeling (including input and output files), workpapers, or analyses.*

Response) Please see Big Rivers' response to AG 1-89.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 21) *Refer to p. 31 line 13 to p. 32 line 5 of the testimony of Robert Berry.*

a. *Identify the forecasted market prices in MISO for 2013 and 2014 referenced therein.*

b. *Explain the basis for the 2013 and 2014 MISO market price forecasts referenced therein.*

c. *Identify and produce any documents supporting the 2013 and 2014 MISO market price forecasts referenced therein.*

d. *Identify when Big Rivers expects marketing all excess power when the market price is greater than marginal generation cost to be an effective mitigation method.*

   i. *Explain the basis for such expectation.*

e. *Identify any forecasted market prices in MISO for 2015, 2016, and any future year beyond 2016, and explain how such prices were incorporated into this application.*

Response)

a. Please see Big Rivers' response to PSC 1-57. The forecasted market prices can be found on the prices tab of the production cost model.

b. ACES provides Big Rivers with market price forecasts.

c. There are no supporting documents.

d. Based on the present ACES market price forecasts, Wilson is currently scheduled to re-start in 2019; however it will be available to operate if

needed to cover other unit outages and to maintain all of its environmental permits.

i. ACES market price forecasts provide the basis for this expectation. Any time the market prices are above the all-in cost of generation, selling into the wholesale market would contribute additional revenue to Big Rivers fixed operating cost, thus reducing the revenue requirements necessary as a result of Century's exit.

e. Please see above response to SC 1-21(a). The process for 2015, 2016 and any future year beyond 2016 are not incorporated into this application because the forecasted test period includes September 1, 2013 through August 31, 2014 exclusively.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25 2013

Item 22. *Refer to p. 22, lines 3-18 of the testimony of Robert Berry.*

a. Identify the length of time for which Big Rivers expects the Wilson Station to be idled.

b. Identify the cost of maintaining the Wilson Station while it is idled.

c. Identify the variable cost of production savings that Big Rivers expects to achieve through the idling of the Wilson Station.

d. Identify the FDE cost savings that Big Rivers expects to achieve through the idling of the Wilson Station.

e. State whether additional Big Rivers generating units are planned to be or may need to be idled in light of Alcan's announced termination of its retail electric service agreement with Kenergy.

e. (i) If so, identify which units and the length of time of such idling.

e. (ii) If not, explain why not.

f. State whether Big Rivers has notified or applied for approval from MISO for the idling of the Wilson Station.

f. (i) If so, produce any such notification or approval application, and any response from MISO.

f. (ii) If not, explain why not.

g. State whether Big Rivers has notified or applied for approval from MISO for the idling of any of its other generating units.

g. (i) If so:

1. Identify the unit or units

2. Produce such notification or approval application

3. Produce any response received from MISO.

g. (ii) If not, explain why not.

Response)

a. Please see Big Rivers' response to PSC 2-21(c).

b. Please see response in d. below.

c. There will be no variable cost of production savings to Big Rivers through the idling of Wilson Station. Big Rivers will have lower production variable expenses but will have less revenue from MISO due to less generation.

d. For the 2014 – 2016 timeframe, Big Rivers expects to save [redacted] in production O&M fixed costs and [redacted] in capital as shown in table below.

Wilson Station			
Year	Production O&M Fixed Costs		
	Running	Lay-Up	Variance
2014	[redacted]	$ 2,433,225	[redacted]
2015		$ 2,487,865	
2016		$ 2,544,279	
Total		**$ 7,465,369**	
Year	Capital Cost		
	Running	Lay-Up	Variance
2014	[redacted]	$ 530,000	[redacted]
2015		$ 2,730,000	
2016		$ 1,280,000	
Total		**$ 4,540,000**	

e. Big Rivers is still evaluating.

f. Please see Big Rivers' response to PSC 2-21.

g. Please see Big Rivers' response to PSC 2-21

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 23) *State whether Big Rivers has evaluated the retirement, rather than idling, of any of its generating units as an option for mitigating the impact of the termination of the Century contract and/or of the decline in off-system sales revenues.*

a. If so:

a. (i) Identify which unit or units were evaluated

a. (ii) Explain the results of that evaluation

a. (iii) Produce any report or other document regarding that evaluation

b. If not, explain why not.

c. State whether the recent notice of termination of Alcan's retail electric service agreement with Kenergy has led to the evaluation of the retirement, rather than idling, of any of Big Rivers' generating units.

c. (i) If so:

1. Identify which unit or units were evaluated

2. Explain the results of that evaluation

3. Produce any report or other document regarding that evaluation.

c. (ii) If not, explain why not.

