

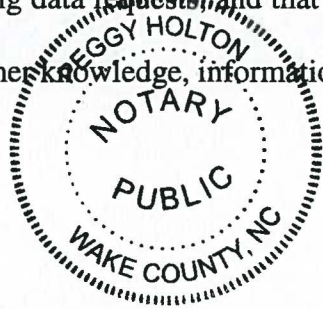
KyPSC Case No. 2019-00277
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VERIFICATION

STATE OF NORTH CAROLINA)
) SS:
COUNTY OF)

The undersigned, Candyce Marsh, Products & Services Manager, being duly sworn, deposes and says that she has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of her knowledge, information and belief.



Candyce Marsh
Candyce Marsh Affiant

Subscribed and sworn to before me by Candyce Marsh on this 13th day of November 2019.

Peggy Holton
NOTARY PUBLIC

My Commission Expires: 12/22/2021

VERIFICATION

STATE OF NORTH CAROLINA)
)
COUNTY OF MECKLENBURG) SS:

The undersigned, Tara Bolen, Products & Services Manager, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of her knowledge, information and belief.

Tara Bolen
Tara Bolen Affiant

Subscribed and sworn to before me by Tara Bolen on this 14 day of November 2019.

Carla Sechrest
NOTARY PUBLIC




My Commission Expires: 9/17/2024

VERIFICATION

STATE OF NORTH CAROLINA)
)
COUNTY OF MECKLENBURG) SS:

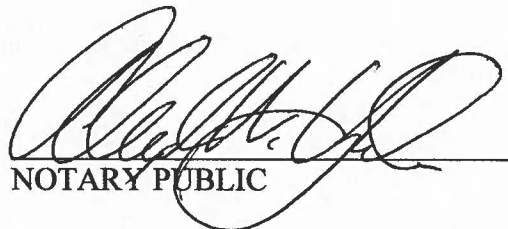
The undersigned, Nate Lewis, Senior Products & Services Manager, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing data requests, and that the answers contained therein are true and correct to the best of his knowledge, information and belief.



Nate Lewis Affiant

Subscribed and sworn to before me by Nate Lewis on this 11 day of Nov, 2019.





NOTARY PUBLIC

My Commission Expires: 03/22/2023

VERIFICATION

STATE OF OHIO)
) SS:
COUNTY OF HAMILTON)

The undersigned, Bruce L. Sailors, Pricing and Regulatory Solutions Manager, being duly sworn, deposes and says that he has personal knowledge of the matters set forth in the foregoing post-hearing data requests and that the answers contained therein are true and correct to the best of his knowledge, information and belief.

Bruce L. Sailors
Bruce L. Sailors, Affiant

Subscribed and sworn to before me by Bruce L. Sailors, on this 18th day of NOVEMBER, 2019.



ADELE M. FRISCH
Notary Public, State of Ohio
My Commission Expires 01-05-2024

Adele M. Frisch
NOTARY PUBLIC

My Commission Expires: 1/5/2024

**Duke Energy Kentucky
Case No. 2019-00277
Staff Second Set Data Requests
Date Received: November 7, 2019**

STAFF-DR-02-001

REQUEST:

Refer to Duke Kentucky's response to Staff's First Request for Information (Staff's First Request), Item 2b. Explain why Duke Kentucky is proposing to add Energy Star Advanced power strips to the Online Saving Store when the Total Resource Cost (TRC) and Rate Impact Measure (RIM) cost-effectiveness scores are less than one.

RESPONSE:

Duke Energy's online saving store would like to offer a variety of products to round out the program. Although an individual measure may not have greater than one TRC or RIM, the program overall is still passing.

PERSON RESPONSIBLE: Candyce Marsh

REQUEST:

Refer to Duke Kentucky's response to Staff's First Request, Item 3.

- a. Explain whether a Duke Kentucky customer must opt into the My Home Energy Report (MyHER) Program in order to view their usage and other information on the Duke Energy Mobile App.
- b. Provide the date of the proposed expansion on the MyHER program on the Duke Energy Mobile App.

RESPONSE:

- a. Duke Energy Kentucky customers must actively enroll in the program in order to view their My Home Energy Report information including home comparisons, usage disaggregation, and personalized tips.
- b. The team began work in Q3 2019 to build the home comparison visualizations and define the business rules. Work continues through Q4 2019 to build the Usage Disaggregation and Personalized Tips visualizations and business rules. The team will then build the customer enrollment visualizations and business rules with a target for implementation of all My Home Energy Report information late in Q1 2020.

PERSON RESPONSIBLE: Tara Bolen

Duke Energy Kentucky
Case No. 2019-00277
Staff Second Set Data Requests
Date Received: November 7, 2019

STAFF-DR-02-003

REQUEST:

Refer to Duke Kentucky's response to Staff's First Request, Item 4b, Attachment, page 1 of 1. For each measure whose TRC cost-effectiveness score is less than one, explain why Duke Kentucky is proposing the demand-side management (DSM) measure.

RESPONSE:

The Company would like to ensure that our non-residential customers are given the opportunity to maximize energy savings by offering incentives on a comprehensive collection of measures from all applicable technologies. While important, ultimately, we view cost effectiveness at the individual measure level secondary to achieving the goal of offering a comprehensive and overall cost-effective program.

Collectively, these 38 food service measures have an average TRC score of 1.55. And as mentioned previously, the 38 food service technologies in question are not new measures being added/modified, but instead we are asking to reintroduce these measures that were removed as a result of the Order for Case No. 2017-00427, including the 15 measures that have a TRC cost-effectiveness score of less than one. Having offered incentives on these measures previously, we feel that reintroducing these measures would further our goal of offering a comprehensive prescriptive incentive program and encourage customer participation overall.

PERSON RESPONSIBLE: Nate Lewis

Duke Energy Kentucky
Case No. 2019-00277
Staff Second Set Data Requests
Date Received: November 7, 2019

STAFF-DR-02-004

REQUEST:

Refer to Duke Kentucky's response to Staff's First Request for Information, Item 6b. Also, refer to Case No. 2019-00271.¹ Explain why the new CIS deployment project, as described in the Direct Testimony of Retha Hunsicker in Case No. 2019-00271, does not allow for the credit associated with a Critical Peak Event to be automatically calculated.

RESPONSE:

Calculating the credit amount for a Critical Peak Event requires multiple computations and involves statistical analysis (i.e., regression analysis). See AG-DR-01-010(a) and the associated attachment for a description of the baseline calculation process. The Peak Time Rebate pilot program requires the calculation of individual customer baselines and then comparing the baseline to actual customer usage during the event window. This type of analysis is better suited for a statistical software package instead of duplicating this functionality in a billing system. This type of analysis is not planned for Customer Connect. In the future if the PTR pilot becomes a permanent program, the interface between the baseline calculation engine and the billing system may be reviewed to improve the process.

PERSON RESPONSIBLE: Bruce L. Sailors

¹ Case No. 2019-00271, *Electronic Application of Duke Energy Kentucky, Inc., for 1) an Adjustment of the Electric Rates; 2) Approval of New Tariffs; 3) Approval of Accounting Practices to Establish Regulatory Assets and Liabilities; and 4) All Other Required Approvals and Relief* (Ky. PSC filed Sept. 3, 2019).

**Duke Energy Kentucky
Case No. 2019-00277
Staff Second Set Data Requests
Date Received: November 7, 2019**

STAFF-DR-02-005

REQUEST:

Refer to Duke Kentucky's response to Staff's First Request, Item 7(a)vii. Explain what is meant by the statement that acquisition efforts are subject to the proposed budget.

RESPONSE:

The stipulation in Case No. 2016-00152 required the Company to development annual marketing costs and caps for this pilot program. See AG-DR-01-012(c) for additional marketing cost information. While the Company requests the flexibility to move marketing dollars between years, the Company intends to adhere to the total marketing budget. If the target enrollment is not reached before all funds are depleted, no additional funding would be available for incremental acquisition efforts.

PERSON RESPONSIBLE: Bruce L. Sailors

**Duke Energy Kentucky
Case No. 2019-00277
Staff Second Set Data Requests
Date Received: November 7, 2019**

STAFF-DR-02-006

REQUEST:

Refer to Duke Kentucky's Response to Staff's First Request, Item 12, and Duke Kentucky's response to the Attorney General's First Request for Information, Item 14. Provide a copy of any similar Peak Time Rebate (PTR) programs Duke Kentucky used for research in the development of the proposed PTR program.

RESPONSE:

The only similar PTR program used for research in the development of the proposed PTR program is the 2015 Duke Energy Carolinas Peak Time Credit pilot. A report on this pilot program is provided as STAFF-DR-02-006 Attachment.

PERSON RESPONSIBLE: Bruce L. Sailors

Duke Energy Carolinas Peak Time Credit Pilot Report to the North Carolina Utilities Commission

December 2015

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I. Executive Summary

In compliance with the North Carolina Utilities Commission (Commission) *Order Granting General Rate Increase*, issued on September 24, 2013 in Docket No. E-7, Sub 1026 (Order), Duke Energy Carolinas (DEC) implemented the Peak Time Credit (PTC) pilot rate schedule in North Carolina. Implementation of the pilot rider focused on three primary goals:

- Assess whether customers are willing to enroll in a peak time rebate program (i.e. also referred to as critical peak rebate programs in some literature).
- Determine the extent to which the PTC rider motivates customers to make behavioral changes and shift their usage (i.e., load impacts).
- Research and identify improvements to the customer experience on the pilot.

In addition, improvements were identified for a possible larger implementation.

A summary of the major findings are provided below.

- Enrollment
 - Acquisition rates of 5.7% residential and 2.3% small commercial are well above previous acquisition rates for Duke Energy rate pilots showing that customers are willing to enroll in a peak time credit rider.
- Customer Experience
 - The Company did not receive any disputes related to credit amounts or any requests for detailed information about baseline calculations. This suggests that the baseline method used in the pilot is acceptable to most customers or is not a significant concern to participants.
 - Survey respondents state that they...
 - most often avoided or reduced the use of HVAC, lighting, laundry appliances, dishwashers, and computers to reduce consumption during Critical Peak Events (CPEs).
 - find the credit amounts to be either about what they expected or lower than they expected.
 - want more performance feedback.
 - would recommend the PTC rider to friends or colleagues and
 - would participate in both a future summer and winter PTC offer.
 - The design of peak time rebate style programs facilitates payment of incentives for some load reduction that may not necessarily be based on participant actions in response to the CPE. Critical or variable peak pricing tariffs help to alleviate this issue.
 - Potential enhancements to the PTC pilot include:
 - Offering a technology solution (e.g., a thermostat or HVAC cycling device) to facilitate customer participation.
 - Providing more detailed information and feedback on event performance.

- Reviewing and potentially altering the incentive structure.
- Load Impacts
 - Between 57% to 71% of participants confirmed their desire to attempt load reduction during CPEs.
 - Over all events, participants reduced 7,726.5 kWh in gross load reduction not adjusted for line losses.
 - Participants demonstrated load reduction during CPEs and received \$2,627.08 in bill credits for their efforts based on their gross load reduction and the credit of \$0.34/kWh. However, using the total net load reduction, instead of gross, not adjusted for line losses of 3,008 kWh, the average incentive paid is \$0.87/net kWh.
 - On average, net load reduction per CPE participant per hour ranged from 0.11 kWh for SGS low usage customers to 0.51 kWh for RE high usage customers.
 - As a group, the SGS customer load profile may not support participation on a PTC offer for the hours of 3 PM to 7 PM during summer months since the business hours of small commercial businesses appears to dictate power usage.
 - There is evidence of a slight decline in load reduction percentage during the late hours of the CPEs as well as rebound consumption after CPEs end.
- Future Implementation
 - For larger scale implementation, several issues may be addressed including:
 - Automation of billing, metering, and customer contact systems to reduce the manual effort required to operate the rider.
 - Examination of the cost effectiveness of the rider in a demand side management (DSM) framework including a determination of the appropriate load reduction measurement and the appropriate incentive amount.
 - Determination of whether or not the rider should be designated a DSM program with the appropriate revenue recovery mechanism.
 - Coordination and integration of the rider with existing demand response and energy efficiency programs.
 - Exploration of alternative rate designs that incent load reduction during CPEs.
 - Consideration of the benefits and costs of customer engagement improvements, specifically, enabling technology.

Based on the PTC pilot experience and information in this report, DEC will continue to evaluate dynamic pricing rate options in the future. DEC commits to discuss another dynamic pricing pilot or a dynamic pricing program with the DEC Energy Efficiency Collaborative in 2016.

II. Background

The Company submits the attached report on the PTC pilot rider in compliance with the Commission's Order. The Order states on page 80 that,

"(3) The Company shall, within 15 months of the date of the Approval Order, propose a pilot peak-time rebate (PTR) or critical peak pricing (CPP) dynamic pricing rate structure."

Rider PTC was filed with the Commission on November 7, 2014, and subsequently approved on April 20, 2015. On September 30, 2015, all participation in Rider PTC was ended as detailed in the rider. This report will provide support for Company's proposed plan for further study on dynamic pricing options in the Company's North Carolina (DEC-NC) service area.

III. Pilot Description

Rider PTC is provided in Appendix A. A brief summary of the PTC Rider is provided below for convenience.

- Rider PTC was available to customers on rate schedules RS, RST, RE, RET, SGS, and SGST. These rate schedules encompass residential customers, including all electric customers, and small general service customers.
- A limit of 100 participants per rate schedule for a maximum of 600 participants in total was established to accommodate the manual billing processes associated with the pilot.
- Customers received a credit on their bill of \$0.34 / reduced kWh during Critical Peak Events (CPEs).
- CPE hours were 3 PM to 7 PM.
- Participants were notified through email of a CPE the day prior to the CPE.
- Participation in events was voluntary.
- Participants were required to confirm their intent to participate in a CPE by responding to the email notification. Receipt of a participant's reply was required prior to the end of the CPE.

As stated by Mr. Jeffrey Bailey in his direct testimony in Docket No. E-7, Sub 1026 on page 17,

"These TOU and potential peak time rebate pilots will allow selected customers the opportunity to shift and or curtail load and make more informed decisions relative to the prices they pay for electricity."

Given this opportunity for customers, the Company explores the following items in this report to:

- o assess whether customers are willing to enroll in a peak time rebate program (i.e., also referred to as critical peak rebate programs in some literature),

- research and identify improvements to the customer experience on the pilot,
- determine the extent to which the PTC rider motivates customers to make behavioral changes and reduce their usage during CPE hours.

Information collected on these topics, as well as the four specific reporting elements recommended by Public Staff will be discussed in this report. For quick reference, the four reporting items recommended by Public Staff and in the Commission's Order are displayed here.

