BEFORE THE
PUBLIC UTILITIES COMMISSION OF OHIO

In the Matter of the Application of Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company for Approval of Ohio Site Deployment of the Smart Grid Modernization Initiative and Timely Recovery of Associated Costs	))))))	Case No. 09-1820-EL-ATA Case No. 09-1821-EL-GRD Case No. 09-1822-EL-EEC Case No. 09-1823-EL-AAM

COMPLIANCE FILING AND MOTION OF OHIO EDISON COMPANY, THE CLEVELAND ELECTRIC ILLUMINATING COMPANY, AND THE TOLEDO EDISON COMPANY FOR DIRECTION REGARDING PHASE II OF THE OHIO SITE DEPLOYMENT OF THE SMART GRID MODERNIZATION INITIATIVE

I. INTRODUCTION

FirstEnergy is conducting a Smart Grid Modernization Initiative ("Initiative") in some of its utilities' territories in Ohio, Pennsylvania and New Jersey. The Initiative is being partially funded by FirstEnergy customers with the remainder of the funds being provided through the U. S. Department of Energy ("DOE") and the American Reinvestment and Recovery Act of 2009 ("ARRA") funds. In Ohio, the Commission had initially instructed Ohio Edison Company, The Cleveland Electric Illuminating Company ("CEI"), and The Toledo Edison Company (collectively, "Companies") to conduct a proposed three year pilot Ohio Site Deployment program ("Ohio Project"). The Commission also authorized related cost recovery related to the afore-mentioned pilot program in CEI. The Ohio Project was anticipated to be comprised of various studies, including a volt-var study, a distribution automation study and a consumer behavior study ("CBS") conducted in two phases.

Staff reviewed the Companies' application involving the Ohio Project in Case No. 09-1820-EL-ATA. As part of this review, Staff recommended that the Companies provide the Commission with the results of the first phase of the CBS and seek direction from the Commission as to whether to proceed with the second phase. The Commission adopted Staff's recommendations in its June 30, 2010 Finding and Order in this proceeding. First, the Companies are making this compliance filing in order to provide results from the first phase of the CBS to the Commission, as required by its June 30, 2010 Finding and Order. Second, the Companies are seeking direction as to whether they should proceed with the second phase of the CBS. Third, should the Commission order the Companies to proceed with the second phase, the Companies will require a modification to the original budget of the Ohio Project as discussed below. Fourth, the Companies are requesting that the Commission provide direction related to the second phase of the CBS on or before November 14, 2012, which, if directed, will provide the Companies with time to implement the second phase of the CBS.

II. PROCEDURAL HISTORY

The Commission has addressed the Ohio Project in several separate cases. On January 21, 2009 in Case No. 07-551-EL-AIR *et al.*, the Commission approved the creation of an advanced metering infrastructure rider ("Rider AMI") as a mechanism for the recovery of costs related to the deployment of smart grid and advanced metering infrastructure.[1]

On March 25, 2009, the Commission approved the stipulation filed in the Companies' ESP Case, Case No. 08-935-EL-SSO *et al.* In this stipulation, the Companies agreed to pursue

[1] Case No. 07-551-EL-AIR *et al.*, Opinion and Order dated January 21, 2009, pp. 44-45.

federal funds for the Ohio Project. The stipulation also approved the recovery for smart grid investment through a nonbypassable rider.[2]

On November 28, 2009, the Companies filed an application for approval of the Ohio Project in this docket.[3] Staff recommended that the Companies "report assessment results of the information and outcomes learned from the initial 5,000 meter deployment,"[4] which was the first phase of the CBS. Staff also recommended that the Commission review the results of Phase I of the CBS and determine whether or not proceeding with Phase II was warranted based on these results.[5] On June 30, 2010, the Commission adopted Staff's recommendations, approving the Companies' application and authorizing the Companies to proceed with the Ohio Project.[6] Among other things, the Commission made clear that the Companies were entitled to recovery for the costs incurred by the Companies which were not reimbursed by the DOE for implementing the Ohio Project through Rider AMI, subject to the cost recovery provisions in the Companies' ESP Case.[7]

On August 25, 2010, the Commission approved a stipulation regarding the terms of the Companies' Second ESP Case.[8] Among other things, this stipulation provided additional detail regarding the administration and cost-recovery associated with the Ohio Project.[9] The Commission approved the Companies' recovery of 50% of estimated $72.2 million in program costs from the DOE and 50% through Rider AMI.

---

[2] Case No. 08-935-EL-SSO *et al.*, Second Opinion and Order dated March 25, 2009, p. 13.

[3] Case No. 09-1820-EL-ATA *et al*., Application, filed November 18, 2009.

[4] Case No. 09-1820-EL-ATA *et al*., Finding and Order dated June 30, 2010, p. 7.

[5] Case No. 09-1820-EL-ATA *et al.*, Finding and Order dated June 30, 2010, p. 8.

[6] Case No. 09-1820-EL-ATA *et al.*, Finding and Order dated June 30, 2010, p. 11.

[7] Case No. 09-1820-EL-ATA *et al.*, Entry on Rehearing dated August 25, 2010, p. 4.

[8] Case No. 10-388-EL-SSO, *et al.*, Opinion and Order dated August 25, 2010, p. 36.

[9] Case No. 10-388-EL-SSO, *et al.*, Proposed Stipulation filed March 23, 2010, p. 23.

As shown by the Companies previous filings, pursuant to the Companies' stipulation in their first ESP, the Companies ultimately applied for and received a grant from the DOE for the Project. As directed by the Commission, since approval of this pilot program, the Companies have worked collaboratively with the Commission Staff on all aspects of the CBS including, but not limited to, the evaluation plan and communications with customers.[10] The Companies also worked with the DOE Technical Advisory Group who provided technical assistance in developing the CBS and the approach to evaluation. Lastly, as the Commission instructed the Companies to do, the Companies have completed Phase I of the CBS.

Phase I of the CBS involved approximately 5,000 meters and a peak time rebate study, which was completed during the summer of this year. The Companies have obtained detailed reports from their consultants describing the results of the CBS, which are attached hereto as Exhibits A and B for the Commission's review. Phase II of the CBS, should the Commission direct the Companies to proceed with the Ohio Project, would include approximately 39,000 additional meters for further study.

III. REPORT ON RESULTS OF PHASE I OF THE PROGRAM

A. CBS Results

As the Commission is aware, the CBS was targeted at a particular geographic area located in CEI's service territory comprised of a mix of residential and commercial customers. This geographic service area services customers on 34 distribution circuits serviced by 14 substations. This geographic area was selected because it could support smart grid infrastructure with minimal additional investment and because customer reliability in this area had been

[10] Case No. 09-1820-EL-ATA *et al.*, Finding and Order dated June 30, 2010, pp. 9-10.

challenged by long circuit length and high customer concentrations.[11] The Ohio Project included a customer behavior study, distribution automation, voltage control, substation relay-based protective strategies, alternative pricing programs, communications and data infrastructure installation, data collection, analysis, and reporting.[12]

Phase I included installation of approximately 5,000 automated meters on residential accounts and combinations of peak time rebates with in-home technology. In-home technology included a programmable thermostat (with choice of the Companies or customer control during critical peak events) or an in-home display showing information only. Fifteen critical peak events were called between June-August of 2012. Attached hereto as Exhibit A is a detailed report on the preliminary demand response results for the first summer of Phase I of the CBS by a consultant retained by the Companies, the Electric Power Research Institute ("EPRI"). The final EPRI report on the Companies' CBS from the summer of 2012 is expected in December, 2012. Attached hereto as Exhibit B is a customer feedback survey regarding Phase I of the CBS by the Shelton Group ("Shelton Study"). These attachments constitute the Companies' report to the Commission of the results of Phase I, and are incorporated herein by reference. Though the reports speak for themselves, the reports indicate some specific lessons learned from Phase I:

1. The Companies' hypothesis testing revealed that the Companies' control thermostat group results in more demand reduction than the customer controlled thermostat group. The in-home displays group shows the lowest amount of demand reduction.

2. The results achieved in the Phase I study have statistical validity. Expanding the same study parameters to a broader population is not necessary.

[11] Case No. 09-1820-EL-ATA *et al.*, Application, filed November 18, 2009, p. 5.

[12] Case No. 09-1820-EL-ATA *et al.*, Application, filed November 18, 2009, p. 5.

3. The four-hour and six-hour treatment groups showed little difference in the per hour demand reduction.

4. Customers who control thermostats themselves are likely to initiate their setback prior to leaving for work.

5. A peak time rebate level of $.40/kwh is high enough to get significant results.

6. The event period or setback strategy may need to be refined.

7. Customer feedback and the Companies' analysis indicate the baseline calculation may need to be adjusted.

8. Most customers like the program and feel that they learned about their usage patterns; they found the CBS to be user friendly.

9. There are additional offerings that could increase participation in the CBS.

B. CBS Costs

The Commission previously approved $72.2 million in costs for the Ohio Project.[13] The Companies have reduced the expected cost of the Ohio Project by approximately $6.7 million, translating into a potential reduction in the estimated AMI Rider of approximately $3.35 million before carrying costs. If the Commission determines that the Companies should proceed with Phase II of the CBS, the Commission should authorize a $6.7 million reduction and reallocation of the Ohio Project budget to the Initiative. As a result of this reduction, $3.35 million of U.S. Department of Energy ("DOE") matching funds are now available for allocation to other aspects of the Initiative outside of Ohio, subject to the approval of the DOE.

[13] Case No. 09-1820-EL-ATA *et al.*, Finding and Order dated June 30, 2010, p. 11.

IV. SHOULD THE COMMISSION DIRECT THE COMPANIES TO IMPLEMENT PHASE II OF THE CBS, THE COMPANIES RECOMMEND SEVERAL MODIFICATIONS.