Response) No.

a. N/A

b. Big Rivers has not evaluated the retirement, rather than idling, of any of its generating units as an option for mitigating the impact of the termination of the Century contract and/or the decline in off-system sales. Despite the fact that current wholesale electricity market prices are low, Big Rivers' generating units have significant remaining useful life and Big Rivers' members would be unduly harmed if Big Rivers were to retire assets instead of temporarily idling them. Although Big Rivers' members will continue to incur some costs over the next three years associated with idled units, Big Rivers' members will be able to reap significant benefits from the units in the future, either by selling wholesale power and using the proceeds to reduce member rates or by supporting the Western Kentucky economy by supplying power to industries.

c. The Alcan notice of termination has not led to the evaluation of retirement of any of Big Rivers generating units.

i. N/A

ii. See Item 23b.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 24) *Refer to p. 31 line 13 to p. 32 line 5 of the testimony of Robert Berry.*

a. *Identify and produce all production cost model input data that Big Rivers provided to ACES.*

b. *Identify which financial model ACES used, who is the vendor of the model, and whether the model is a proprietary model that requires a license in order to gain access to the files.*

c. *Produce, in machine readable format with formulas intact, all of the production cost modeling (including input and output files) and workpapers generated by ACES.*

d. *Identify and produce all PAR model output data that ACES provided to Big Rivers.*

e. *Please identify any changes to the input files that may be required to reproduce the modeling.*

    i. *If changes are required, please explain why such changes were made.*

f. *Please identify the assumptions, including any supporting documentation, Big Rivers or its agents used in each base case and sensitivity scenario that you modeled*

g. *If a license is required to obtain access to any information in this request, please explain how Sierra Club could obtain that license*

or, if they already have a license, who they should provide information to regarding the license to obtain the files

Response)

a. – g. Please see Big Rivers' response to AG 1-97 for all of the inputs submitted to ACES and Big Rivers' responses to PSC 1-57 and AG 1-236 for all the model outputs provided to Big Rivers from ACES. The only license required to view these inputs files to ACES and output files from ACES is a Microsoft Office license (Excel and Word).

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 25) *With regards to any modeling carried out for this application, identify for each of the years 2013 through 2031, and each of the Wilson, Green, Coleman, Reid, or HMP&L generating units, identify the annual assumed:*

a. *Non-environmental capital expenditures*

b. *Capital expenditures for pollution controls*

c. *Fixed O & M costs*

d. *Variable O & M costs*

e. *Fuel costs*

f. *Heat rate*

g. *Capacity factor*

h. *EFOR*

Response) Please see the attachment, which is being provided under a petition for confidential treatment. (Big Rivers' budget and financial plan only extends through 2016, not 2031.)

Witness) Robert W. Berry

Big Rivers Electric Corporation
Case No. 2012-00535
Attachment to Response SC 1-25

	Green Station (Excluding CMS)	2013	2014	2015	2016
a	Non-Environmental Captial Projects*	[redacted]			
b	Environmental Capital Projects*				
c	Fixed O&M				
d	VOM Cost ($) (includes capping/dredging)				
e	Fuel Cost ($) (includes startup)				
f	Heat Rate				
g	Capacity Factor				
h	EFOR				

	Reid/Station Two (Net of HMPL)	2013	2014	2015	2016
a	Non-Environmental Captial Projects*	[redacted]			
b	Environmental Capital Projects*				
c	Fixed O&M				
d	VOM Cost ($) (includes capping/dredging)				
e	Fuel Cost ($) (includes startup)				
f	Heat Rate				
g	Capacity Factor				
h	EFOR				

Big Rivers Electric Corporation

Case No. 2012-00535

Attachment to Response SC 1-25

	Coleman Station	2013	2014	2015	2016
a	Non-Environmental Captial Projects*				
b	Environmental Capital Projects*				
c	Fixed O&M				
d	VOM Cost ($) (includes capping/dredging)				
e	Fuel Cost ($) (includes startup)				
f	Heat Rate				
g	Capacity Factor				
h	EFOR				

	Wilson Station	2013	2014	2015	2016
a	Non-Environmental Captial Projects*				
b	Environmental Capital Projects*				
c	Fixed O&M				
d	VOM Cost ($) (includes capping/dredging)				
e	Fuel Cost ($) (includes startup)				
f	Heat Rate				
g	Capacity Factor				
h	EFOR				

* Excludes Capitalized Interest

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 26) ***Produce a copy of any assessment of each of the following that has been prepared by or for Big Rivers:***

(a) future natural gas prices

(b) future coal prices

(c) future market energy prices

(d) future market capacity prices

(e) future carbon costs, taxes, or emission allowance prices.