1. The method of calculating load reductions, increases, and baselines for a representative sample of participants.
2. The weather conditions on critical peak event days, as well as the days used in the baseline calculations.
3. Any instances in which participants failed to acknowledge receipt of the email CPE notifications.
4. Any disputes over the determination of the bill credits, including the calculations provided to any participant that disputed the amount of its credit.

In addition, Company will discuss issues surrounding expansion of the pilot into a larger program.

IV. Pilot Operations and Customer Experience

A. PTC Launch: Acquisition & Attrition

DEC marketed the PTC pilot shortly after the rider was approved by the Commission. The acquisition plan involved email and direct mail to customers in each of the 6 eligible rate schedules. It was quickly realized that very few customers in rates RST, RET, and SGST (i.e., Pilot TOU Rates) would be eligible for the PTC pilot due to metering limitations and that acquisition of 100 participants for these schedules would be unlikely. For the other schedules, RS, RE, and SGS, the Company desired a diverse group of participants within each rate schedule and therefore split target customers into 2 groups: low usage customers and high usage customers. The Company acquired an approximately even number of participants from each usage level in each rate schedule: RS, RE, and SGS (i.e., together referred to as the Pilot Standard Rates). Company received unexpectedly high enrollment rates for each of the Pilot Standard Rates. Although there is a stated enrollment limit of 100, up to approximately 120 customers were enrolled from each Pilot Standard Rate. The Company exceeded the enrollment limit due to its acquisition experience in 2014 related to time-of-use (TOU) pilots with the Pilot TOU Rates where customers enrolled but subsequently left the pilot for various reasons; some even before being placed on the TOU rate. However, the attrition experienced in the Pilot TOU Rates was not experienced during the PTC pilot. Tables 1 & 2 below summarize acquisition and attrition results.

Table 1: PTC Pilot Acquisition

Total Enrollment Requests – Customer Accounts				
Group	Type	Number Received	Sign Ups	Response Rate
Residential Email RS/RE sent 4/23/15	Email (RS)	4,646	257	5.5%
	Email & Direct Mail (RE)*	1,624	79	4.9%
	Direct Mail Only (RE Only)	3,422	211	6.2%
Residential Email RST/RET sent 4/23/15	Email	45	8	17.8%
	Direct Mail	7	2	28.6%
SGS Email sent 4/23/15	Email	7,598	123	1.6%
	Direct Mail	12,000	333	2.8%
SGST Email sent 4/23/15	Email	40	-	0.0%
	Direct Mail	19	1	5.3%
Grand Total		29,401	1,014	3.4%

*Some email recipients also received direct mail.

Acquisition activities resulted in an overall residential acquisition rate of 5.7% and an overall small commercial acquisition rate of 2.3%. Company enrolled a total of 379 customer accounts in the PTC pilot. It is unknown whether or not TOU pilot participants would have responded similarly since most TOU pilot participants did not have the interval meter required for the PTC pilot.

Table 2: PTC Pilot Enrollment

Customer Accounts Enrolled								
Usage Level	Rate→	RS	RST	RE	RET	SGS	SGST	All Rates
Average and Above Usage		63	2	60	3	60	-	188
Below Average Usage		58	4	60	1	67	1	191
Total		121	6	120	4	127	1	379

Attrition from the program was low. Since event participation was optional, the Company suspects that participants were not motivated to terminate their participation even if they didn't like the program. In addition, PTC participants were aware that the pilot would end automatically on September 30. For these reasons, the only attrition from the program was from customer accounts becoming inactive (i.e., moving). It could therefore be suggested that the attrition rate is less than the 1.6% implied rate (i.e., 6 / 379) since customers were not recruited to participate at their new residence.

Table 3: PTC Pilot Attrition

Attrition - Customers Who Left the Pilot and Why							
Reason	RS	RST	RE	RET	SGS	SGST	All Rates
Moved	2	-	1	1	2	-	6
Total	2	-	1	1	2	-	6

B. Customer Inquiries

During the PTC pilot, DEC received relatively few inquiries with the vast majority of inquiries related to assistance with enrollment. Tables 4 and 5 below capture the PTC pilot inquiries for residential and small commercial customers respectively.

Table 4: Residential Inquiries

Total Inquiries for RS/RST and RE/RET Participants	
Inquiry Category	Grand Total
Assisted in signup	98
Sign up Question	8
Change email address	4
Baseline question	3
Question regarding Credit amount	3
Event Times	2
Event Participation Request	2
Energy Advice	1
Total	121

Table 5: Small Commercial Inquiries

Total Inquiries for SGS/SGST Participants	
Inquiry Category	Grand Total
Assisted in signup	104
Sign up Question	10
Rate Question	5
Baseline question	2
Event Times	2
Change email address	1
Total	124


The three residential inquiries related to credit amounts may be of interest to the Commission. All three inquiries were related to where the credit was displayed on the customer's bill. ***There were no credit amount disputes regarding either an amount credited or the absence of a credit.*** In addition, the Public Staff has previously shown interest in baseline questions. ***A total of 5 customers inquired about the baselines developed in the program. All 5 inquiries were addressed by Energy Specialists and the customers received a description of how baselines were calculated.*** No follow-up inquiries were received seeking more details or information on baseline calculations.

C. Customer Communications

Multiple communications were sent to customers throughout the duration of the pilot that provided information as well as directed them to information on Company's website. These materials included acquisition materials (emails and website materials that included text information and videos), disqualification emails, event notifications, and an end-of-pilot announcement email. The following figure is an example of the acquisition email sent to residential customers.

Figure 1: Residential Acquisition Email

This message contains graphics. If you do not see the graphics, [click here to view](#).



Get paid to use less.

Enroll before the events begin on June 1st to start saving!

The Peak Time Credit pilot program gives you up to 15 chances to earn credits on your bill this summer, just for using less electricity during times of very high demand.

- Use less electricity than usual on 10 to 15 specific weekday afternoons between 3 p.m. and 7 p.m.
- Get credits on your bill.

The less you use, the more you earn.

Have questions? Call us at 800.823.7966 (M-F, 8 a.m. - 5 p.m.) or email us at peaktimecredit@duke-energy.com.

[Learn more](#)

Be the first to test this new program and save.

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The next communication is a template for the confirmation of enrollment email.

Figure 2: Enrollment Confirmation Email

INSERT BANNER

Insert Customer's first Name

Welcome to the Peak Time Credit pilot program! We received and accept your application to participate in the program and appreciate your willingness to be a part of this important test. Here are the next steps:

From June 1st through September 30th, Duke Energy will call 10 to 15 Peak Time Events when peak energy demand is expected to be high – usually the hottest days. These events will only occur on weekdays, Monday through Friday, and last four hours from 3pm to 7pm. You can earn a credit of 34 cents per kWh for any energy use you shift or reduce during the peak event's four-hour time period.

Look for email notifications: We'll notify you via email by 5pm the day before the event. To earn your credits, you must reply to our email by 7pm on the day of the peak event. Confirm your participation in each event by clicking the "Confirm Here" button in each of our event emails. Every credit you earn will be applied to your bill within 2 months.

If you have questions, contact us at 800-823-7966 or at PeakTimeCredit@Duke-Energy.com.

Thanks again for participating.

Dan B.
Smart Energy Specialist
Duke Energy

In addition, Appendix B contains a copy of the residential Frequently Asked Questions (FAQs) provided on the Company's website for customers to review before enrollment.

The next figure is a template for the disqualification emails.

Figure 3: Disqualification Email Example

From: Duke Energy [PeakTimeCredit@Duke-Energy.com]
Subject: Information about Peak Time Credit Pilot Program

This message contains graphics. If you do not see the graphics, [click here to view](#).

INSERT BANNER

We recently received your request to participate in Duke Energy's Peak Time Credit pilot program but unfortunately we are unable to enroll you into the pilot at this time.

We have reached the required number of pilot enrollments. We appreciate your interest and encourage you to participate in future pilot programs.

If you have any questions about this letter, please do not hesitate to call or email us.

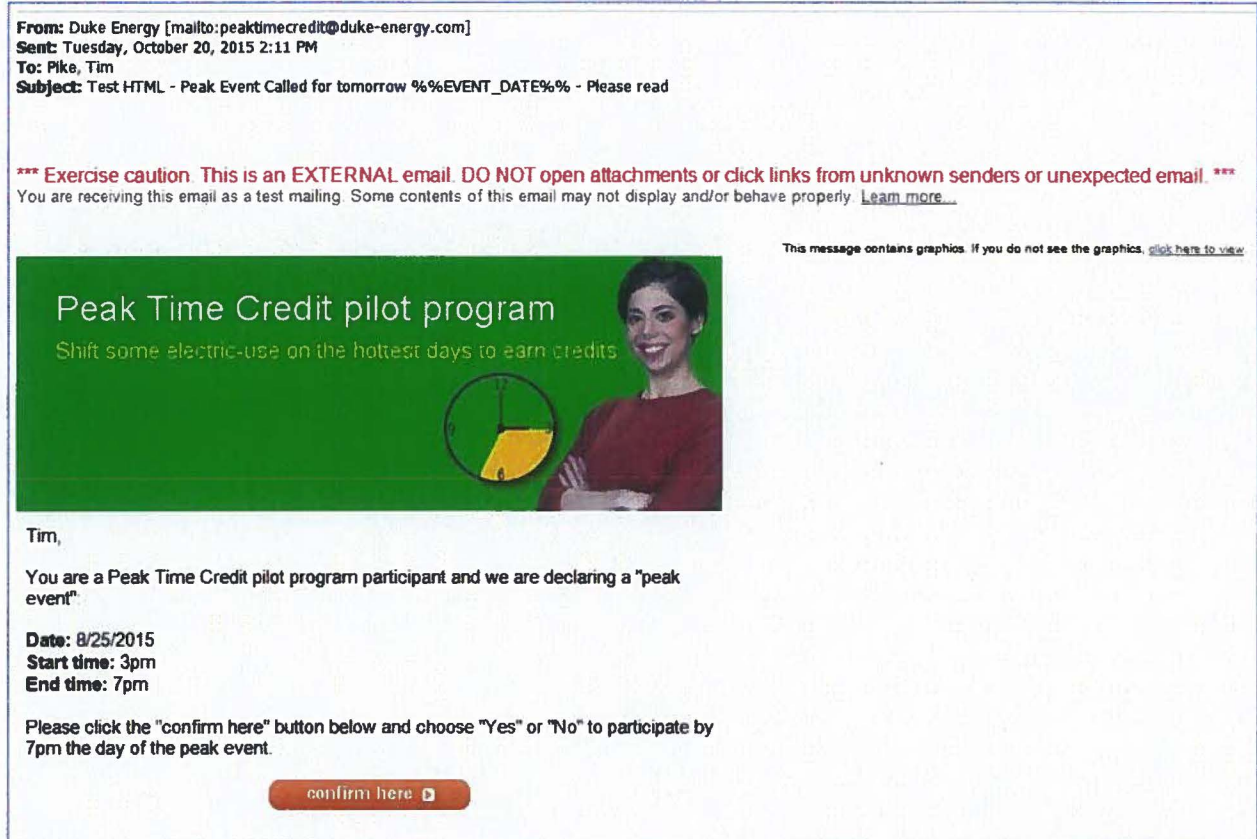
Thank you.

Dan B.
Smart Energy Specialist
Duke Energy
800-XXX-XXXX
PeakTimeCredit@Duke-Energy.com

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[Duke Energy](#) • 550 South Tryon Street • Charlotte, NC • 28202

The next communication is an email example for notification of a critical peak event.

Figure 4: Critical Peak Event Notification Email



The last communication sent to pilot participants is the end-of-pilot announcement. Figure 5 displays this email.

Figure 5: End of Pilot Notification

From: Duke Energy [PeakTimeCredit@duke-energy.com]
Subject: The Peak Time Credit Pilot is coming to a close!

INSERT Peak Time Credit BANNER

Dear <Insert Customer's Name>

Thank you for being a part of the Peak Time Credit Pilot.

This pilot will end on Sept. 30, 2015. After that date, you will no longer be able to participate in peak events, although credits from past events may show up on your bill through Oct. 31, 2015.

We greatly appreciate your participation in the <Insert # of total events> peak events during the pilot. To help us better understand your experience we would appreciate your feedback via the survey below. The survey will remain open until Sept. 30.

Button: Take Survey Now. (populate with unique Identifier)

Once again, thank you for your participation. Customers like you are helping to shape the future of rate options in North Carolina.

If you have any questions, please do not hesitate to call or email us using the contact information below.

Dan B.
Smart Energy Specialist
Duke Energy
800.823.7966
PeakTimeCredit@duke-energy.com

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Duke Energy • 550 South Tryon Street • Charlotte, NC • 28202

D. Customer Surveys

In connection with the end of the PTC pilot, the Company sent a survey to current participants via email to research their experience. The survey can be found in Appendix C. The table below summarizes the surveys sent out and the surveys returned. In total, 81 surveys were completed and reviewed. Note that the number of completed surveys is relatively small.

Table 6: Email Survey Counts

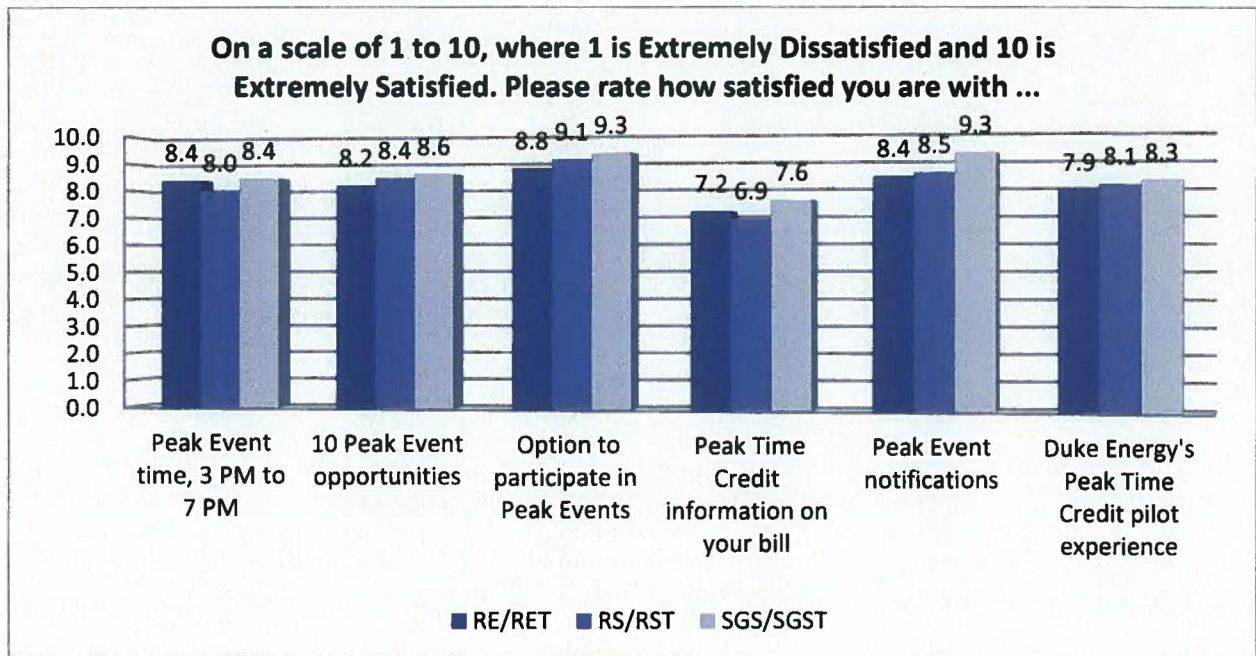
	RS/RST	RE/RET	SGS/SGST
Surveys Emailed	125	122	120
Surveys Completed	28	37	16

The survey information will be organized into sections on Customer Satisfaction, Behavior Changes, Suggestions for Improvement, and Future Participation.