As discussed above, Staff recommended that the Commission determine whether the Companies should proceed with Phase II of the CBS, which the Commission adopted in its June 30, 2010 Opinion and Order. Although Phase II was designed to be an expansion of Phase I of the CBS, including the addition of commercial customers, should the Commission decide that Phase II of the CBS should go forward, the Companies believe that certain modifications will need to be made to the original plan of Phase II as explained in detail in Exhibit B of the Companies' Application, filed in this case on November 18, 2009.[14] Please also see Exhibit C for a description of the proposed approach to Phase II of the CBS, if Phase II is directed to go forward.

1. Increase Emphasis On The Peak Time Rebate.

In Phase I, the Companies made the offer of the in-home technology in their initial offer to customers. If the customer accepted the in-home technology, he or she was offered the peak time rebate. If Phase II proceeds, the Companies suggest increasing the emphasis on the peak time rebate in their marketing efforts to a portion of customers, rather than the in-home technology and offering some customers an additional option of a choice of in-home technology. Customers offered in-home technologies may pick a technology that best suits their needs or choose to participate in only the peak time rebate with no technology.

2. Consideration of Alternative Baseline Calculation.

The Companies suggest that any Phase II of the CBS involves a discussion with the Commission Staff, EPRI, the DOE and its Technical Advisory Group to consider an alternate

[14] Case No. 09-1820-EL-ATA.

baseline calculation for use in rebate calculations and a comparison with the calculation that is being used for the Phase I customers.

3. Adjust Thermostat Setback To Avoid "Snap Back."

Measuring customers' willingness to reduce peak demand is a goal of the Initiative. In Phase I, customer usage changed for customers with the Companies' controlled thermostats during peak demand reduction events. However, the benefit of this peak demand reduction was partially lost after the event window ended as customer usage increased immediately after the event ended. This increase in demand was primarily caused by customer air conditioners automatically adjusting to the levels set prior to the event window. In order to avoid the "snap back" to the previous level of peak demand in any Phase II that is ordered, the Companies suggest that they test the effects of gradually ending events so that customer air conditioners can reach the ultimate level of temperature control gradually.

4. Expand On Customer Education Regarding The Ohio Project.

The results of the customer survey indicated that customers value education and it could therefore significantly affect their behavior, ultimately resulting in peak demand reductions. If Phase II goes forward, the Companies recommend enhancements to the CBS website to provide additional educational materials, testimonials from customers, and educational games designed to encourage peak demand reduction during high usage events and to inform customers of the ways in which they can save money by reducing usage and taking advantage of smart meter technology at no cost to them. The Companies propose to include a link from this website to the customers' specific usage information, which currently is available on another website but is infrequently accessed.

5. Compare The Results Of The Peak Time Rebate With Customer Education Only.

If Phase II is ordered, the Companies suggest testing the effectiveness of education only versus education combined with a peak time rebate. In order to test this, the Companies propose to add two treatment groups. Group One would receive a message from the Companies and a peak time rebate on the day before a peak event, while Group Two would receive only a notification and would not receive a rebate, allowing the Companies to determine the effectiveness of the rebate in altering customer behavior and demand reductions.

6. Educate Competitive Retail Electric Service ("CRES") Providers In The Ohio Project Footprint And Work With Them On Billing Options For Time Differentiated Pricing.

There is a significant amount of shopping in the Ohio Project footprint. Toward that end, any ordered Phase II should include educating registered CRES providers within CEI's service territory to educate them on the advanced metering capabilities in this footprint and to gauge their interest in providing dynamic pricing options to customers.

7. Install Automated Meters On Some Commercial Customers.

Phase I of the CBS did not include commercial accounts. If Phase II is to go forward, the Companies suggest the replacement of two forms of commercial meters with automated meters, which would involve up to 3,400 commercial customers based on the number of customers who opt-out of getting the automated meter. A random drawing would decide the control group for these commercial customers. If a commercial customer has an advanced meter installed and is not part of the control group, the customer can be offered the $0.40 per kWh peak time rebate. Commercial customers may not be offered enabling technology but may be educated on existing time differentiated price options available from their local distribution utility and provided targeted education materials about reducing energy and demand. Inclusion of commercial

customers could allow the Companies to determine the level of peak demand reduction capability for commercial customers of this size.

V. SHOULD THE COMMISSION DIRECT THE COMPANIES TO IMPLEMENT PHASE II OF THE CBS, A MODIFICATION OF THE BUDGET IS NECESSARY.

The Companies anticipate that the Ohio Project will be completed at approximately $6.7 million under the original projected budget of $72.2 million. As the Ohio Project is now anticipated to be $6.7 million under budget, if the Commission direct the Companies to implement Phase II, the Commission should authorize the Companies to reallocate the corresponding $3.35 million of funds that are to be received from DOE to other aspects of the Initiative outside of Ohio that are currently underfunded. In so authorizing, Ohio customers will receive a reduction in what they otherwise would have been required to pay, without losing any of the benefits originally anticipated, while allowing a more thorough study of other aspects of the comprehensive Smart Grid Modernization Initiative Project.

VI. CONCLUSION

Based on the foregoing, the Companies respectfully request direction of whether they should implement Phase II of the CBS, as modified herein. If so, the Commission may also approve the updated budget for Phase II, which includes a $6.7 million reduction that generates $3.35 million of DOE matching funds that will be utilized in other aspects of the Project outside of Ohio, subject to the approval of the DOE. Further, the Companies request that the Commission provide its direction on whether to proceed with Phase II no later than November 14, 2012, in order to allow smart meter deployment and adequate marketing for Phase II of the CBS to commence in a timely manner.

Respectfully submitted,

/s/ Kathy J. Kolich

Kathy J. Kolich
FIRSTENERGY SERVICE COMPANY
76 South Main Street
Akron, OH 44308
(330) 384-4580
(330) 384-3875 (fax)
kjkolich@firstenergycorp.com

Attorney for Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company

CERTIFICATE OF SERVICE

I hereby certify that a copy of the foregoing *Compliance Filing and Motion of Ohio Edison Company, The Cleveland Electric Illuminating Company and The Toledo Edison Company for Direction Regarding Phase II of the Ohio Site Deployment of the Smart Grid Modernization Initiative* was served this 19th day of October, 2012, via e-mail upon the parties below.

/s/ *Kathy J. Kolich*
Attorney for Ohio Edison Company, The Cleveland Electric Illuminating Company, and The Toledo Edison Company

Samuel C. Randazzo
McNees Wallace & Nurick
21 East State St., 17th Floor
Columbus, OH 43215
sam@mwncmh.com

Colleen L. Mooney
David C. Rinebolt
Ohio Partners for Affordable Energy
231 West Lima St.
Findlay, OH 45840
cmooney2@columbus.rr.com
drinebolt@ohiopartners.org

Mark S. Yurick
Taft Stettinius & Hollister LLP
65 East State St., Suite 1000
Columbus, OH 43215
myurick@taftlaw.com

David F. Boehm
Michael L. Kurtz
Boehm, Kurtz & Lowry
36 East Seventh St.. Suite 1510
Cincinnati, OH 45202
dboehm@bkllawfirm.com
mkurtz@bkllawfirm.com

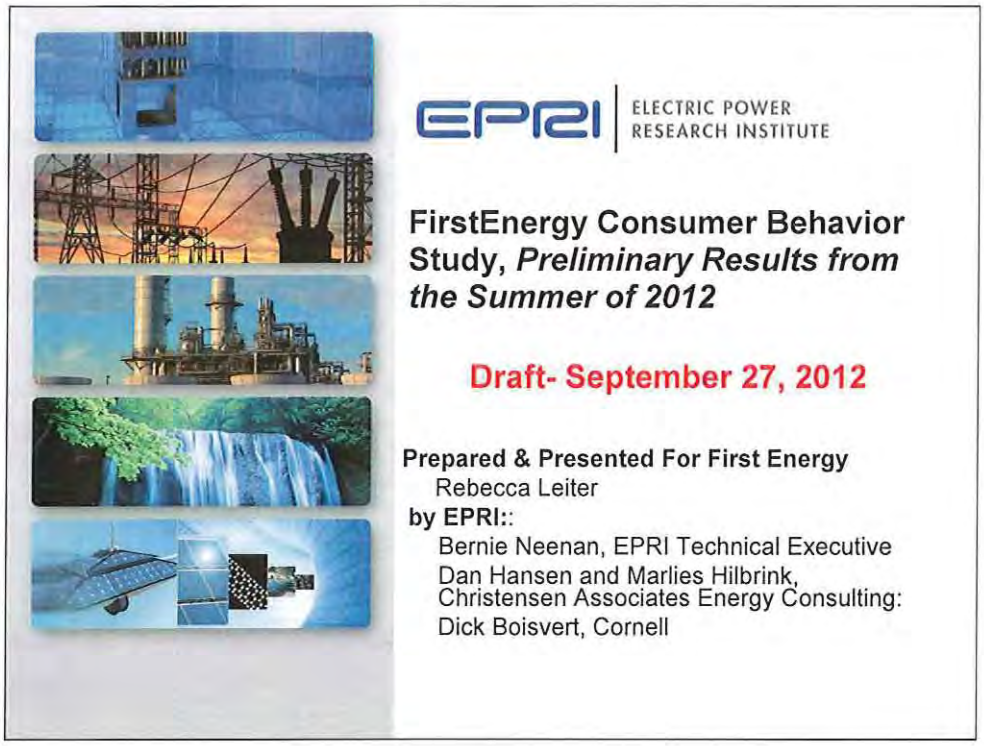
Jeffrey Small
Ann Hotz
Office of the Ohio Consumers' Counsel
10 West Broad St., Suite 1800
Columbus, OH 43215
small@occ.state.oh.us
hotz@occ.state.oh.us

Garrett A. Stone
Michael K. Lavanga
Brickfield, Burchette Ritts & Stone, PC
1025 Thomas Jefferson St., N.W.
8th Floor, West Tower
Washington, D.C. 20007
mkl@bbrslaw.com
gas@bbrslaw.com