Response)

Please see the attachments in response to AG 1-236 where all future prices that were provided can be found on the Prices tab.

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 27) ***Identify Big Rivers' actual electric energy sales in MWh and actual peak loads in MW for each year since 2004.***

Response) The requested information is provided in the attachment to this response.

Witness) Lindsay N. Barron

Big Rivers Electric Corporation
Case No. 2012-00535

Attachment to Response for Sierra Club 1-27
Electric Energy Sales and Actual Peak Loads

	Actual Calendar Year 2004	Actual Calendar Year 2005
Total Electric Energy Sales - MWh	4,998,660	5,255,306
System Peak Demand-MW		
Winter Season	562	558
Summer Season	604	618

	Actual Calendar Year 2006	Actual Calendar Year 2007
Total Electric Energy Sales - MWh	5,250,342	6,163,594
System Peak Demand-MW		
Winter Season	593	604
Summer Season	631	653

	Actual Calendar Year 2008	Actual Calendar Year 2009
Total Electric Energy Sales - MWh	5,157,386	7,793,961
System Peak Demand-MW		
Winter Season	619	1,304
Summer Season	616	1,300

Big Rivers Electric Corporation
Case No. 2012-00535

Attachment to Response for Sierra Club 1-27
Electric Energy Sales and Actual Peak Loads

	Actual Calendar Year 2010	Actual Calendar Year 2011
Total Electric Energy Sales - MWh	11,969,420	13,255,125
System Peak Demand-MW		
Winter Season	1,367	1,375
Summer Season	1,393	1,441

	Actual Calendar Year 2012
Total Electric Energy Sales - MWh	12,244,082
System Peak Demand-MW	
Winter Season	1,422
Summer Season	1,507

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 28. *Identify Big Rivers' projected electric energy sales in MWh and projected peak demand in MW for each year of 2013 through 2030. State whether these projections assume the termination of both the Century and Alcan retail electric service agreements. If not, explain how those projections change in light of both terminations.*

Response) See the file provided in response to AG 1-80. These projections assume the termination of both Century and Alcan retail electric service agreements. Note that Big Rivers long term load forecast is for 15 years through 2027.

Witness) Lindsay N. Barron

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 29. *Refer to p. 5 lines 21-22 of the testimony of Lindsay N. Barron. Produce the 2011 Load Forecast and, in machine readable format with formulas intact, all attendant modeling (including input and output files) and workpapers.*

Response) Please see AG 1-79 for a copy of the 2011 Load Forecast, "2011 Load Forecast_BigRivers_09-07-11.pdf".

All modeling (including input and output files) and workpapers are on the CONFIDENTIAL CD accompanying these responses. Please note that to view modeling files with an .NDM extension requires a licensed copy of Itron's MetrixND software.

Witness) Lindsay N. Barron

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 30. *Refer to p. 6 lines 3-8 of the testimony of Lindsay N. Barron.*

a. Produce the load forecast used in the development of Big Rivers' budgets and this application, and all attendant modeling (including input and output files) and workpapers in machine readable format with formulas intact.

b. Identify all updates or changes made to the inputs or assumptions used in the 2011 Load Forecast in developing the load forecast for this application.

b. (i) Explain the basis for each such update or change to the 2011 Load Forecast.

Response)

a. Please see the spreadsheet provided in response to AG 1-231.

b. 1) Updated transmission loss rate.

2) Century load changed to zero, effective August 20, 2013.

3) Alcan load changed to zero, effective January 31, 2013.

4) Updated various direct serve load customers demand and energy.

b.(i.)

1) As a normal course of business Big Rivers' transmission loss rate percentage is recalculated in January of each year based on historical system information. Additionally as a result of the Alcan and Century loads going to zero, the percentage loss rate will increase. Big Rivers

estimated this new percentage and incorporated it into the load forecast.

2) On August 20, 2012 Big Rivers received a notice from Century indicating they would cease smelting operations effective August 20, 2013.

3) On January 31, 2013 Big Rivers received a notice from Alcan indicating they would cease smelting operations effective January 31, 2014.