1. Customer Satisfaction

Figure 6 displays satisfaction ratings for several aspects of the pilot rate as well as overall pilot experience satisfaction. From the graph, it appears that customers are satisfied most with the option to participate in events and satisfied least with information/feedback provided to them on their bill. The mean values between these two questions is statistically different for each of the rate classes.

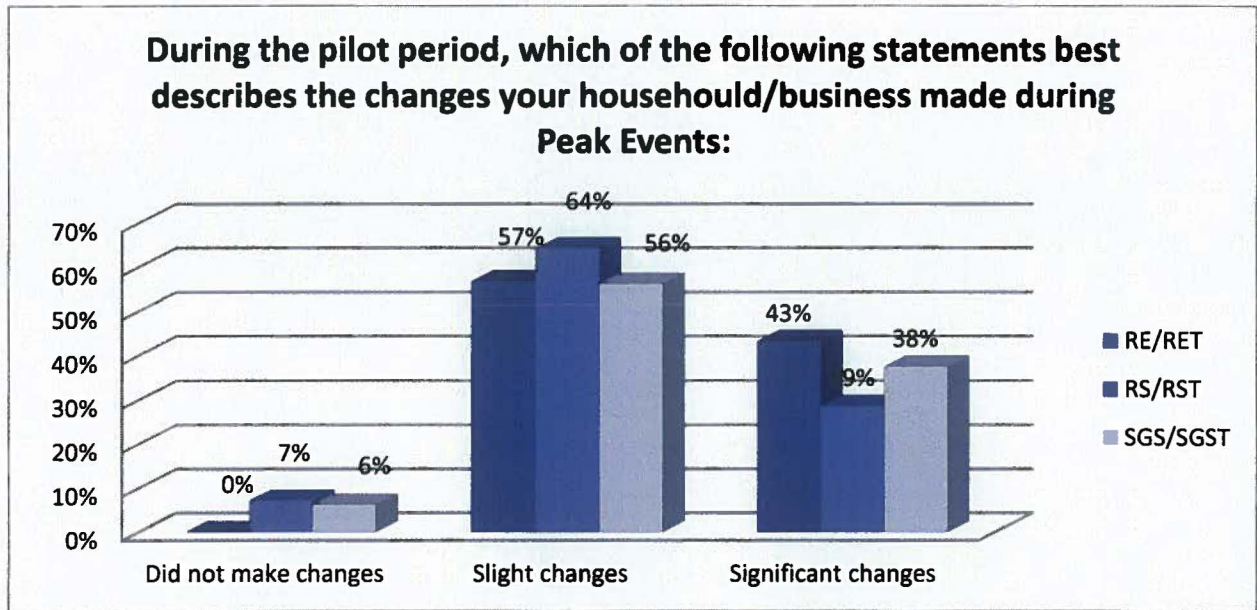
Figure 6: PTC Pilot Feature Satisfaction



2. Behavior Changes

Most survey respondents state that they either made slight or significant changes during event periods. Figure 7 shows that most respondents said they made slight changes.

Figure 7: PTC Pilot Stated Behavior Change During Events



These slight and significant changes were made to appliances that participants have at their disposal to reduce usage. Residential customers concentrated on HVAC and laundry appliances along with some oven and lighting reduction, see Figure 8. Commercial participants concentrated on HVAC, Lighting, and computer usage, see Figure 9.

Figure 8: Residential Behavior Change During Events - Appliances

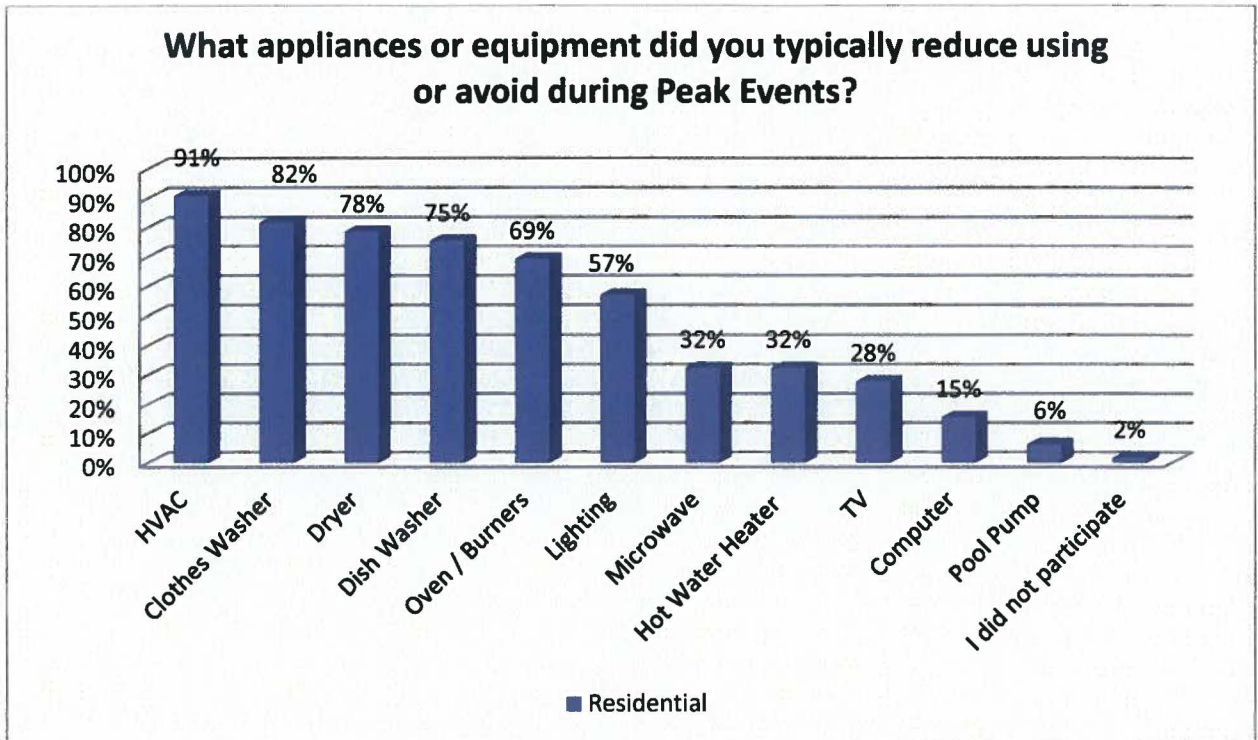
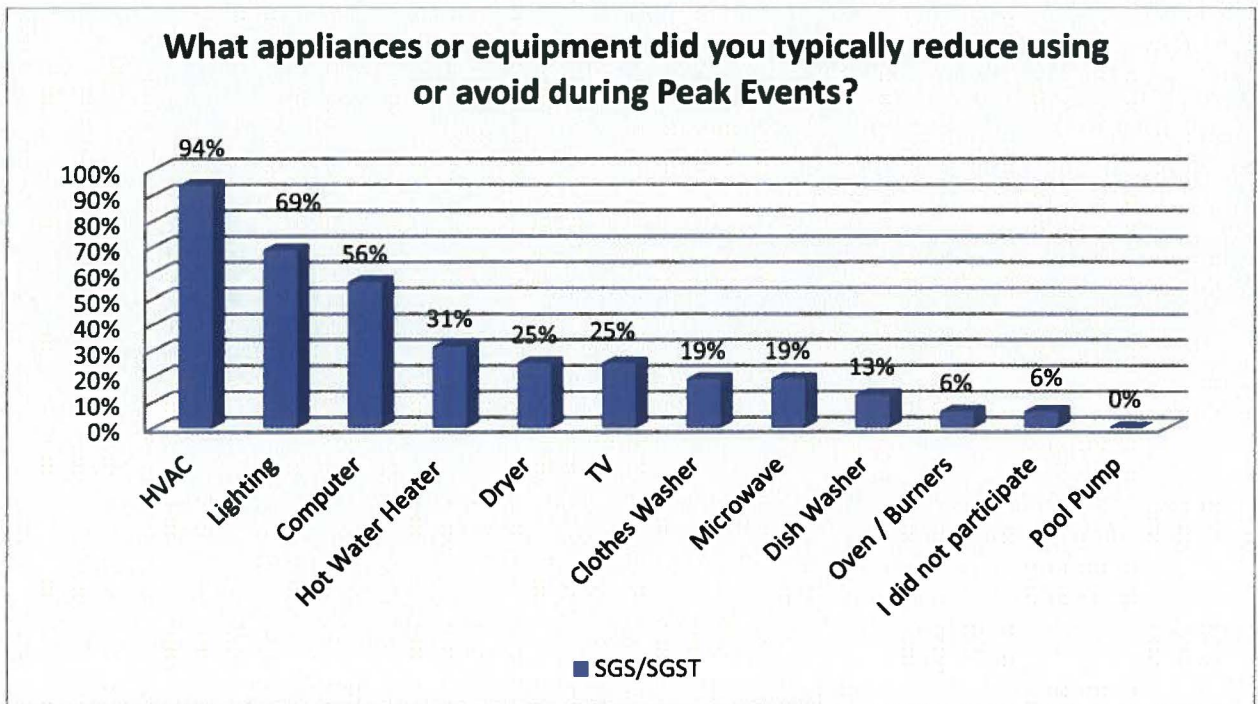
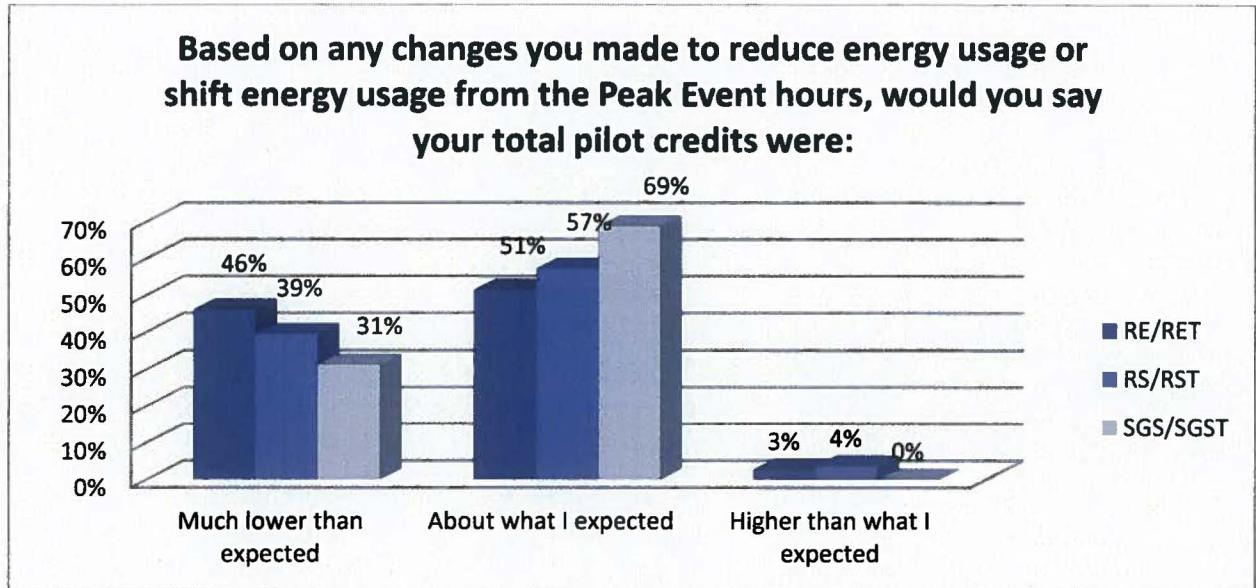


Figure 9: Small Commercial Behavior Change During Events - Appliances



Based on these changes, overall, participants thought the credits received were about what they expected with few participants perceiving that the credits were higher than expected. See Figure 10.

Figure 10: PTC Participants Perception of Credit Amount



3. Suggestions for Improvement

Participants were provided a text box in the survey to write suggestions for improvement. Company received a variety of responses which are grouped into categories below.

- Provide Better Feedback on Performance (8)
- Good Pilot / No Changes (6)
- Provide More Savings / Not Worth My Effort or Inconvenience (6)
- Provide More Advance Notice (6)
- Confusing Location of Credits on Bill / Confusing Credits with EPP (3)
- Have More Events / Extend Hours for More Savings (2)

4. Future Participation

The Company asked several questions to participants on potential participation in a similar, future program. Figures 11, 12, and 13 below display results. Although there are flaws with a credit/rebate style pricing program as discussed in this report below, these figures demonstrate a positive aspect of the peak time credit pricing design which is that customers understand the concept and have the choice to participate or not under a risk free structure.

Figure 11: Would You Recommend the PTC Pilot?