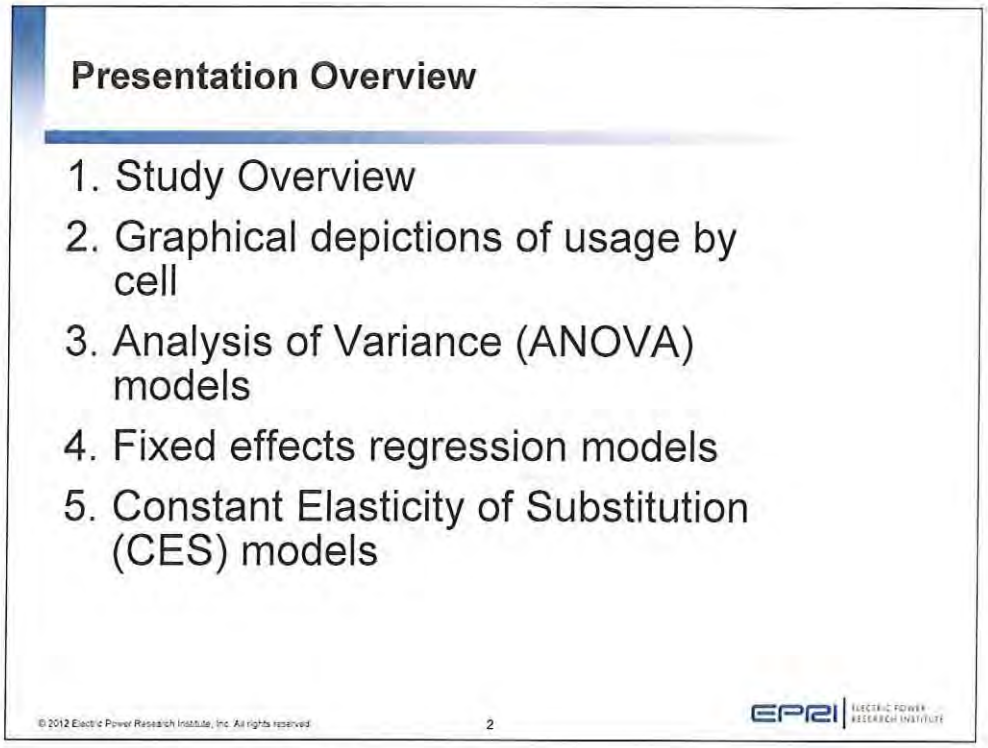
Theodore S. Robinson
Citzien Power, inc.
2121 Murray Ave.
Pittsburgh, PA 15217
robinson@citizenpower.com

William Wright
Assistant Attorneys General
Public Utilities Section
180 East Broad St., 6th Floor
Columbus, OH 43215
william.wright@puc.state.oh.us

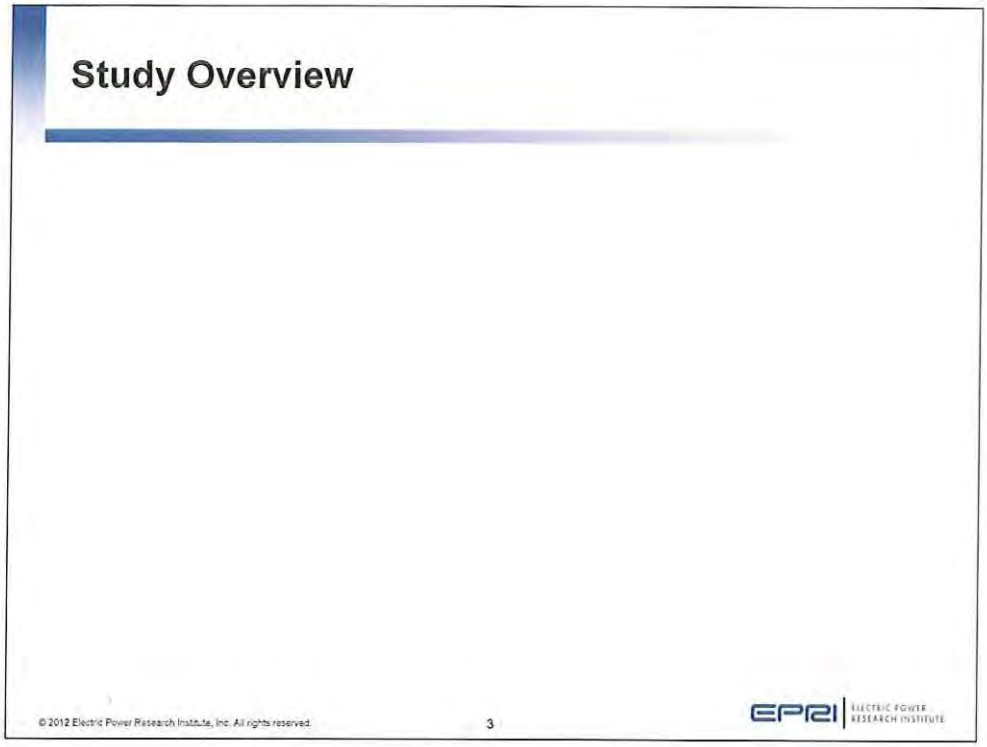
Joseph P. Meissner
Matthew D. Vincel
The Legal Aid Society of Cleveland
1223 West 6th Street
Cleveland, OH 44113
Phone: 216.687.1900
jpmeissn@lasclev.org

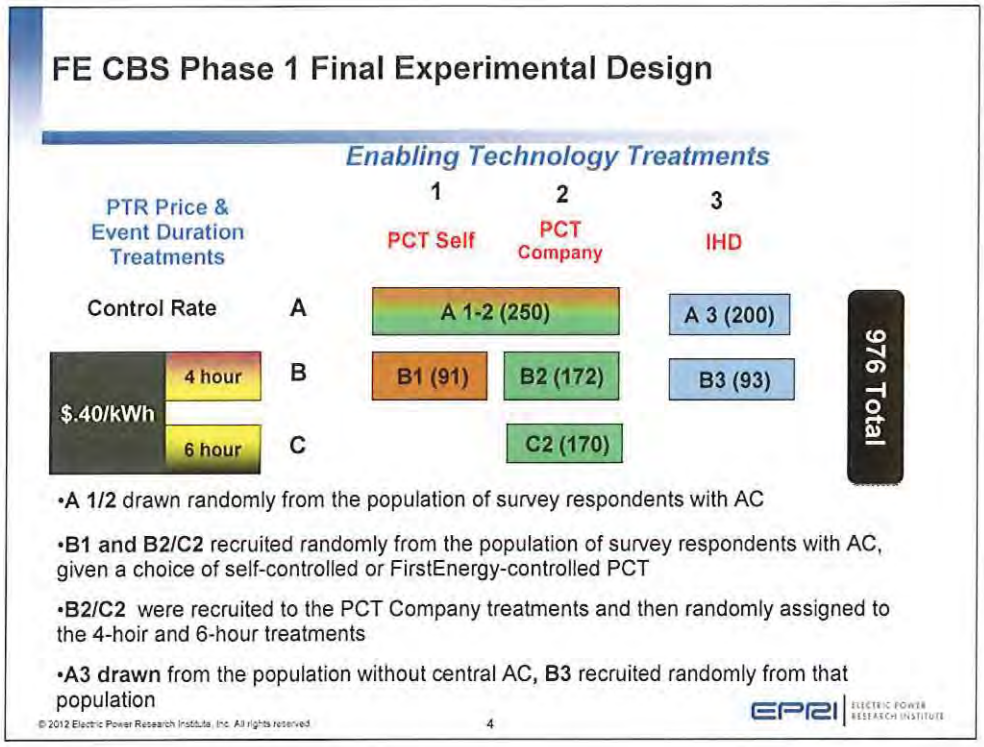


Study conducted by EPRI for FirstEnergy to evaluate the CBS pilot

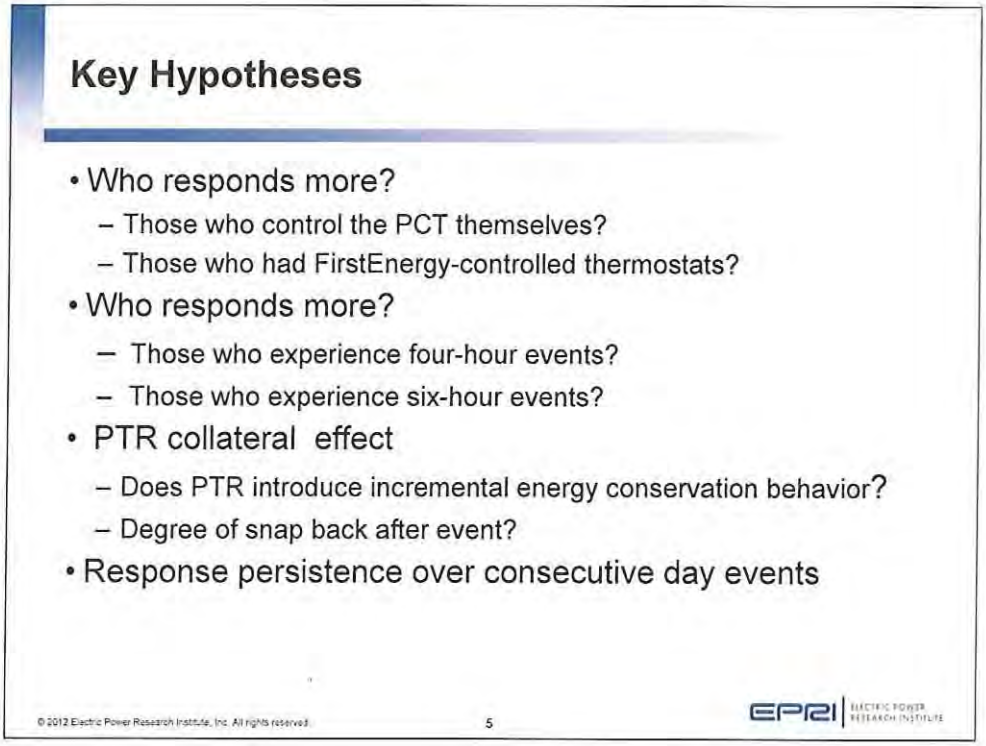


Four analyses (2-5) were conducted serially to fully characterize the impacts attributable to the CBS treatments