4) Big Rivers incorporates changes in the load forecast regarding the demand and energy requirements of direct serve customers as they become known.

Witness) Lindsay N. Barron

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 31) *Refer to p. 5 line 3 through p. 6 line 3 of the testimony of Travis Siewert. Produce, in machine readable format with formulas intact, all of the financial modeling (including input and output files) and workpapers that Big Rivers generated for this proceeding.*

Response) Please reference the electronic files provided in response to PSC 1-57 and AG 1-239.

Witness) Chris A. Warren

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 32) *For each of the Wilson, Green, Coleman, Reid, or HMP&L generating units:*

a. Identify the estimated retirement date

b. Produce any analysis or assessment of the economics of continued operation of such unit

c. Produce any analysis or assessment of the impact that retirement of each unit would have on capacity adequacy, transmission grid stability, transmission grid support, voltage support, or transmission system reliability

d. Identify any transmission grid upgrades or changes that would be needed to permit the retirement of any of the units

e. Produce any analysis or assessment of the need for the continued operation of each unit.

Response)

a. Per Big Rivers 2012 Depreciation Study conducted by Burns & McDonnell Engineering the expected retirement dates for Big Rivers generating assets in "Scenario 1" on page II-4 are as follows:

Green Units 1 & 2	2041
HMP&L Units 1 & 2	2035
Reid Unit 1	2025
Wilson Unit 1	2045
Coleman Units 1, 2 & 3	2035

b. No analysis or assessments have been done.

c. See Big Rivers' response to PSC 2-21(f)(1).

d. Big Rivers has not performed the studies necessary to identify the transmission grid upgrades needed to permit the retirement of any of the generating units currently operating on its system.

e. See Big Rivers' response to PSC 2-21(f)(1).

Witness) Robert W. Berry

BIG RIVERS ELECTRIC CORPORATION

APPLICATION OF BIG RIVERS ELECTRIC CORPORATION
FOR A GENERAL ADJUSTMENT IN RATES
CASE NO. 2012-00535

Response to Ben Taylor and Sierra Club's Initial Request for Information dated February 14, 2013

April 25, 2013

Item 33) *For each of the following existing, proposed, or potential regulatory requirements, produce any evaluation of the pollution controls that would be needed, or the estimated costs that would be incurred, to bring each of Big Rivers' coal-fired electric generating units into compliance with the requirement:*

a. 1-hour SO2 NAAQS

b. The proposed Coal Combustion Residuals Rule

c. Section 316(b) of the Clean Water Act

d. Section 316(a) of the Clean Water Act

e. Clean Water Act effluent limitation guidelines

f. Clean Air Interstate Rule

g. Ozone NAAQS

h. PM2.5 NAAQS

i. Greenhouse gas New Source Performance Standards

j. MATS

Response) Relative to the aforementioned regulatory requirements Big Rivers offers the following:

a. No studies completed.

b. No additional studies completed after Sargent & Lundy LLC report of February 13, 2012.

SULLIVAN, MOUNTJOY, STAINBACK & MILLER PSC
ATTORNEYS AT LAW

Ronald M. Sullivan
'e T. Mountjoy
. rank Stainback
James M. Miller
Michael A. Fiorella
Allen W. Holbrook
R. Michael Sullivan
Bryan R. Reynolds*
Tyson A. Kamuf
Mark W. Starnes
C. Ellsworth Mountjoy

*Also Licensed in Indiana

April 25, 2013

Mr. Jeff Derouen
Executive Director
Public Service Commission of Kentucky
P.O. Box 615
211 Sower Boulevard
Frankfort, KY 40602-0615

In The Matter Of: *Application of Big Rivers Electric Corporation For A General Adjustment In Rates - Case No. 2012-00535*

Dear Mr. Derouen:

Enclosed for filing are an original and ten (10) copies of (i) Big Rivers Electric Corporation's response to Ben Taylor and Sierra Club's initial request for information; (ii) a petition for confidential treatment; and (iii) a motion for deviation.

I certify that on this date copies of this letter, the response, the petition, and the motion have been served on those parties listed on the attached service list by either Federal Express or hand delivery.

Sincerely,

TSLP

Tyson Kamuf

cc: Service List
Billie J. Richert

Telephone (270) 926-4000
Telecopier (270) 683-6694

100 St. Ann Building
PO Box 727
'boro, Kentucky
42302-0727

www.westkylaw.com