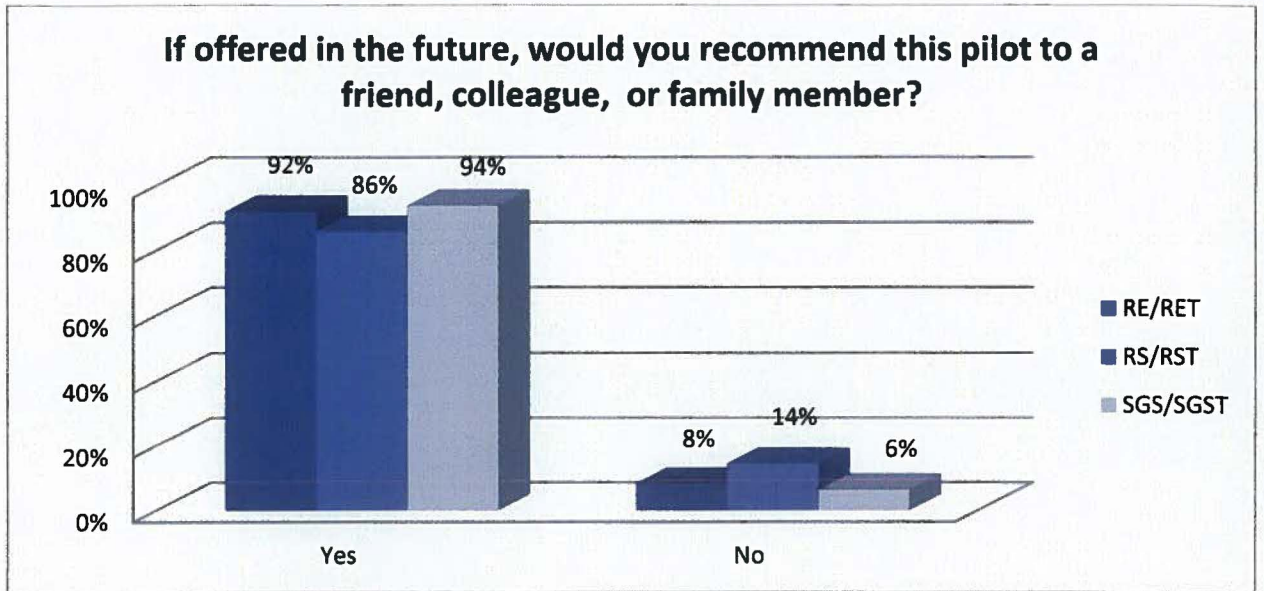


Figure 12: Would You Participate in the Future - Summer

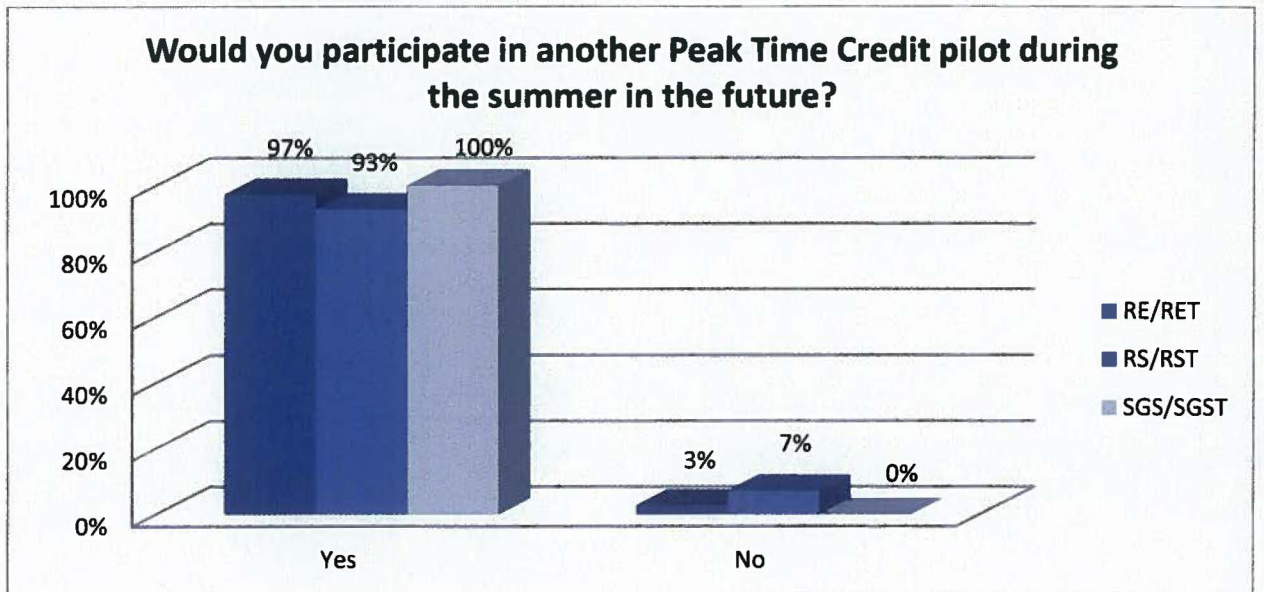
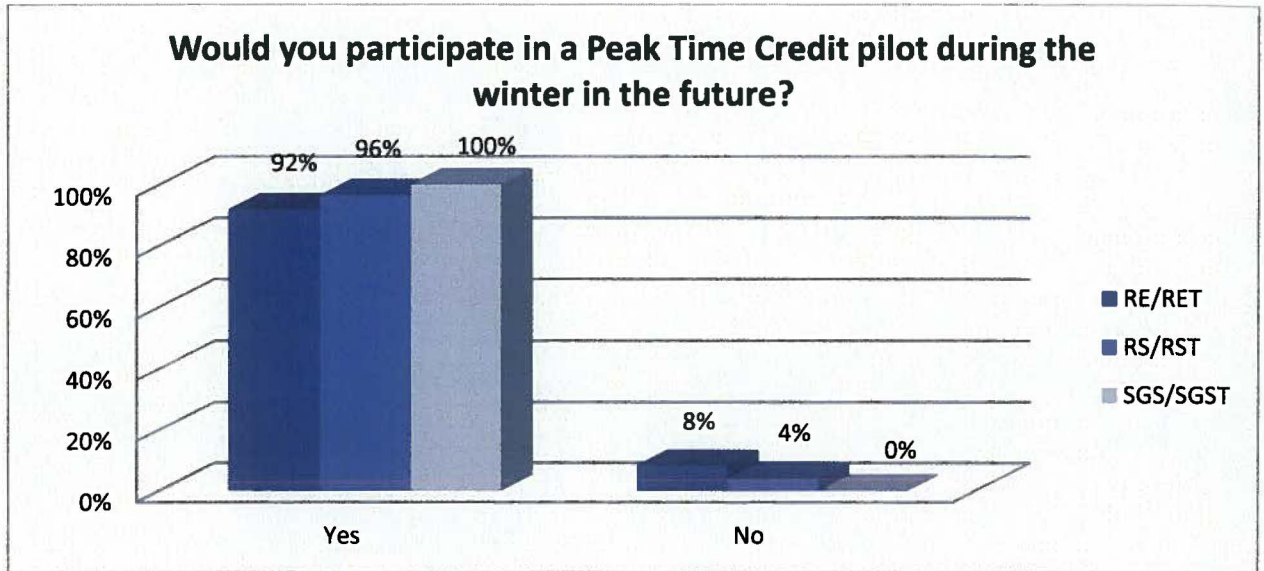
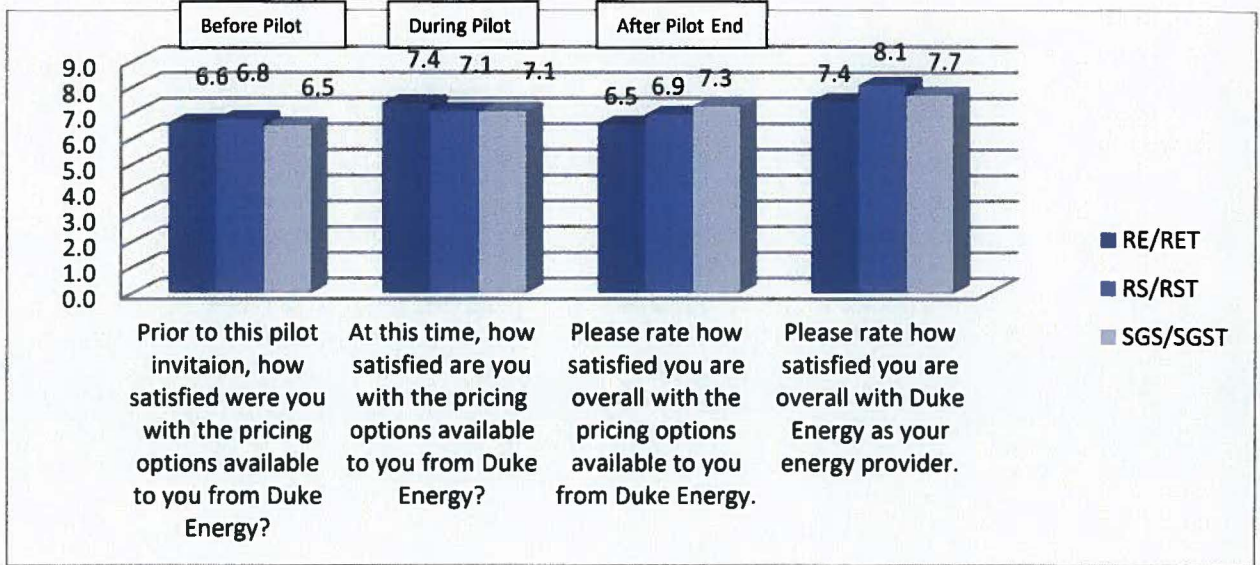


Figure 13: Would You Participate in the Future - Winter



Finally, Company asked another set of questions related to participants' satisfaction with Duke Energy pricing options. This information was collected at both the beginning of the pilot and at the end. At the beginning of the pilot, participants were asked to provide their level of satisfaction with their available pricing options before they learned about the PTC pilot and after they learned about the PTC pilot. As reflected in the chart, there is an increase in stated satisfaction. This increase is statistically significant only for rate group RE/RET. At the end of the pilot, customers were asked this question again. As expected, given that the pilot was now over, satisfaction returned to approximately its previous levels for residential participants. Note, however, that commercial participants' satisfaction with their pricing options did not degrade like residential customers even though the pilot ended. Again, the changes in the average satisfaction value is only statistically significant for rate group RE/RET.

Figure 14: Pricing Option and Overall Satisfaction



E. Critical Peak Events

The summer of 2015 provided numerous days with hot weather on which to collect information on how participants respond to CPEs. Ten CPEs were implemented over the summer to assess customer response to event implementations, leaving multiple hot weather days to also collect information on customer load profiles absent a CPE. The Public Staff showed particular interest in how customers acknowledged the events given the acknowledgment requirement to participate in a CPE. Table 7 below captures the participation information for each of the 10 CPEs.

Table 7: Critical Peak Event Participation

Event Date	Emails Sent	Emails Received	Emails Opened	"Yes" Replies	"No" Reply (Or a Yes Reply after deadline)	Total Non-Participants	Percent Participating in Event	How Many Reduced Load	Percent Who Reduced Load
June 16, 2015	379	378	314	270	5	109	71%	224	59%
June 17, 2015	379	378	304	256	2	123	68%	226	60%
June 22, 2015	379	378	293	232	1	147	61%	173	46%
June 24, 2015	379	378	303	258	3	121	68%	229	61%
July 9, 2015	379	379	281	236	8	143	62%	203	54%
July 10, 2015	379	378	273	219	11	160	58%	180	48%
July 20, 2015	379	376	255	214	6	165	57%	181	48%
August 3, 2015	379	375	282	224	8	155	60%	186	50%
August 4, 2015	379	375	274	222	8	157	59%	182	49%
August 5, 2015	379	375	265	221	10	158	59%	199	53%

Table 7 above documents a range of participation in CPEs from 57% to 71%. There does appear to be an overall downward trend in participation as the summer continued. More details on those customers who reduced load will be provided below in the load impact section. Table 8 shows a distribution of how customers participated across the 10 implemented CPEs. This table can be interpreted as follows. For example, 42 participants (11.1%) never replied YES to participate in a CPE. At the other extreme, 88 participants (23.2%) replied YES to all 10 CPEs.

Table 8: Participation Consistency in CPEs

Counts and Percentages of Participants Replying YES to a Number of Events			
# of Events	All Count	All	Box
0	42	11.1%	26.4%
1	17	4.5%	
2	20	5.3%	
3	21	5.5%	
4	19	5.0%	17.9%
5	24	6.3%	
6	25	6.6%	
7	30	7.9%	55.7%
8	41	10.8%	
9	52	13.7%	
10	88	23.2%	
Total	379	100%	100%

Another specific point of interest requested from the Public Staff was the weather conditions on event days and non-event days. The daily weather conditions (i.e., average heat index from 3 PM to 7 PM) are displayed in Table 9 below. Note that CPE days are highlighted in yellow and weekends are shaded in grey.

Table 9: Average Daily Heat Index

Year	Month	Day	Average Heat Index - 3 PM to 7 PM		
			Charlotte	Greensboro	Hickory
2015	6	1	84.8	83.6	83.2
2015	6	2	76.2	77.9	69.8
2015	6	3	68.7	62.3	64.8
2015	6	4	74.8	66.7	73.6
2015	6	5	82.8	78.7	78.5
2015	6	6	87.3	84.8	84.5
2015	6	7	83.5	82.1	82.5
2015	6	8	86.1	86.2	79.9
2015	6	9	87.4	85.9	84.7
2015	6	10	85.4	87.6	87.1
2015	6	11	89.4	89.8	86.3
2015	6	12	89.9	89.4	79.9
2015	6	13	93.8	92.2	90.2
2015	6	14	95.7	94.8	92.2
2015	6	15	96.8	95.7	93.5
2015	6	16	97.8	97.0	94.5
2015	6	17	98.3	94.6	86.5
2015	6	18	98.9	92.7	87.7
2015	6	19	94.7	88.2	82.5
2015	6	20	89.1	91.2	87.5
2015	6	21	96.7	94.3	93.4
2015	6	22	94.7	94.6	89.2
2015	6	23	98.3	97.4	95.2
2015	6	24	98.2	94.7	97.2
2015	6	25	98.5	96.4	93.2
2015	6	26	98.1	83.9	94.8
2015	6	27	79.0	80.5	82.6
2015	6	28	82.3	81.2	80.2
2015	6	29	84.6	83.2	81.2
2015	6	30	85.1	83.4	86.7
2015	7	1	87.0	87.1	81.1
2015	7	2	85.5	79.7	81.7
2015	7	3	86.4	79.4	80.6
2015	7	4	86.4	88.0	85.3
2015	7	5	86.6	83.6	84.2
2015	7	6	91.0	87.4	87.4
2015	7	7	93.1	91.4	90.4
2015	7	8	87.5	92.1	85.9