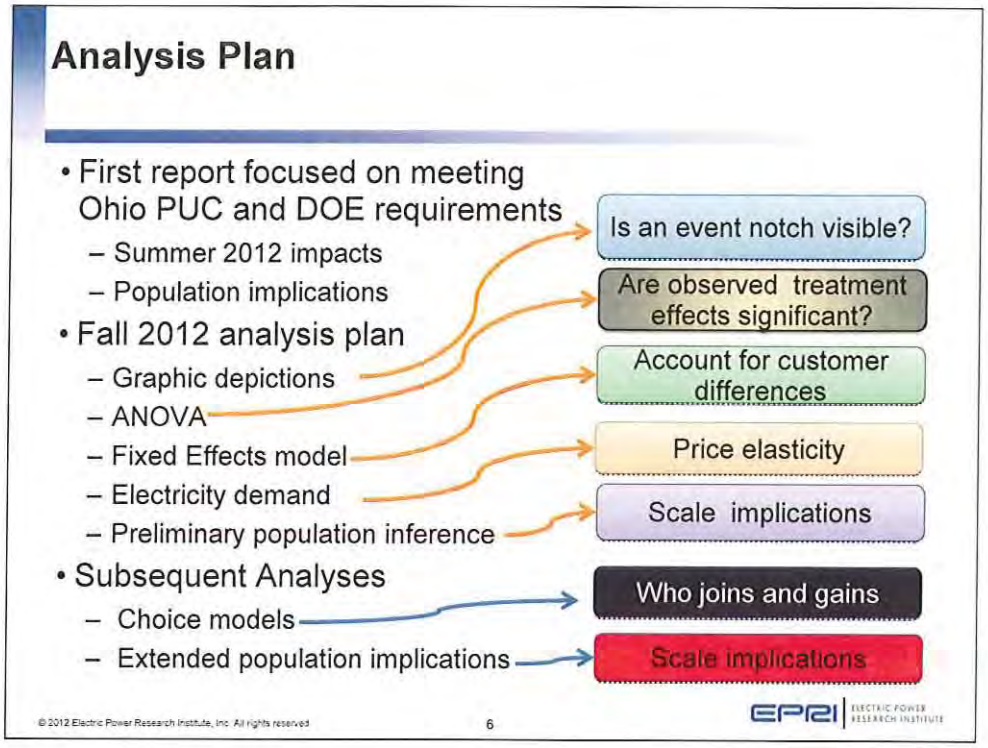

Study Overview
© 2012 Electric Power Research Institute, Inc. All rights reserved.
3
EPRI ELECTRIC POWER RESEARCH INSTITUTE



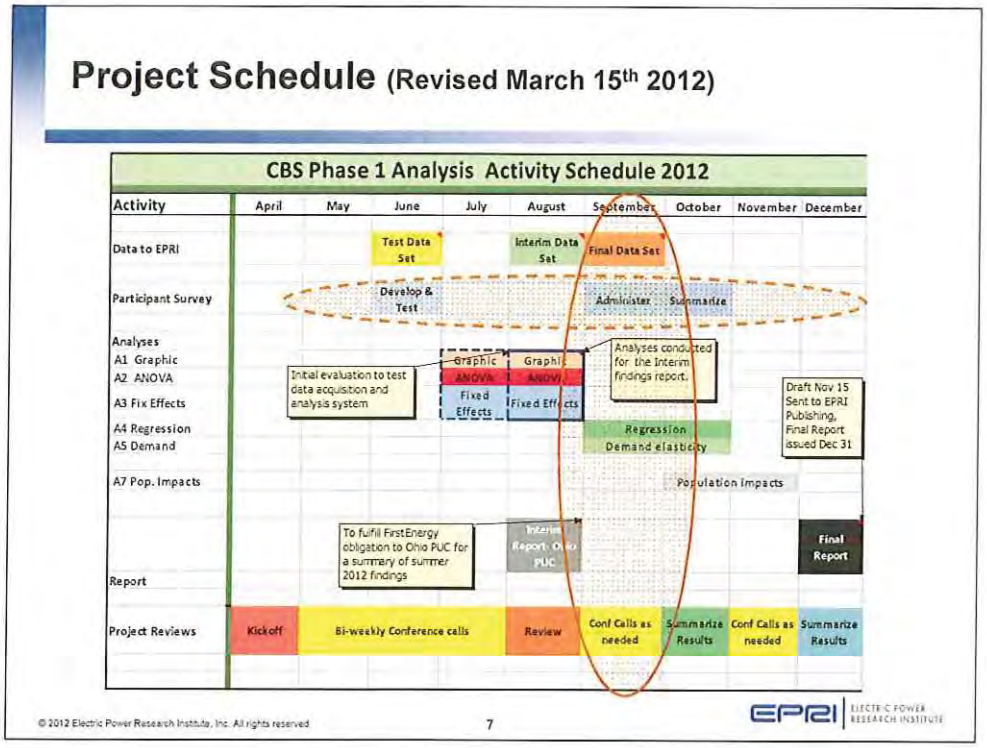
FirstEnergy followed the ordered sampling suggested by the DOE TAG. The sample frame was comprised of ~5,000 customers (out of the ~15,000) that completed a pre-treatment survey.



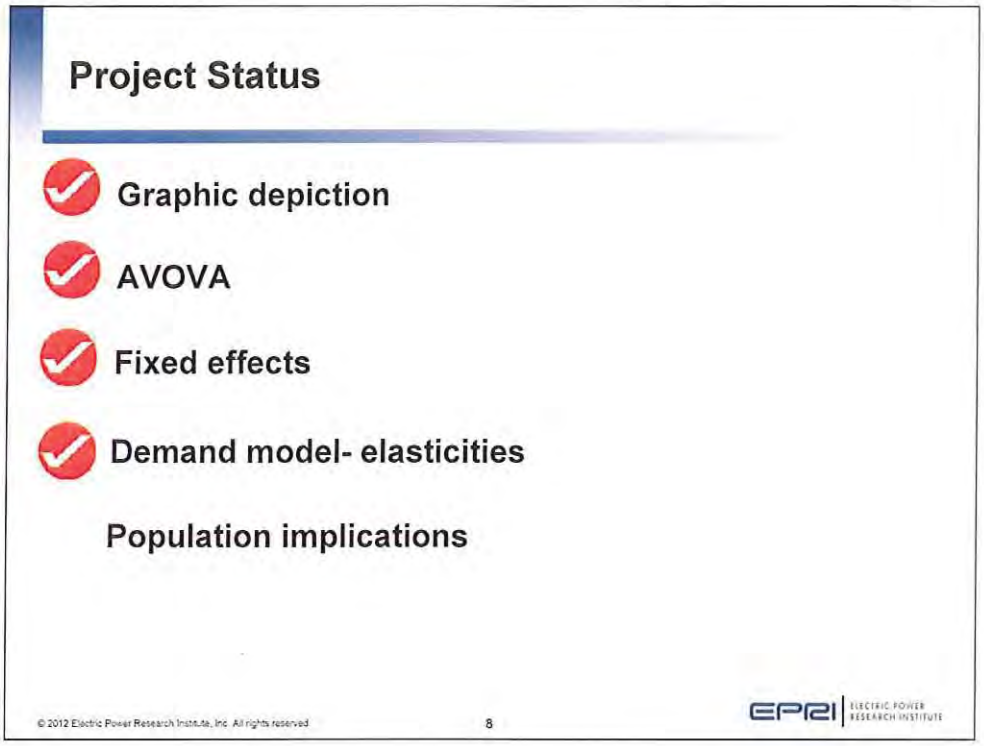
The hypotheses reflect the research priorities set by FirstEnergy and the DOE TAG.

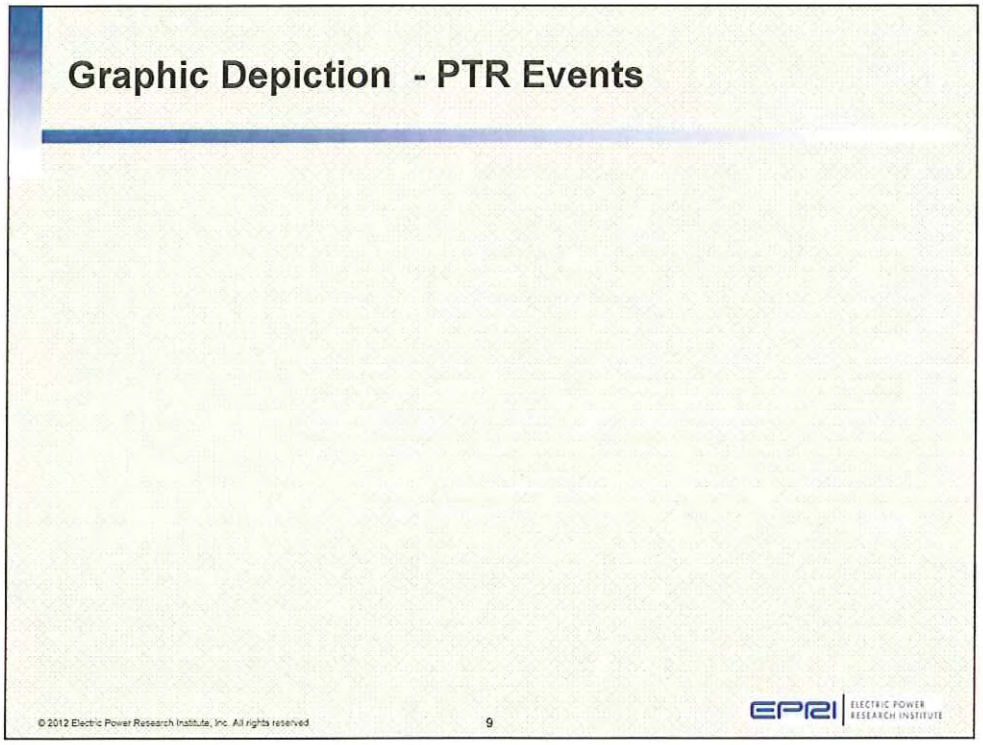


The Fall 2012 analyses are being conducted to inform the Go/No Go for Phase 2 that would result in an additional ~40,000 more meters being installed to serve as the basis for additional treatment tests