2015	7	9	97.4	95.5	94.7
2015	7	10	97.0	94.1	93.1
2015	7	11	94.5	89.8	91.7
2015	7	12	89.3	86.0	86.7
2015	7	13	96.2	93.0	94.4
2015	7	14	88.9	89.1	82.5
2015	7	15	88.3	85.7	83.0
2015	7	16	90.6	85.5	88.1
2015	7	17	94.4	89.7	91.3
2015	7	18	82.8	92.0	88.4
2015	7	19	93.3	86.8	93.6
2015	7	20	98.9	97.4	88.4
2015	7	21	91.6	92.3	92.1
2015	7	22	93.5	89.1	91.4
2015	7	23	88.4	83.6	80.7
2015	7	24	88.1	87.1	86.7
2015	7	25	89.9	86.3	86.9
2015	7	26	92.2	89.4	91.7
2015	7	27	91.4	86.9	80.9
2015	7	28	85.2	89.1	90.3
2015	7	29	93.7	89.1	92.1
2015	7	30	98.9	95.2	97.8
2015	7	31	90.2	87.3	86.7
2015	8	1	91.0	89.1	88.3
2015	8	2	89.8	86.8	88.7
2015	8	3	93.2	91.6	92.7
2015	8	4	97.3	95.0	92.1
2015	8	5	97.0	94.6	93.7
2015	8	6	84.4	86.6	83.9
2015	8	7	87.7	75.6	80.3
2015	8	8	88.9	84.7	88.4
2015	8	9	90.6	85.3	88.2
2015	8	10	91.3	86.0	87.5
2015	8	11	80.3	85.7	90.2
2015	8	12	86.9	83.5	85.0
2015	8	13	87.5	84.9	83.9
2015	8	14	87.7	85.4	81.9
2015	8	15	89.3	88.2	82.7
2015	8	16	91.7	89.1	88.0
2015	8	17	90.7	89.2	87.7
2015	8	18	90.5	83.3	82.6

2015	8	19	82.7	89.2	79.8
2015	8	20	94.1	90.0	89.2
2015	8	21	89.5	85.1	86.6
2015	8	22	87.7	83.3	84.4
2015	8	23	84.8	84.8	83.3
2015	8	24	93.9	88.9	90.7
2015	8	25	89.1	85.4	84.8
2015	8	26	84.0	78.7	81.1
2015	8	27	83.1	81.0	80.6
2015	8	28	84.3	81.8	81.6
2015	8	29	81.7	82.2	80.1
2015	8	30	80.1	79.2	80.1
2015	8	31	88.0	84.0	86.6

Event Days bolded and highlighted yellow

Weekends shaded in grey

V. Load Impacts & Customer Credits

For each CPE, each participating customer (i.e., those who replied 'YES' to the CPE invitation before the end of the CPE) requires analysis to determine the amount of kWh reduced during the CPE hours. This information is then translated into the amount of credit provided to each participant. To provide a complete picture of how this process occurred during the pilot, several topics need to be documented including: A) Baseline Calculations - used to determine the kWh reduction values, B) Bill Credit Amounts - how kWh reduction values are translated into bill credits, and C) Load Impacts - additional kWh load reduction analysis to add insight into the participant's response to CPEs.

A. Baseline Calculations

To determine the amount of kWh a participant reduced during a CPE, the Company requires two values for each CPE hour for each participant. First, DEC needed the actual metered kWh. Second, the Company required an estimate of what the kWh would have been absent the CPE. This estimated load absent a CPE is called the baseline load. Since these loads are calculated hourly for the CPE period of 3 PM to 7 PM, they will be referred to as the Hourly Baseline Loads (HBL). The HBL is calculated for each CPE for each participant responding "Yes" to the CPE invitation and having the required data. A series of steps are utilized resulting in one of 3 potential HBL calculations. The HBL calculation steps are described in Appendix D.

[Note that while the steps detailed in Appendix D result in an HBL, the actual load data is not necessarily a hourly metered quantity. Although this is a rare situation, pilot operations showed that it does occur and a handful of adjustments were required to deal with this situation where the actual hourly metered kWh is an estimated value. See additional comments below.]

Table 10 presents the HBL calculation method breakdown for each CPE event. This table illustrates how the Similar Day method dominates when a similar day is available. When a similar day is not available, the weather adjusted 10-day average is utilized most often since most participants are found to be weather sensitive.

Table 10: Baseline Method Counts by Event Day

Event Date	'Yes' Participants	Baseline Method		
		Similar Day	10-Day Average	Weather Adjusted 10-Day Average
16-Jun-15	269	0	54	215
17-Jun-15	255	50	39	166
22-Jun-15	231	137	22	72
24-Jun-15	256	238	3	15
9-Jul-15	236	235	0	1
10-Jul-15	219	47	24	148
20-Jul-15	214	15	33	166
3-Aug-15	225	224	1	0
4-Aug-15	223	113	11	99
5-Aug-15	222	133	10	79

Once the HBL is established for a participant, the load reduction value is calculated hourly by the following equation: Load Reduction = HBL – Metered kWh. As mentioned above, there were a few situations where the hourly load data was not available or was an estimated value for a customer. In these few situations, information on how a customer responded to other CPEs is utilized to provide a credit amount.

The load reduction value (LR) calculated can be positive or negative meaning that the participants' metered kWh could be above or below the HBL. Without adjustment, positive and negative values for LR would be summed for a total amount for the CPE (i.e., net load reduction). However, Company decided at the beginning of the PTC pilot to not net the pilot participants load reductions with their load increases during a CPE. Therefore, any LR value that was negative (i.e., a metered kWh greater than the HBL) was set to 0. However, these values were tracked and a comparison is presented later in this report. There are additional steps utilized to determine the LR used to calculate credits placed on the bill. These steps are listed below.

1. Calculate hourly LR as described above
2. Set all negative values to 0 as described above
3. Sum unrounded LR values for a participant for all events during a calendar month
 - a. Note that PTC credits were applied to customer bills once per month
 - b. LR is summed over all events for a month before rounding so that small LR values less than 0.5 kWh are not removed by rounding at the hourly or individual CPE level
4. Round the monthly total LR values for the account
 - a. Note that credits for June CPEs were based on unrounded LR values. After credits were placed on bills for June, it was noticed that customers may become confused because the kWh LR on the bill is an integer value. No decimals are displayed. Therefore, the credit amount, while correct, did not necessarily equal the kWh LR displayed on the bill multiplied by \$0.34. This was revised for July and August by rounding the kWh LR after they were summed for the month.

- b. Any participant with an LR greater than 0 but less than 1 kWh was provided a credit amount based on 1 kWh load reduction. In other words, the minimum credit amount provided to participants for a month was \$0.34 and any participant with LR greater than 0 received at least a \$0.34 credit.
- 5. As needed, add additional LR to address missing or estimated meter data
- 6. Multiply the resulting kWh LR by \$0.34 to determine credit amount

B. Bill Credits

The steps above describe how the final bill credit is calculated for each CPE participant during a calendar month. Table 11 displays the total load reduction and credit amounts placed on customer bills for CPEs during calendar months of June, July, and August. There were no CPEs during the month of September.

Table 11: PTC Pilot Credits Applied by Month for All Participating Customers

CPE Month	Number of CPEs	Total CPE Load Reduction for Credit	Total Credits Applied	Average Credit Applied per CPE
June, 2015	4	3,328.5	\$ 1,131.76	\$ 282.94
July, 2015	3	2,284.0	\$ 776.56	\$ 258.85
August, 2015	3	2,114.0	\$ 718.76	\$ 239.59
Total	10	7,726.5	\$ 2,627.08	\$ 262.71

C. Load Impacts

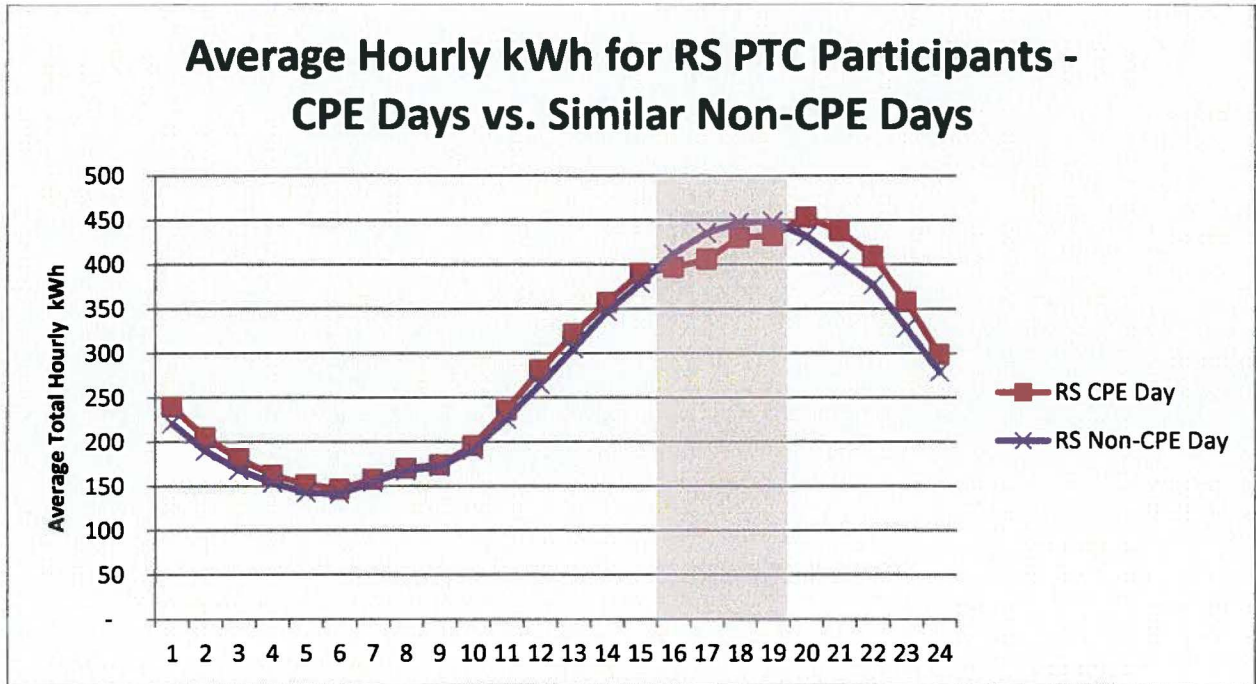
The amount of load reduction used to calculate PTC Pilot credits is documented in Table 11. However, for a more detailed discussion of kWh load reduction, the hourly load reduction values at the Pilot Standard Rate and CPE level are required. Therefore, the values in this section may not precisely sum to the values presented above. This is due to rounding or not rounding at different levels of aggregation. Several items will be reviewed in this section.

- First, summary graphs are presented with general comments about PTC load reduction.
- Next, the Company will discuss gross hourly load reductions (GLR) compared to net hourly load reductions (NLR). These values will be presented at the base rate schedule level of the participants.
- Third, a comparison of the load reduction from low usage customers versus high usage customers is presented.
- Fourth, a review of kWh reduced per participating customer is presented.
- And finally, the Company briefly discusses the possibility of unearned credits paid to customers due to natural load diversity.

1. Summary Graphs

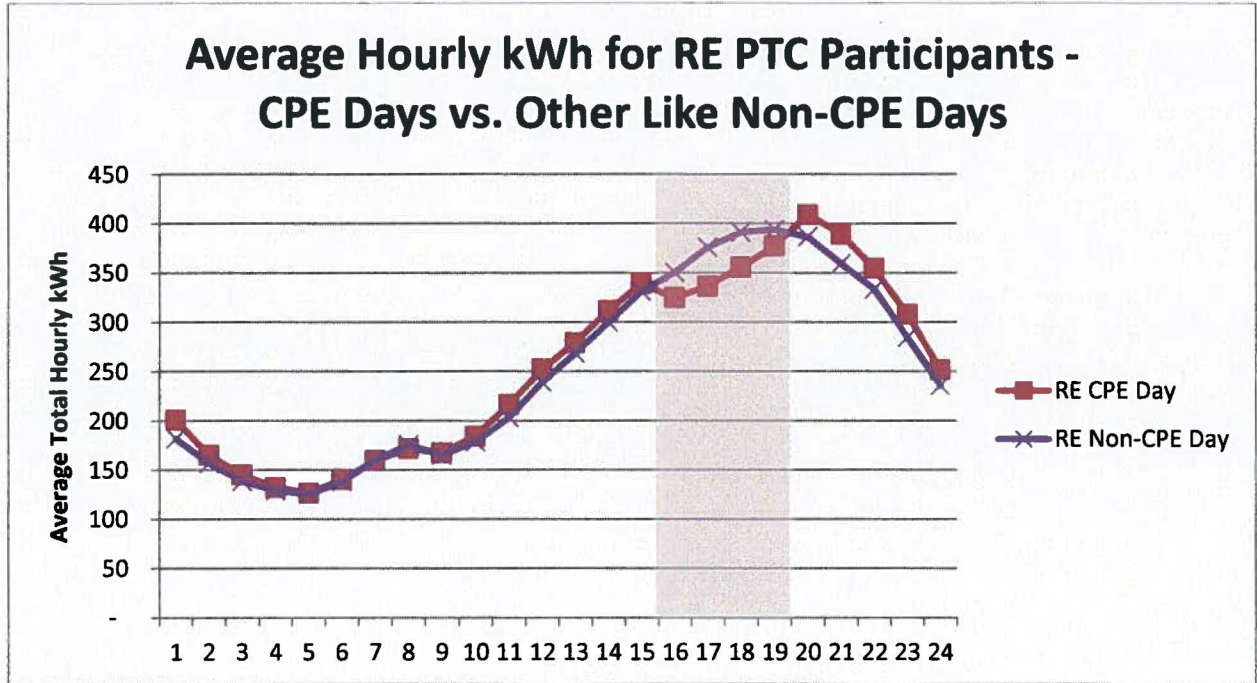
The summer of 2015 provided many days with hot weather. The data available enables the Company to present meaningful summary graphs for the PTC Pilot presenting average hourly load of all pilot participants (i.e., all 379 customer accounts) over the 10 CPEs as compared to average hourly loads for all pilot participants over a selection of 10 days with similar weather to the CPE days but on which a CPE was not implemented (i.e., Non-CPE Days). For emphasis, each graph line contains an average load value using the same participants; both those who curtailed during the CPE hours and those who did not. While these graphs are not adjusted for weather conditions, usage level of participants, or weekday variations, the average heat index during the hours of 3 pm to 7 pm for Charlotte on the 10 CPE days (96.98) is very similar to the average heat index for the Non-CPE Days (96.70). These graphs are similar to what a systems operator might want to see which is the net impact of what happens to the load shape of program participants on CPE days. However, the focus is not on load impacts for these graphs. Impacts are discussed below. Here, we focus on load shapes and consider several comments related to shape changes.