The September 25 review meeting presents the findings for review and revisions for subsequent vetting by DOE TAG and the Ohio PUC


Project Status
Graphic depiction
AVOVA
Fixed effects
Demand model- elasticities
Population implications
© 2012 Electric Power Research Institute, Inc. All rights reserved.
8
EPRI ELECTRIC POWER RESEARCH INSTITUTE


Graphic Depiction - PTR Events
© 2012 Electric Power Research Institute, Inc. All rights reserved
9
EPRI
ELECTRIC POWER RESEARCH INSTITUTE

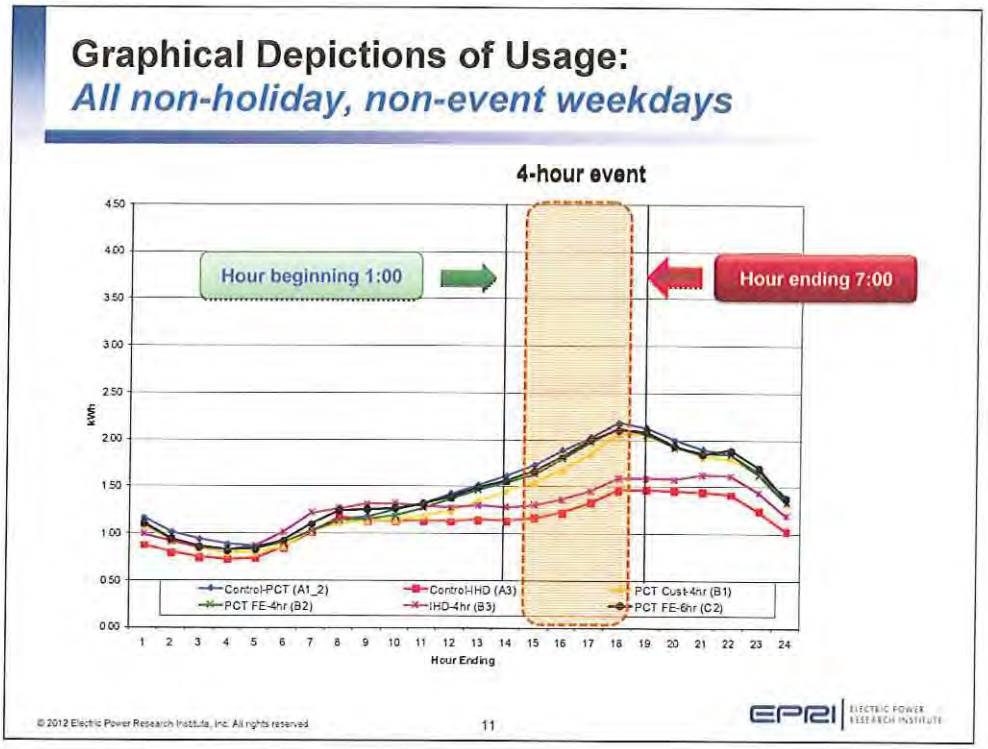
Event Days

Event Day	Max Temp - Event Hours	Average Event kWh PCT Control (A1/2)
19-Jun-12	91	3.23
20-Jun-12	90	3.41
21-Jun-12	91	3.40
29-Jun-12	91	3.37
2-Jul-12	90	3.14
3-Jul-12	85	1.88
5-Jul-12	86	2.36
6-Jul-12	94	3.71
16-Jul-12	90	3.31
17-Jul-12	98	3.90
23-Jul-12	94	3.43
26-Jul-12	88	3.10
3-Aug-12	93	3.63
16-Aug-12	86	1.98
24-Aug-12	87	2.28

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Control-group event-day usage (which provides an indication of the amount of load available to be reduced) is strongly related to temperature, as we'd expect. But, there is still a lot of variation among the event days.

There was one instance of three consecutive weekdays with events (19-21 June) and three 2-consecutive day events (2-3 July and 5-6 July, 16-17 July) and six single-day events

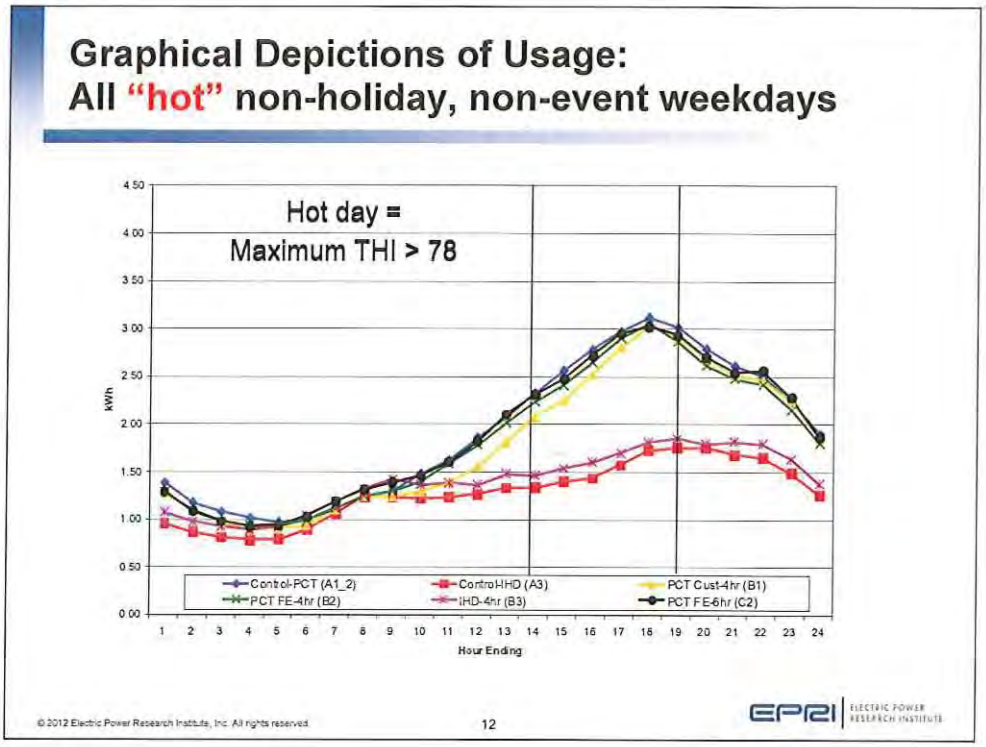


B1 (customer PCT control, 4-hr) is lower than its control group (A1/2) during many hours of the day. This indicates that selection issues (customers chose B1 over B2 or C2) affected the load treatment load profile, preventing a completely "clean" comparison of B1 treatment loads to A1/2 control loads.

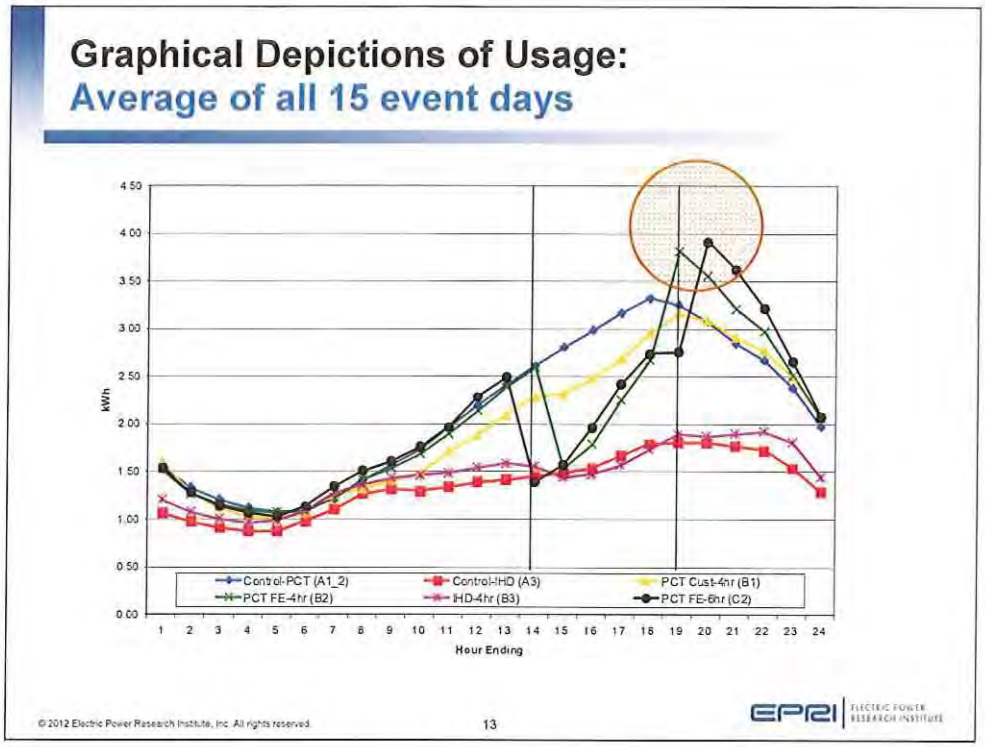
B2 (utility PCT control, 4-hr) and C2 (utility PCT control, 6-hour) look quite similar to control group (A1/2) loads.