Figure 15: RS Summary Comparison – CPE Average kWh vs. Non-CPE Average kWh



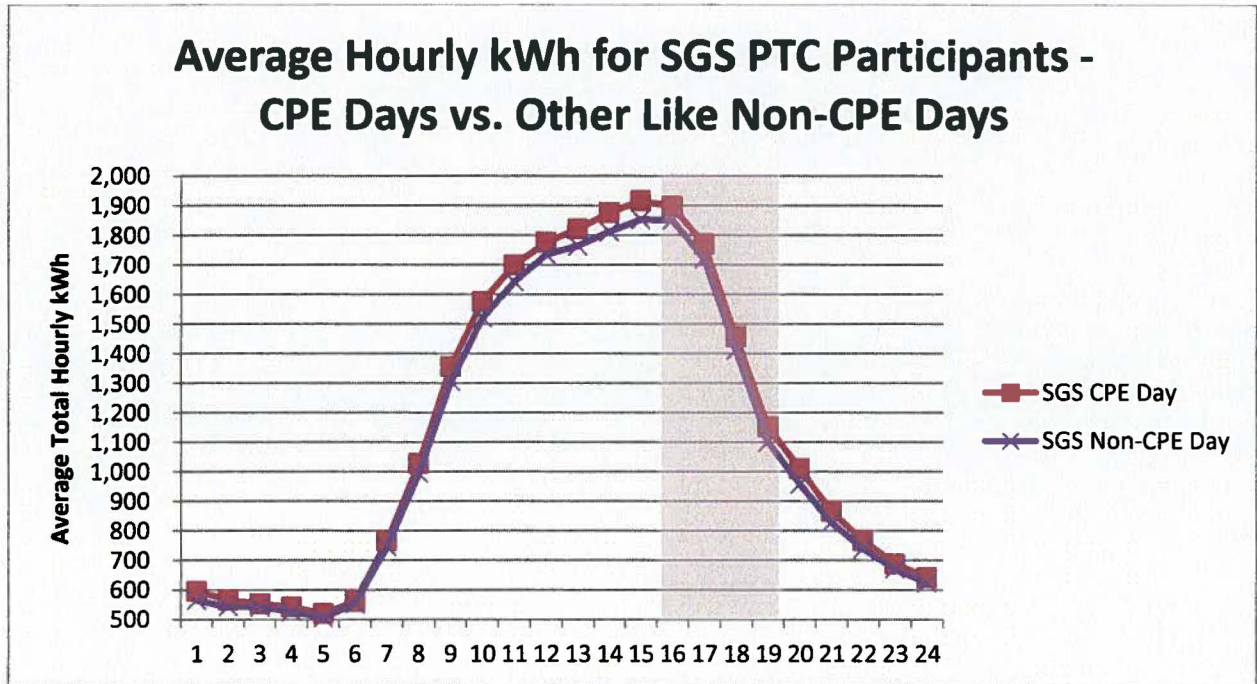
The data for RS PTC participants shows that their average group load shape on the 10 CPE days is different than the shape on the 10 Non-CPE Days. There are several items of particular note. First, visually, there do appear to be load shape changes during the CPE hours. It is interesting to see the erosion of this change in hours ending 18 and 19. Potential reasons for this erosion could be a conscious decision by participants to curtail the first 2 hours and then not to curtail as much the last 2 hours. This could also be a thermostat issue in that the participants may have increased the setting on their thermostats to start the event but when the home reached the new set point, the air conditioner (AC) kicked back on. Of additional note, the period of time before and after the events appear to have some degree of change in the shape possibly due to pre-event consumption and AC rebound effects (i.e., the thermostat is returned to a lower setting after the event hours causing the AC to run continuously to return the home to the desired temperature).

Figure 16: RE Summary Comparison – CPE Average kWh vs. Non-CPE Average kWh



The data for RE PTC participants shows that their average group load shape on the 10 CPE days is different than the shape on the 10 Non-CPE Days. There are several items of particular note. First, visually, there appear to be load shape changes during the CPE hours. It is interesting to see the gradual erosion of this change. Potential reasons for this erosion could be a conscious decision by participants to curtail the first hours of the CPE and then not to curtail as much later in the event. This could also be a thermostat issue as described above for RS participants. Of additional note, the period of time before and after the event appear to have some degree of change in the shape possibly due to pre-event consumption and AC rebound effects.

Figure 17: SGS Summary Comparison – CPE Average kWh vs. Non-CPE Average kWh



Unlike the RS and RE PTC participants, the SGS participants showed less load shape change as a group. [To avoid confusion, note that credit numbers presented earlier in this report suggest that SGS customers did reduce load during CPE hours. This graphic is not conflicting. The graphics here, RS, RE, and SGS, display all participants and not just those who reduced load. There is also the issue of gross versus net load reduction which is discussed below. These graphs display actual metered usage and therefore would reflect a net load concept.] A close inspection of the SGS shapes shows a slight difference in load between hours ending 15 and 16 on CPE days that is essentially flat on Non-CPE Days. Additional review is provided below. Of particular note is the sharply declining load shape over the CPE hours for SGS participants. Load is naturally being reduced among these participants during CPE hours. This raises the question of whether the price signal, while appropriate for the system load shape, is impactful for SGS customers and further suggests that a PTC program, focused on these hours, may not be of significant benefit for SGS customers or the Company.

2. Gross Hourly Load Reductions vs. Net Hourly Load Reductions

The credit calculation process is documented above and credits are paid to customers based on Gross Load Reduction (GLR). GLR only sums values for load reduction that are positive (i.e., where the customer's actual load is less than the HBL). Net Load Reduction (NLR) does not ignore those participants who have actual load greater than their HBL. These participants would have a negative load reduction amount and would serve to offset a portion of the load reduction calculated under GLR. Under the assumption that the HBL is a perfect estimation of the customer's load absent the

CPE, the descriptions above would be accepted as straight forward; some customers reduce load during the event and some customers increase load during the event. However, the interpretation or explanation of why customers would increase load above their HBL during an event is difficult. Therefore, more realistically, consider that the HBL is not a perfect estimation of load absent the event. This realization allows us to consider small deviations above and below the HBL for customers who actually do not reduce or increase their load. Ideally, these small deviations could be identified and ignored. However, such a process has not been implemented for the pilot and therefore GLR is an overestimated load reduction value. NLR, while compensating for some of the optimistic characteristics of GLR, does not necessarily perfectly correct the GLR estimate. There are different approaches to help correct for overestimating the load reduction including the incorporation of confidence bands, limiting participation to only customers with predictable load shapes, and summing each customers load reduction across the CPE hours and evaluating the net result. In this report, GLR and NLR are displayed below in Tables 12 and 13 noting that load reduction values for a demand response program are a function of the established Measurement and Verification (M&V) processes. For this pilot, the HBL is the basis for M&V. Further, for this report, NLR will be considered the best available estimate of customer response.

Table 12 and 13 below provide a comparison of GLR and NLR summed across all 10 CPEs by base rate schedule and CPE hour. CPE hours include hours ending 16 to 19. This represents the period of 3 PM to 7 PM. GLR is the amount on which credits for the pilot are based. NLR is considered the estimated load reduction for the pilot. NLR is 60%, 55%, and 11% of GLR for RE, RS, and SGS respectively.

Table 12: Gross Load Reduction by Standard Rate

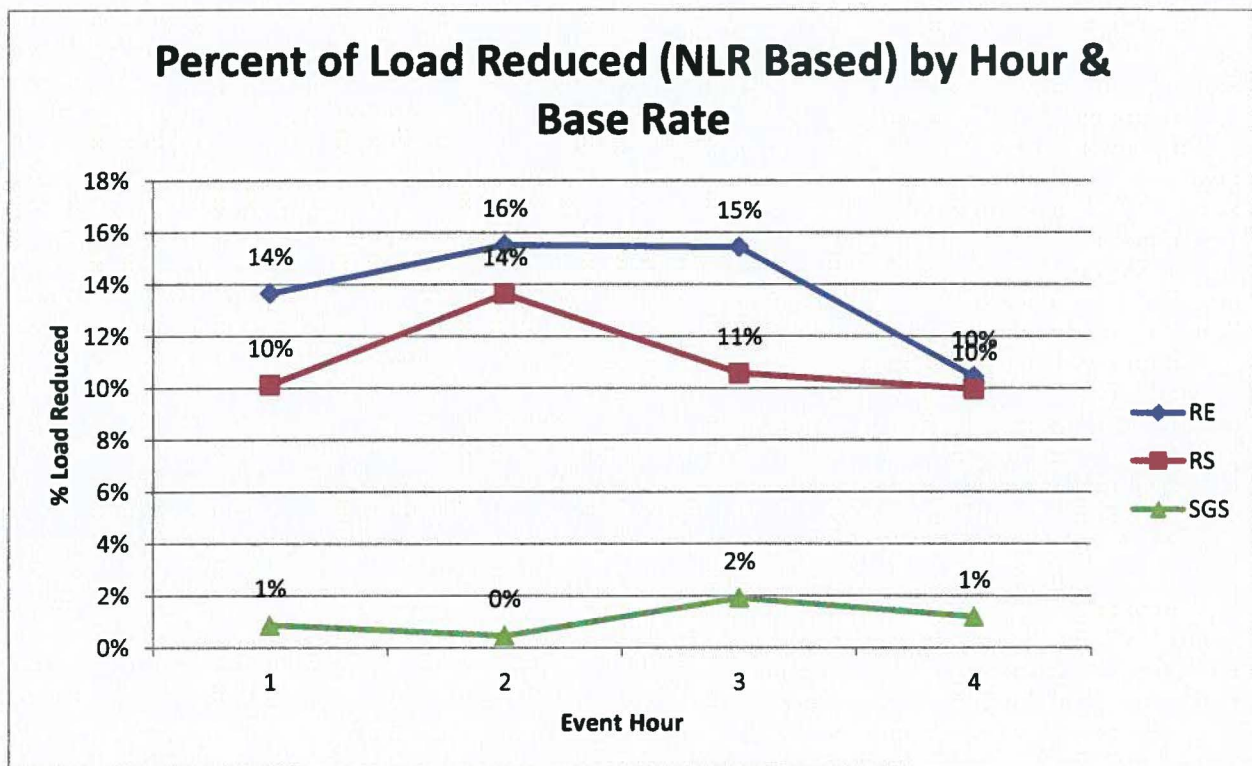
GLR - Gross Load Reduction (kWh)	Hour Ending				Grand Total
	16	17	18	19	
Rate					
RE	572	628	646	584	2,430
RS	511	613	551	531	2,207
SGS	808	808	761	687	3,063
Grand Total	1,891	2,050	1,958	1,801	7,700

Table 13: Net Load Reduction by Standard Rate

NLR - Net Load Reduction (kWh)	Hour Ending				Grand Total
	16	17	18	19	
RE	337	410	427	293	1,467
RS	258	371	298	283	1,210
SGS	83	41	142	66	332
Grand Total	678	822	866	642	3,008

Further information is provided below in Figure 18 on the hourly load reduction pattern for each base rate schedule. As noted above in the summary graphics, load reduction appears to decrease in later event hours. Only Rate RE participants appear to change significantly in the final hour while RS participants decrease load reduction in hour 3 of the event. These patterns can be seen by viewing NLR as a percent of load.

Figure 18: NLR Based Load Reduction Percentage by Rate Schedule



NLR can also be viewed for each individual CPE through a graphic that displays the CPE participant groups' baseline compared to their actual metered usage. Figures 19 – 21 below show each rate schedule for the August 5, 2015, CPE. Note that baseline values are only calculated for the 4 CPE hours.

Figure 19: RS Participants Actual Load and HBL for August 5, 2015

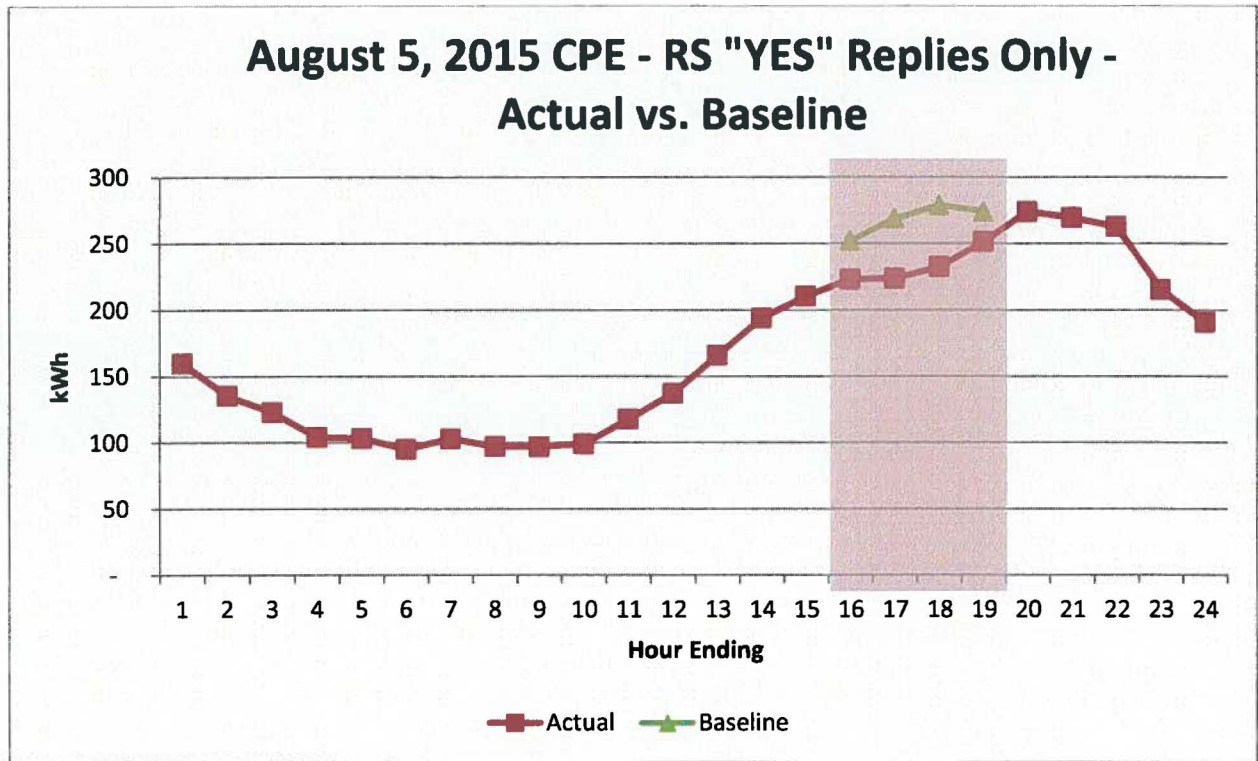


Figure 20: RE Participants Actual Load and HBL for August 5, 2015

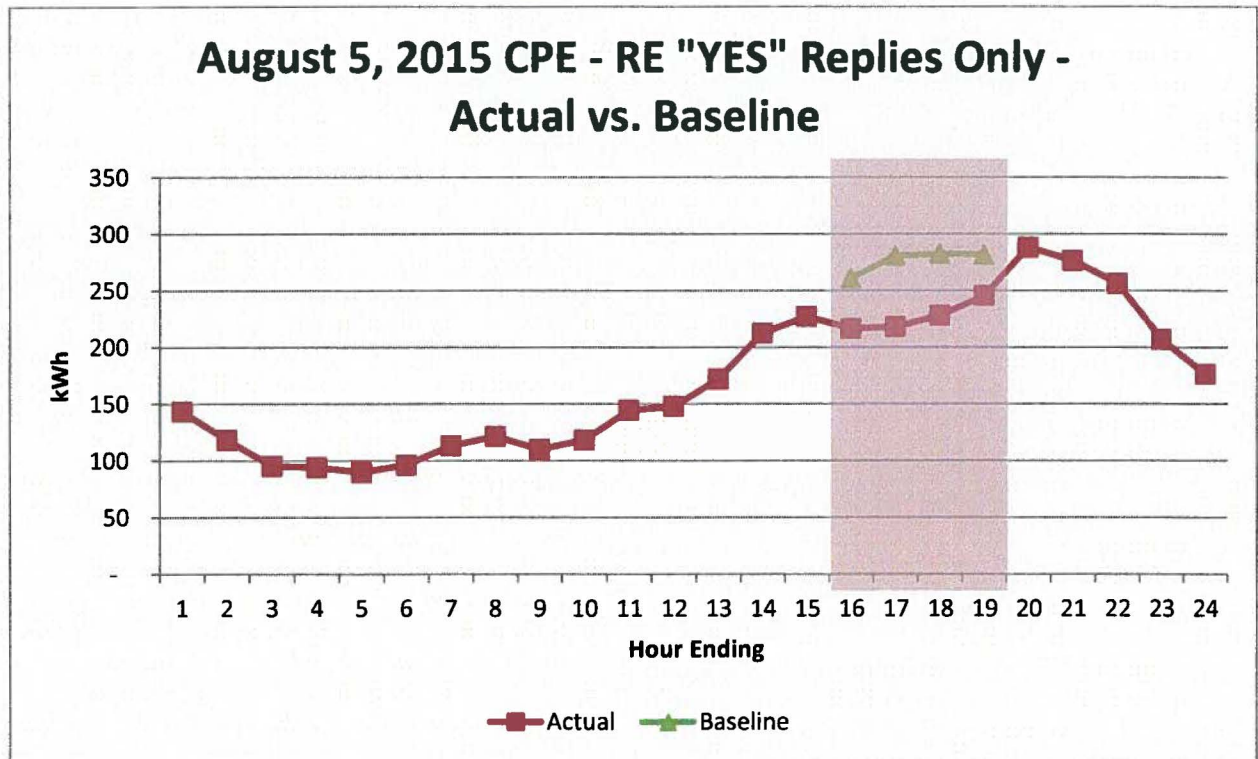
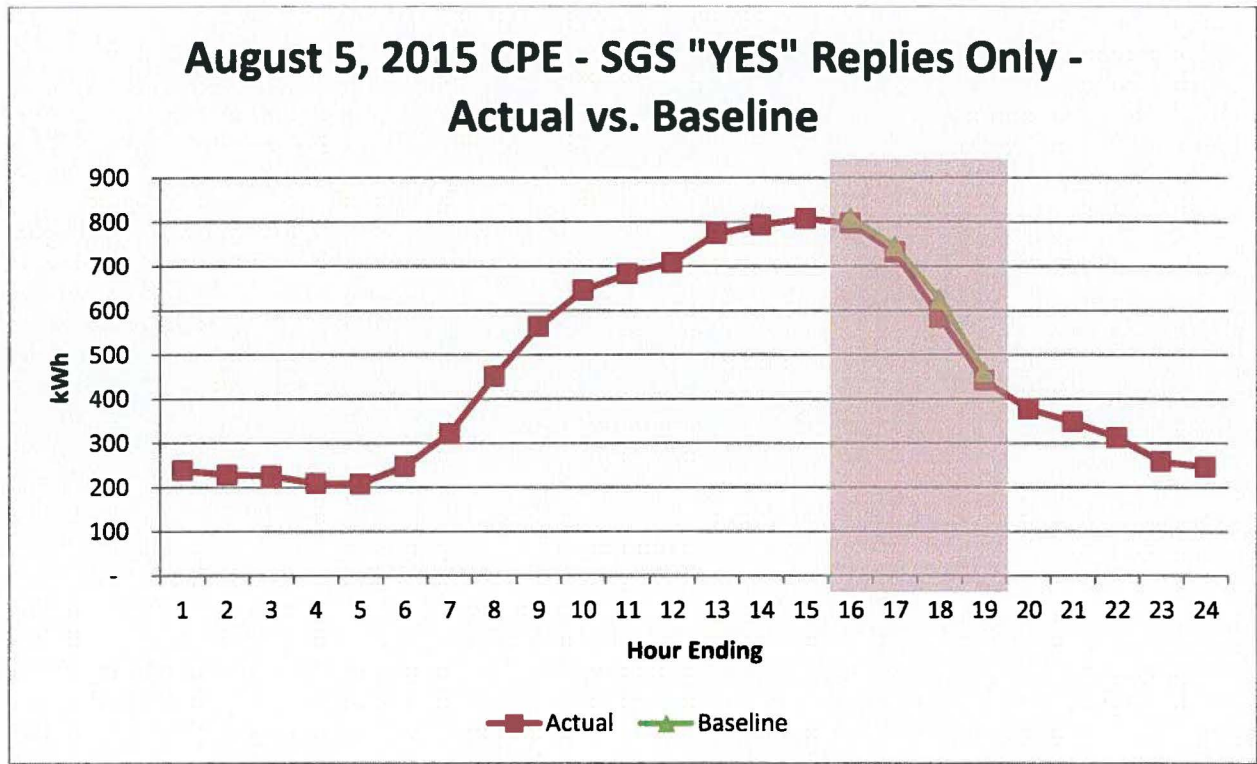


Figure 21: SGS Participants Actual Load and HBL for August 5, 2015



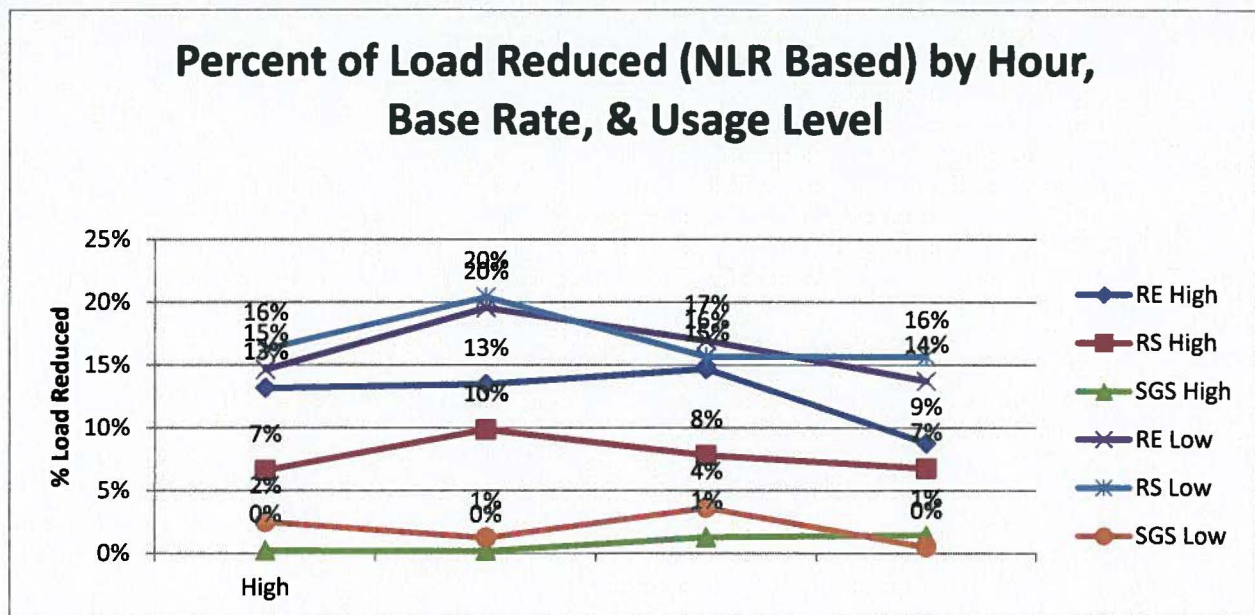
3. Low Usage vs. High Usage Participants

Each participant in the PTC pilot was placed into either a high usage or low usage category based on whether the customer's 2013 average monthly summer kWh was greater than or less than the applicable load research sample's average customer profile. The residential breakpoint is 1,100 kWh and the small commercial breakpoint is 4,600 kWh. NLR by base rate and usage profile is provided below in Table 14 and as a percentage of load in Figure 22. As displayed below, the profile categories of High and Low provide approximately similar load reduction amounts but on a percentage basis, the Low profile customers reduce more. In the next section, this comparison will be reviewed on a reduced kWh per customer basis.

Table 14: Net Load Reduction Hourly by Usage Profile and Base Rate Schedule

NLR - Net Load Reduction	Hour Ending										Grand Total
	High				High Total	Low				Low Total	
	16	17	18	19		16	17	18	19		
RE	220	236	271	163	889	117	174	156	130	578	1,467
RS	107	171	142	123	544	151	199	155	160	666	1,210
SGS	14	11	69	59	154	69	30	72	7	178	332
Grand Total	341	419	482	345	1,587	337	403	384	297	1,421	3,008

Figure 22: NLR Hourly by Usage Profile and Base Rate Schedule – Percent of HBL



4. Load Reduction per Customer

Load Reduction per Customer can be presented in multiple forms. From a load reduction perspective, GLR or NLR could be used depending on the concept being discussed. In addition, “per customer” could be looked at in terms of all pilot participants, CPE participating customers (i.e., those who replied “YES”), or only customers who replied “YES” and in addition actually reduced load. For this report, we will present values below in Table 15 that represent net load reduction per customer per hour of participants who responded “Yes” to the event invitation. This concept is useful since it would allow Company to estimate the amount of load reduction expected for a CPE after the number of respondents to the event invitation is known. The numbers below are at the customer meter level and represent the average NLR per participant during the CPE events. These values are not normalized for weather.

Table 15: NLR / "YES" Participant

Net Load Reduction / Customer						
Hour	RE		RS		SGS	
	High	Low	High	Low	High	Low
16	0.50	0.28	0.27	0.36	0.05	0.18
17	0.54	0.42	0.43	0.47	0.04	0.08
18	0.62	0.38	0.36	0.37	0.24	0.19
19	0.37	0.32	0.31	0.38	0.20	0.02
Average	0.51	0.35	0.34	0.39	0.13	0.11

SGS participants provided lower amounts while RE High usage participants appear to be the most responsive group in the pilot. It is also interesting to see that RE Low, RS High, and RS Low participants all provided approximately the same response to a CPE although in different hourly patterns.

5. Natural Load Diversity and Credits Paid

An issue often raised when discussing peak credit pricing programs relates to the payment of credits for load reduction that would have occurred without the pricing event. Residential and small commercial customers can have significant variability in their hourly usage from day to day based on factors that cannot typically be incorporated into a participant's baseline. Guests, vacations, and accidental appliance operation are just a few potential causes of electric consumption variability other than weather. Therefore, when a CPE is implemented, some customers may receive credits without any action while other customers may take action, but not receive credits. The structure of the credit in the PTC pilot ensures payment of credit for natural reductions while ignoring the offsetting natural increases. This issue does overlap with the concepts of GLR and NLR discussed earlier. The Company reviews NLR in an attempt to obtain a better estimate of the load reduction provided. However, the NLR approach does not prevent customers from receiving natural load diversity credits. Further, the Company required participants to reply to the PTC event invitation in an attempt to add a behavioral barrier to the natural load diversity issue. The Company believes this approach helped reduce overpayment of credits although no analysis, other than below, is presented in support of this perception.

One approach to gain insight into the natural load diversity issue involves the calculation of baselines for customers on a day that is a non-CPE day. Since participants are not informed of a CPE, there should be no CPE-related intentional load reduction embedded in metered data. Therefore, comparing the baseline information to the actual customer loads should provide insight into the potential magnitude of this issue. The deviations of course are not fully due to load diversity. Some of the deviation between the baseline and the actual load is sourced from variation due to modeling (i.e., baseline estimation) error. This error is always present and it should be minimized where possible. Having noted these

caveats, Thursday, July 30, 2015, is used as the test non-CPE day in the results presented below in Table 16. This day is selected since it is similar to the weather conditions on CPE days and it has no actual CPE day within a week before this date. This ensures that little or no interaction is present with an actual CPE day or with the July 4 holiday. It also avoids using a Monday or Friday as the test day since Mondays and Fridays may have a better chance of portraying peculiar load patterns due to close proximity to weekends. Results are presented below in Table 16. Note that the values in the table are not put through the full credit calculation process described above. The credit values are simply a calculation of the raw (i.e., unrounded) kWh reduction values multiplied by the credit amount of \$0.34 / kWh reduced.

Table 16: Load Diversity Credit Analysis

Credit Calculation Example on a Non-Critical Peak Event Day - 7/30/2015										
Rate Group	Baselines Calculated*	Accounts Earning Credit				Accounts Not Earning Credit			Total	
		Number of Accounts	GLR	NLR	Credit Amount	Number of Accounts	GLR	NLR	GLR	NLR
RS	127	108	197.25	101.73	\$ 67.01	19	-	(61.00)	197.25	40.73
RE	122	111	282.25	177.06	\$ 96.01	11	-	(55.74)	282.25	121.32
SGS	128	90	468.05	246.50	\$ 159.09	38	-	(290.28)	468.05	(43.78)
All	377	309	947.55	525.29	\$ 322.11	68	-	(407.02)	947.55	118.27

*Two Accounts did not receive baseline calculations due to missing data.
 GLR - Gross Load Reduction in kWh
 NLR - Net Load Reduction in kWh

Note that the numbers presented above incorporate full participation. As noted above, pilot participants were required to respond to the event invitation in order to be considered to receive PTC credits and between 57% and 71% did so for CPEs. Therefore, the values in the table above could be reduced since at most 71% of participants would have acknowledged the event invitation. Further, an optimistic position would be that the required invitation response eliminates a high percentage of natural diversity.

The values demonstrate the load diversity issue combined with the credit calculation process used for the pilot. As a group, the baseline process resulted in NLR of 118 kWh. However, credits would have been based on the GLR of about 945 kWh. Other dynamic pricing programs such as Critical Peak Pricing and Variable Peak Pricing require payment for all load consumed during critical hours thus eliminating the need for baselines for billing customers.

VI. Learnings Regarding Future Deployment

DEC has gathered several insights from the pilot experience related to future PTC implementation. These items relate to customer interest, operations, and customer engagement.

A. Customer Interest

The pilot results, acquisition rates of 5.7% residential and 2.3% small commercial, are strong, positive pilot results and suggest that potentially a segment of customers are interested in a PTC type of program. The Company believes that additional customer support services could be offered to further increase these observed acquisition rates. Services of particular interest are customer feedback services, discussed below, and an enabling technology device such as a thermostat. Such services could improve the customer experience but will also add cost to a potential offer. In addition, through the pilot survey, customers show encouraging attitudes toward future participation.