B3 (IHD+PTR, 4-hr) customers use more in all hours than their control customers (A3). The load shape is very similar for the two groups. The load shape also reflects the fact that IHD+PTR customers do not have central AC (whereas PCT customers do), preventing a direct comparison of PCT and IHD+PTR customers.

Non-event day usage level differences between B1 and B3 and their control groups will be accounted for in a fixed-effects analysis, but not in the ANOVA analysis. Conducting both provides a picture of the extent of the bias on the measured treatment effects



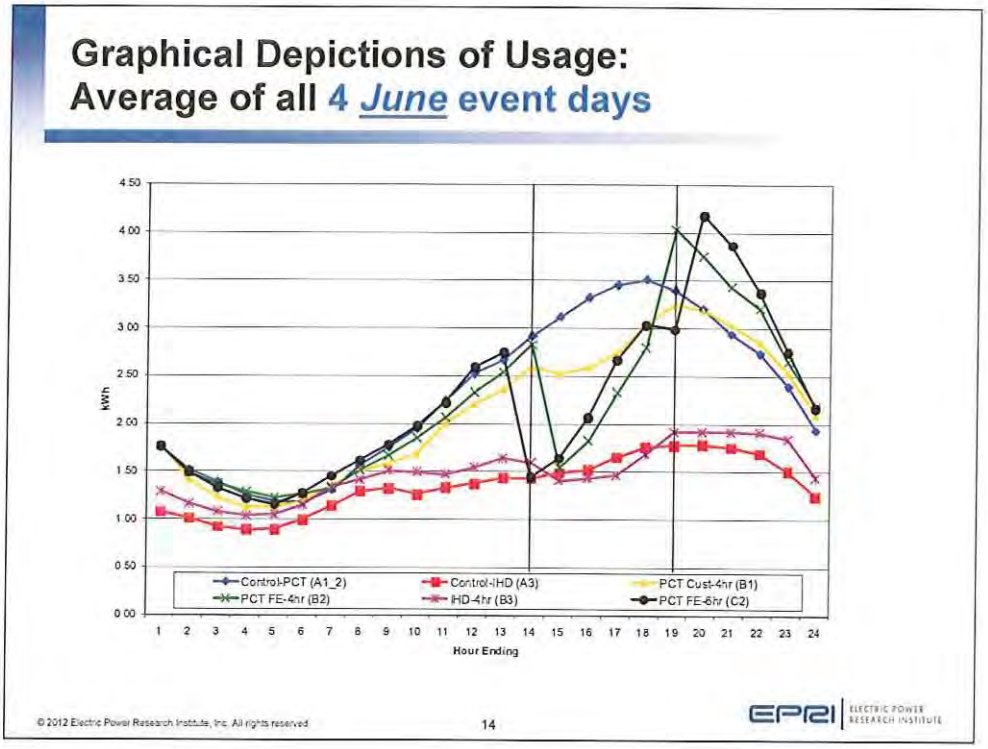
These are days where the temperature was close to that of event days, but no event was called. Event-like (i.e., hot) non-event day loads display similar patterns to those observed on the previous slide. Overall load levels are higher, but B1 is still below A1/2 and B3 is still higher than A3.



This graph shows the average load profile for the controls and treatments over all 15 event days. B2 and C2 show clear event-hour "notches" (distinctly lower loads during the event hours) indicating demand response across their applicable event hours. Both groups exhibit post-event "snap-back" (distinctly higher loads just after the vent ends)

B1 is lower than A1/2 loads, but recall that it is somewhat lower on non-event days as well. Indication of further usage reduction during event-hours. Their response will be more easily identified in the fixed effects analysis results.

B3 loads change shape, but event usage ends up at levels close to the control group level. We'll show that this demand response can be identified using a fixed effects model or ANOVA analysis of peak to off-peak usage ratios (but not through an ANOVA study of the level of event-hour usage).

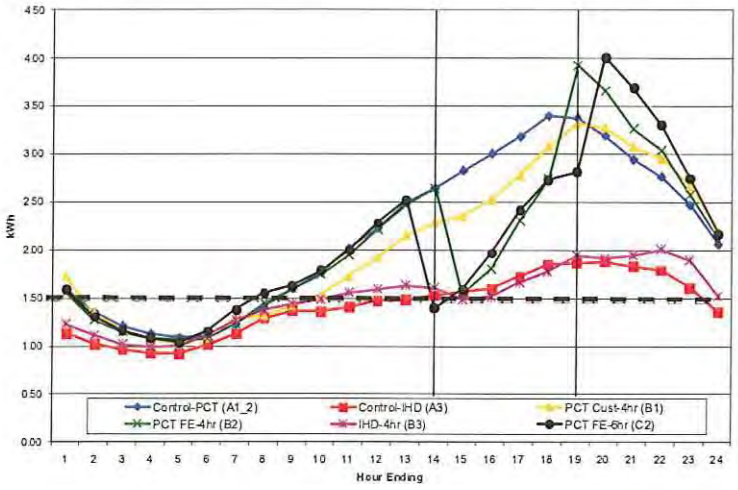


The next 3 slides look at demand response by month (all are presented on the same scale to facilitate spotting differences).

B1 and B3 demand response is most pronounced in June.

August has lower overall load levels, but still displays distinct "notches" for B2 and C2.

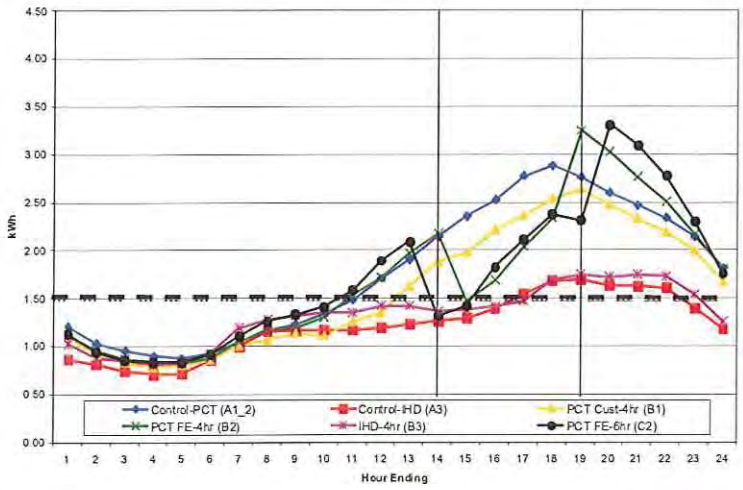
Graphical Depictions of Usage: Average of all 8 *July* event days



15

EPRI ELECTRIC POWER RESEARCH INSTITUTE

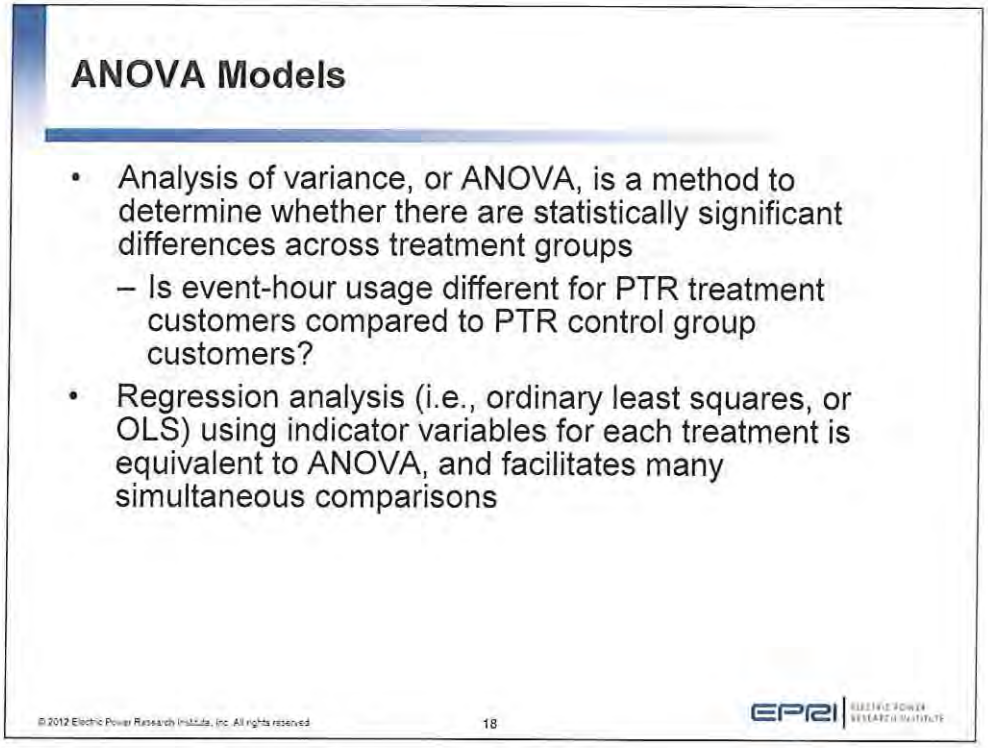
Graphical Depictions of Usage: Average of all 3 *August* event days



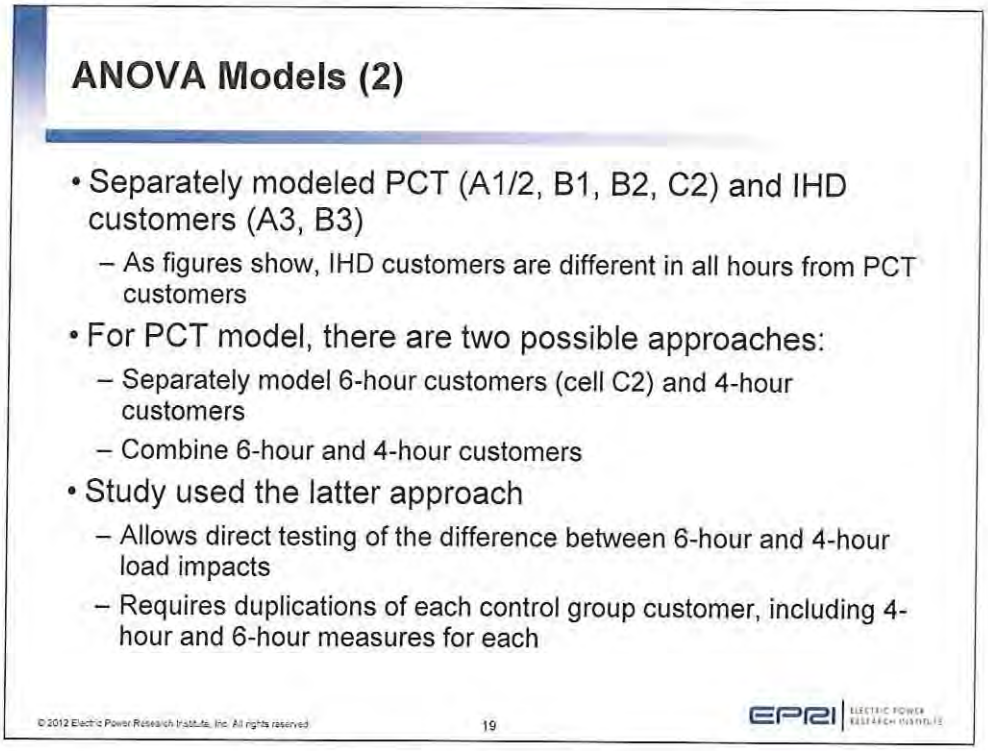
16

EPRI ELECTRIC POWER RESEARCH INSTITUTE

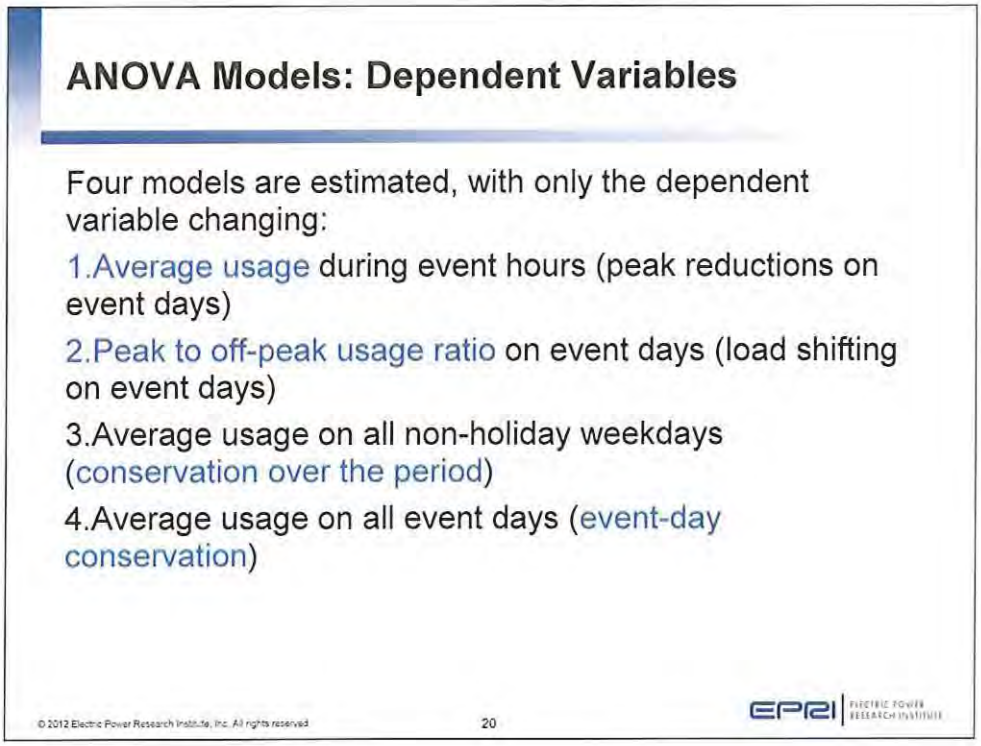
ANOVA Models



Analysis of Variance models attempt to determine whether statistically significant differences exist between the treatment and control groups (are the measured average load difference significant?). It assumes that the control group is representing the treatment loads in the absence of an event. Therefore, ANOVA does not account for the observed differences in treatment and control loads on all days, which is remedied in the fixed effects models. Nonetheless, ANOVA provides a preliminary portrayal of the effects of the PCT, PRT and event duration treatments.



The control group's average load for the event period (which serve as the basis of comparison to treatment event loads) can be portrayed in terms of a 4-hour event or a 6-hour event. But, to properly compare the different event duration treatments, the control group must have both event duration representations. ANOVA models cluster control group observations to account for the fact that each one is included twice (i.e., the standard errors are adjusted upward to account for the fact that not all draws are truly independent).



We employed different measures of the treatment effect to characterize the impacts with respect to event day load changes and overall load changes. The conservation measures test whether there is a carry-over from event responses (to earn payments) to other days of the year and if reducing during event hours is accompanied by an overall reduction in load associated with reducing usage in hours when they were offered a monetary incentive. Many recent pilots report conservation effects of 2-4% .

ANOVA Models: PCT Regression Model

- $Usage_i$ =

$\alpha + \beta_{PCT\_FE} \times PCT\_FE_i + \beta_{PTR} \times PTR_i + \beta_{Hr6} \times Hr6_i +$
$+ \beta_{PTR\_Hr6} \times PTR\_Hr6_i + e_i$

Subscript *i* indexes customers
α is the constant (Cell A1/2, PCT Control Group, 4-hr)
βs are estimated parameters, or treatment effects
e_i is the error term

21
EPRI ELECTRIC POWER RESEARCH INSTITUTE

PCT_FE indicates FirstEnergy control of PCT, equals 1 for B2 and C2.

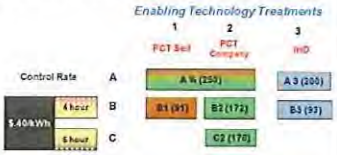
PTR indicates presence of PTR pricing, equals 1 for B1, B2, and C2.

Hr6 indicates 6-hour measure of peak period, equals 1 for A1/2 6-hr customers and C2.

PTR_Hr6 indicates 6-hour PTR customers, equals 1 for C2.

ANOVA Models: Results Interpretation

- α represents the average usage (or peak to off-peak usage ratio, depending on the model) for the 4-hour control group customers
- $\alpha + \beta_{Hr6}$ represents the average usage for the 6-hour control group customers, an adjustment to the α to account for the longer event duration
- Cell-level treatment effects (e.g., event-day load impacts) can be calculated from the estimates:
  - Cell B1 Effect = β_{PTR}
  - Cell B2 Effect = $\beta_{PTR} + \beta_{PCT\_FE}$
  - Cell C2 Effect = $\beta_{PTR} + \beta_{PCT\_FE} + \beta_{PTR\_Hr6}$



We expect the α το βε ποσιτιωε– ιτ□σ τηε χοντρολ λοαδ ιν κΩ/ηρ Ωε εξπεχτ β_{Hr6} to be negative since more hours are included in the event period, so the average per hour goes down.

All other coefficient should be negative because they are treatments intended to reduce event load

ANOVA Models: PCT Results

PCT Customer Model where Usage is Measured as:				
	(1)	(2)	(3)	(4)
	Event Day Peak Hours	Event Day P/O Ratio	All Non-Holiday Weekday Hours	All Event Day Hours
Constant	3.075+++ (0.100)	1.676+++ (0.029)	1.611+++ (0.066)	2.125+++ (0.077)
PTR	-0.462+++ (0.174)	-0.223+++ (0.061)	-0.111 (0.103)	-0.146 (0.122)
PCT_FE	-0.551+++ (0.162)	-0.378+++ (0.062)	0.049 (0.094)	0.039 (0.114)
Hr6	-0.046+++ (0.006)	0.120+++ (0.008)	0.000 (0.000)	0.000 (0.000)
PTR_Hr6	0.127 (0.110)	-0.080+ (0.042)	0.025 (0.076)	0.004 (0.091)
Observations	933	931	933	933
R-squared	0.095	0.305	0.002	0.003
Robust standard errors in parentheses. +++ p<0.01, ++ p<0.05, + p<0.1				

The rows in the first column are the model variables and the columns labeled 1-4 are the four models estimated by ANOVA. The value in the cells are the estimated event treatment impact coefficients (kW/hr) - the significance of which is indicated by + signs (the parenthetic values are the standard error of the estimate).

For example, for column (1) Even day peak Hours

Column 1, "Constant" result of **3.075** indicates that A1/2 customers use an average of 3.075 kWh during each hour of the 4-hour event window.

Column 1, "Hr6" result indicates that A1/2 customers measured using a 6-hour event window decreases usage by **0.046** kWh.

Column 1, "PTR" result indicates that the presence of PTR reduces event-hour usage by an average of **0.462** kWh. This is the entire effect for cell B1.

Column 1, "PCT_FE" result indicates that FirstEnergy control of the PCT further reduces event-hour usage by **0.551** kWh.

Total effect for B2 = -0.462 – 0.551 = -1.013.

Column 1, "PCT_Hr6" result, whose estimate is not statistically significant, indicates that 6-hour FirstEnergy PCT control are not statistically significantly different from B2 customers. Total effect for B3 = -0.462 – 0.551 + 0.127 = -0.886.