B. Operations

The PTC pilot uncovered a few operational issues to consider alongside several other issues previously identified. These issues related to metering, billing, and Demand Side Management (DSM).

1. Metering:

- a. Participants require interval metering and the supporting systems necessary to use the interval information for billing purposes. While DEC-NC has several hundred thousand smart meters installed, any customer interested in participating that does not have a smart meter may be required to pay the meter cost which most likely would considerably reduce customer interest. Without addressing meter cost issues, participation would be limited.
- b. A second metering issue discussed above relates to the estimation of interval data. Occasionally, smart meters miss reads. Therefore, when the next actual meter read occurs, data is estimated for intervals between the two actual reads. This estimation process is not conducive to PTC participation. Solutions might include verifying meter functionality prior to events or an administrative solution for providing a credit amount to those participants who are impacted.

2. Billing:

- a. For pilot purposes, billing was a manual process. After credits were calculated, a file was sent to the billing group and miscellaneous adjustments were entered to show the credit amounts on the bill. This would not be a sustainable process for a large scale deployment.
- b. Similarly, the credit calculation process was performed by analysts to facilitate the pilot. This would not be a sustainable process for a large scale deployment. Billing system automation or a third party vendor software could be potential solutions to automate the credit calculation process and place credit amounts on participants' bills.

- c. Finally, it was noticed that the PTC credit process interacted with the Equal Payment Plan (EPP) information on customers' bills. These minor interactions require attention prior to a full deployment to reduce confusion from EPP participating customers.
3. DSM:
- a. Company provides customers with multiple opportunities to participate in traditional demand response programs. Current programs include Power Manager, IS, SG, and PowerShare. Careful attention will be needed to coordinate the interaction between existing and new demand response programs to ensure that useful load reduction amounts are available when needed.
 - b. Several sections in this report talk about PTC credit calculation issues such as gross load reduction versus net load reduction, and natural load diversity. Processes designed to reduce the unearned amount of credits provided in a PTC type of program will enhance cost effectiveness. These efforts should be balanced so that cost effectiveness is achievable while at the same time not making the program so restrictive as to discourage participation.
- C. Customer Engagement

There are three items that stood out during the pilot as areas for improvement. These items could work together, or separately, as an engagement package for customers. These items include performance feedback, customer communications, and enabling technology.

1. Performance Feedback: Through the pilot survey, participants let Company know that CPE performance feedback is a desired enhancement to the PTC pilot. Individual event performance feedback and other information enhances the customer experience. This information could be delivered in a variety of ways but preferred solutions would incorporate online services, bill messaging, and potentially a Duke Energy App. All these options will require investment in Company capabilities.
2. Customer Communication: For the PTC pilot, communications with customers were handled through email inside the Customer Prototype Lab. For a commercialized rate, a more robust communication system solution will be required. This system would contact customers for CPE implementation and potentially other useful communication. Expanding beyond email and into text messaging and allowing customers to select their desired path and update their contact information would be desirable.
3. Enabling Technology: Providing customers with an optional technology, such as a thermostat, that can automate their response to a CPE implementation would provide convenience to participants. This type of technology would also provide benefits to Company through potentially increased and sustained load reduction.

The items above require review and evaluation prior to commercialization of a PTC rate option.

VII. Conclusion

The DEC-NC PTC pilot researched several topics including customer's willingness to enroll, customer's experiences on the pilot, and load reductions achieved. In addition, considerations were identified for a future implementation. Based on the PTC pilot experience and information in this report, the Company will continue to evaluate dynamic pricing rate options in the future. DEC commits to discuss a dynamic pricing pilot or a dynamic pricing program with the DEC Energy Efficiency Collaborative in 2016.

Appendix A – Peak Time Credit Rider

RIDER PTC
PEAK TIME CREDIT (NC)
Pilot

at any time but no later than one hour prior to the event. Customers who desire to receive credits during the CPE must reply to Company's email notification before the 7:00 p.m. end of the CPE. Failure of the Customer to receive the Company notice of a CPE or failure of the Company to receive the Customer's reply to a CPE notice shall not entitle the Customer to receive credits under this rider.

CONTRACT PERIOD

Each Customer shall enter into a contract for service under this Rider through September 30, 2015.

Appendix B – Frequently Asked Questions Example

FAQs for PTC Web Site and Direct Mailer

Who can participate in the Peak Time Credit pilot program?

In order to participate in the PTC pilot, you must own and occupy your residence in North Carolina and receive electricity from Duke Energy. You must be on one of the following rates: RS, RST, RE or RET to participate. You cannot participate in this pilot if you are on Power Manager, Net Metering, are out for Disconnection for Non Payment, are a landlord, a builder, have medical alert on your account or on an assistance program.

How long is the pilot program?

This will be a one-summer pilot, from June 1 through September 30, 2015

Is there a deadline for signing up to participate?

YES. The deadline to sign up is May 15, 2015

Why should I participate in this pilot?

This pilot gives you the opportunity to save energy and money while helping us better assess the program and the value it can bring to all our customers. There is no program fee and nothing to lose with your participation. You will also earn a credit on your electric bill for your conservation efforts.

When are the Peak Event periods?

Peak Events occur during the hours of 3 p.m. to 7 p.m. when demand for energy is high. Peak events will not occur during weekends or holidays. There will be approximately 15 peak events called, depending on the weather.

How will I know when to participate in a Peak Event?

Duke Energy will notify you via email, the day before a Peak Event. If you are willing to participate, you must respond to our email notification by 7pm. the day of the event. You can do this by simply clicking the designated button and then click "Yes" next to "I will participate in this Peak Event". Otherwise, you will not receive a credit even if you conserve during the event times.

How much credit can I earn on my electric bill if I participate?

You receive a credit of 34 cents on your electric bill for every kilowatt-hour (kWh) reduced during a Peak Event. The credits you earn during the peak events will show up on your bill within 1 to 2 months of the event depending on when the event occurred in your billing cycle. See chart for kWh equivalence. Link PDF)

What should I do to get the most credits for my efforts on this pilot?

It is important to conserve or shift your energy use when a peak event is called from 3pm – 7pm. Please see the energy savings tip page on this site for more information on how to accomplish this.

If you are currently on the Home Time-of-Use pilot (Rate RST or RET) please read.

It is important to conserve or shift your energy use when a peak event is called from 3pm – 7pm but it is also equally important for you to not turn on all your electrical equipment and air conditioning at the same time right after the event ends. By slowly bringing "on" your equipment, you will eliminate a spike in the demand charges you have on the TOU Pilot. Remember you are still enrolled in the Home Time-of-Use pilot program and those charges and times still apply to you during and after a Peak Event.

What if I don't reduce my energy use during a Peak Event?

If you choose not to participate in a Peak Event, you lose nothing, but you give up an opportunity to save energy and lower your electric bill.

How will Duke Energy know I participated in a Peak Event?

Duke Energy will know you participated because you would have responded to our notification by 7pm of the day of the event by clicking on the designated button and then click "Yes" next to "I will participate in this Peak Event". Once you do this, Duke Energy will create a personal baseline usage for you and

compare your electric usage during the peak event to your baseline usage to determine the electricity you saved and the credit you will receive.

How is my Baseline determined?

The baseline will be determined using your electric consumption history from the 10 most recent weekdays, excluding holidays and prior Peak Events where you received a credit.

What if I want to get out of the pilot?

The Peak Time Credit is voluntary. Signing up for the Peak Time Credit Pilot doesn't obligate you to participate in a Peak Event. When you receive notice of a Peak Event, you may choose to participate by clicking a button on your notification if you are going to participate and then simply conserve energy during the peak event times. If you choose not to participate, you will not receive a credit on your monthly electric bill. There are no obligations under this pilot program. Your participation will automatically end on September 30, 2015 or if you close your account during the pilot.

Will there be any changes in how I am billed?

- No, except you will receive a credit of 34 cents per kWh on your bill for any energy savings you earned during the Peak Events (if you confirmed your participation). It will show up as: " PTC Rider XX kWh (saved) and the credit amount \$XX.XX." . It is important to remember that the amount on the bill will be a cumulative amount applied monthly. For example if you participated in four events during June, your July bill will show the total amount of kWh saved and the credit amount from all four events. If in turn you did not reduce usage for any event during the month, you will not see a credit on your bill.

Appendix C – PTC End of Pilot Customer Survey

We appreciate your participation in the Duke Energy Peak Time Credit pilot. Your feedback and insights are important to determine future pricing offers in North Carolina. To continue with the survey, please click the Next button.

On a scale of 1 to 10, where 1 is Extremely Dissatisfied and 10 is Extremely Satisfied.

	Extremely Dissatisfied 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (7)	8 (8)	9 (9)	Extremely Satisfied 10 (10)
Please rate how satisfied you are with the Peak Event time, 3 PM to 7 PM. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please rate how satisfied you are with the 10 Peak Event opportunities. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please rate how satisfied you are with the option to participate or not participate in Peak Events. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please rate how satisfied you are with the Peak Time Credit information on your bill. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please rate how satisfied you are with the Peak Event notifications. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please rate how satisfied	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

you are overall with Duke Energy's Peak Time Credit pilot experience. (6)										
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For peak event notifications which method of communication would you prefer:

- Email (1)
- Text (2)
- Automated phone message (3)

Since participating in the pilot, have you purchased and/or installed any energy efficiency equipment or made energy efficiency improvements to your home/facility?

- Yes (4)
- No (5)
- Don't Know (6)

If No Is Selected, Then Skip To Did you utilize any of Duke Energy's ...If Don't Know Is Selected, Then Skip To Did you utilize any of Duke Energy's ...

What type of energy efficient improvements did you make to your home/facility?

Did you utilize any of Duke Energy's energy efficiency rebates or other offers or programs?

- Yes (4)
- No (5)
- Don't Know (6)

What appliances or equipment did you typically reduce using or avoid during Peak Events? (Select all that apply.)

- Air Conditioner (increased temperature setting or turned off) (1)
- Oven / Burners -- Electric (3)
- Microwave (4)
- Dish Washer (5)
- Clothes Washer (6)
- Dryer -- Electric (8)
- Hot Water Heater -- Electric (Avoided Showers/Baths/other hot water equipment) (10)
- Lighting (11)
- Pool Pump (12)
- TV (13)
- Computer (14)
- None, I did not participate in any Peak Events (15)

During the pilot period, which of the following statements best describes the changes your household/business made during Peak Events:

- We made significant changes in our behavior to reduce usage during Peak Events (1)
- We made slight changes in our behavior to reduce usage during Peak Events (2)
- We did not make changes in our behavior to reduce usage during Peak Events (3)

Was someone in your household or business during the Peak Events in which you participated?

- Yes (1)
- No (4)
- Sometimes (3)

Based on any changes you made to reduce energy usage or shift energy usage from the Peak Event hours, would you say your total pilot savings (credits) were:

- Much lower than expected (1)
- About what I expected (2)
- Higher than what I expected (3)

What could we have done differently to improve your experience while on this pilot? Please consider commenting on the Peak Event notifications, time of the events, duration of the events, number of event opportunities, length of the events, as well as any other areas of the pilot.

Did you contact a Duke Energy Specialist with a question during the pilot period?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To Please choose the statement that best...

Thinking about the Specialist that you interacted with during this pilot, on a scale of 1 to 10, where 1 is Strongly Disagree and 10 is Strongly Agree, please indicate how much you agree with the following statements: The Specialist...

	Strongly Disagree 1 (1)	2 (2)	3 (3)	4 (4)	5 (5)	6 (6)	7 (8)	8 (9)	9 (0)	Strongly Agree 10 (10)	N/A (1)
Was easy to contact (14)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promptly returned my call or email (15)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was friendly and courteous (16)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Was a good listener (17)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Provided useful information (18)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Completed the request/resolved the problem as promised (19)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Please choose the statement that best describes your cooling system:

- Heat Pump (1)
- Central Air Conditioning (2)
- Window Unit(s) (3)
- None (4)

If offered in the future, would you recommend this pilot to a friend, colleague, or family member?

- Yes (1)
- No (2)

If No Is Selected, Then Skip To Would you participate in another Peak...

Why would you recommend this rate to a friend, colleague, or family member?

Would you participate in another Peak Time Credit pilot during the summer in the future?

- Yes (1)
- No (2)

Would you participate in a Peak Time Credit pilot during the winter in the future?

- Yes (1)
- No (2)

On a scale of 1 to 10, where 1 is Extremely Dissatisfied and 10 is Extremely Satisfied.

	Extremely Dissatisfied 1 (0)	2 (1)	3 (2)	4 (3)	5 (4)	6 (5)	7 (6)	8 (7)	9 (8)	Extremely Satisfied 10 (9)
Please rate how satisfied you are overall with the pricing options available to you from Duke Energy. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Please rate how satisfied you are overall with Duke Energy as your energy provider. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Appendix D – Hourly Baseline Load Calculation Steps

Hourly Baseline Load Calculation Steps:

1. Identify up to the last 10 non-event, non-holiday, weekdays for the participant, but not going back prior to May 18, 2015.
2. If the average Heat Index (HI) between 3 pm and 7 pm for any selected day identified in #1 above is not within +/- 1 of the event day average HI between 3 pm and 7 pm, then exclude the day. A day is called a Similar Day if the average HI is within +/- 1 of the CPE average HI value.
3. Average the loads by hour for all Similar Days found. **The result is the customer's HBL and the baseline process ends if any Similar Days are identified.**
4. If no Similar Days are identified above and the customer is NOT weather sensitive (i.e., a separate calculation is completed to determine if the customer is weather sensitive or not), then average by hour the loads on all days identified in #1 above (i.e., at most 10). **If the customer is not weather sensitive and there are no similar heat index days, this average 10-day value is the customer's HBL and the baseline process ends.**
5. If no Similar Days are identified above and the customer is weather sensitive, then the baseline is calculated using the following steps.
 - a. Average by hour the load on all days identified in #1 above (i.e., at most 10). These are the underlying values to which the weather adjustment is applied. Note that this is the same calculation described in #4 above.
 - b. Average by hour the HI for the hours 3 pm to 7 pm on all days identified in #1 above.
 - c. Perform a regression on customer hourly loads for hours 3 pm to 7 pm on all non-event, non-holiday, weekdays during the summer to obtain an HI relationship to load during each event hour.
 - d. Subtract the average HI (calculated in 5.b above) hourly value from the applicable CPE hour HI.
 - e. By hour, multiply the difference calculated in 5.d by the HI relationship values calculated in 5.c.
 - f. Add the hourly adjustments calculated in 5.e to the average load calculated in 5.a. **This is the customer's HBL and the baseline process ends.**