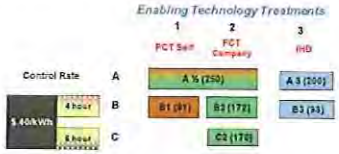
Column 2 reflects similar results using P/O ratio instead of peak-hour kWh. The coefficient are of the proper sign and most are significant

Columns 3 and 4, which measure conservation effects, the coefficients (expect the intercept) are insignificant, and indicate that there was no change in total usage on all days and event days (respectively). That is, ANOVA provides no evidence of conservation effects.

ANOVA Models: IHD + PCT Results*

IHD Customer Model where Usage is Measured as:				
	(1)	(2)	(3)	(4)
	Event Day Peak Hours	Event Day P/O Ratio	All Non-Holiday Weekday Hours	All Event Day Hours
Constant	1.625+++ (0.079)	1.265+++ (0.035)	1.180+++ (0.050)	1.365+++ (0.061)
PTR	-0.068 (0.141)	-0.195+++ (0.049)	0.135 (0.095)	0.100 (0.109)
Observations	293	290	293	293
R-squared	0.001	0.040	0.007	0.003
Robust standard errors in parentheses. +++ p<0.01, ++ p<0.05, + p<0.1				

* Cell B3 includes both the PTR and IHD treatments so the measured effect of PTR is the sum of the two



24

EPRI ELECTRIC POWER RESEARCH INSTITUTE

This is the model for the combined PTR (4-hour) and IHD treatment (B3). The model has only a constant and a PTR value to measure the impact of PTR event prices on loads.

As before, four models were estimated to measure enter load reductions, peak (event) to off-peak load ratios, and the conservation effect.

As expected from the graphic portrayal, event-hour usage for IHD + PTR (cell B3) customers is not statistically significantly different from control group customers despite the fact that B3 customers appear to have modified their load profile on event days. However, the P/O usage ratio is lower (significantly so) for the B3 customers.

As was the case with the PCT customers, there is no evidence of conservation.

The issue with B3 is that ANOVA doesn't do a very good job of estimating event-hour load changes because B3 loads (those of the treatment customers) start out above A3 loads (on non-event days). So when B3 reduces its load on event days, the final load level is about the same as the A3 load level; hence it suggests that they did indeed respond, but ANOVA did not capture it. ANOVA just compares the event-day load levels for A3 and B3 and sees no difference, despite the fact that B3 customers seem to have reduced load during event hours, based on graphic inspection of event day loads.

ANOVA Models: Summary of Treatment Effects

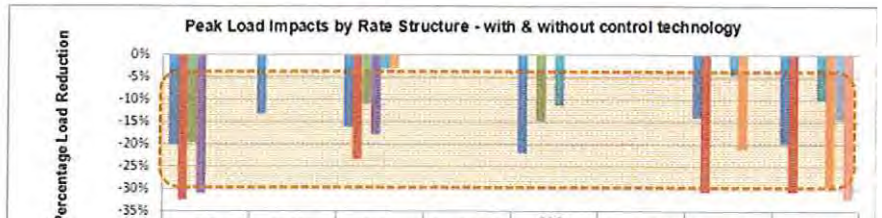
Average Hourly Load Changes as Measured by (% reductions in parentheses):				
	(1)	(2)	(3)	(4)
	Event Day Peak Hours (kWh/hr)	Event Day P/O Ratio	All Non-Holiday Weekday Hours (kWh/hr)	All Event Day Hours (kWh/hr)
B1	-0.462 (15%)	-0.223 (13%)	-0.111 (7%)	-0.146 (7%)
B2	-1.013 (32%)	-0.601 (36%)	-0.062 (4%)	-0.107 (5%)
C2	-0.886 (29%)	-0.681 (38%)	-0.037 (2%)	-0.103 (5%)
B3	-0.068 (4%)	-0.195 (15%)	0.135 (-11%)	0.100 (-7%)

These results represent the total treatment effect by cell.

For example, measured by **event day peak hour loads**, the B1 treatment results in a 15% reduction in event usage. For B2 and C2 it's 32% and 29%, respectively. The B3 effect is smaller- a reduction of 4%

.

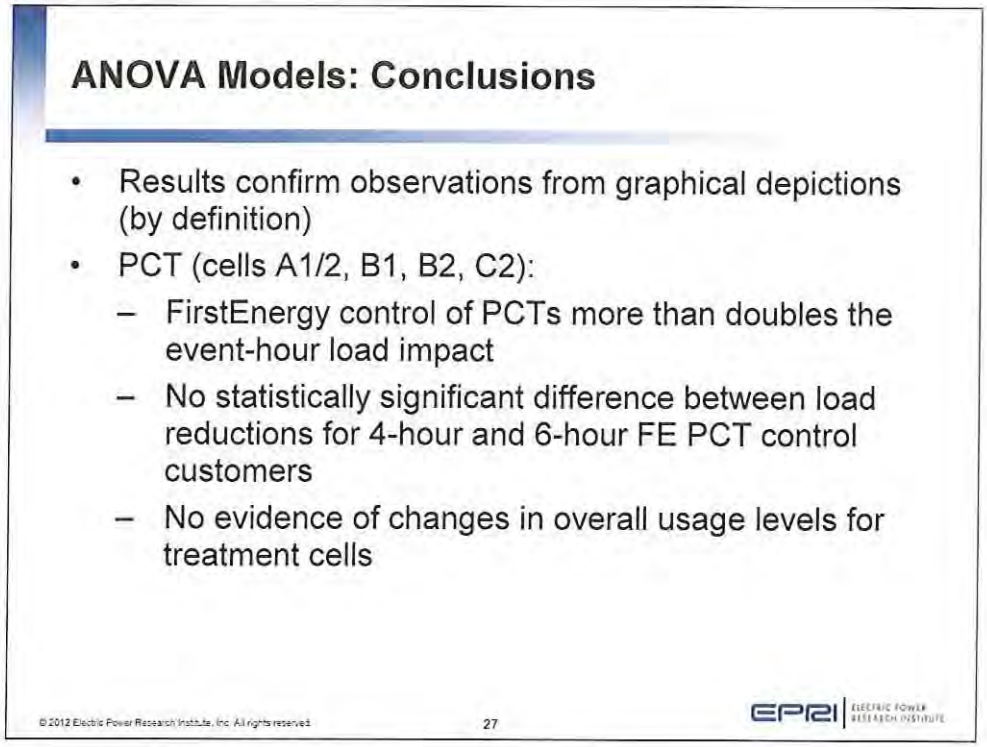
Relative Impacts



	BGE	CA-SPP	CL&P	ComEd CAP	CAP-responders	ComEd RTP	PSE&G	OG&E
CPP	-20%	-13%	-16%	0	-22%		-14.0%	-20%
CPP + Technology	-33%		-23%	0			-31%	-31%
PTR	-20%		-11%	0	-15%			
PTR + Technology	-31%		-18%	0				
TOU			-3%	0	-11%		-5%	-10%
TOU + Technology			-3%	0			-21%	-29%
VPP								-15%
VPP + Technology								-32%

EPRI ELECTRIC POWER RESEARCH INSTITUTE

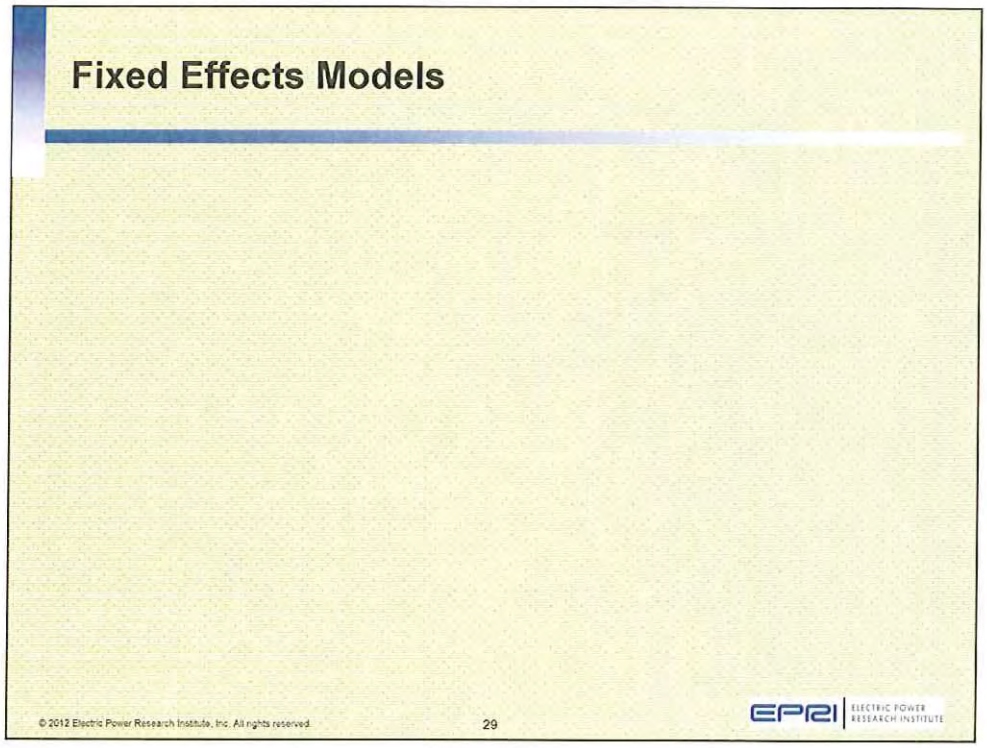
The slides shows reported impacts of CPP and PTR for 7 pilots, in some cases with and without a PCT (technology) . The colored band represents the range of impact values form the FE ANOVA analysis. The highest FE values equal the highest reported in previous pilots, the lowest FE value (for the PCT/IHD treatment to homes with no central air) is considerable less, but that is to be expected since the B3 treatment homes have lower event loads and must find things other than the AC to reduce to realize a benefit.

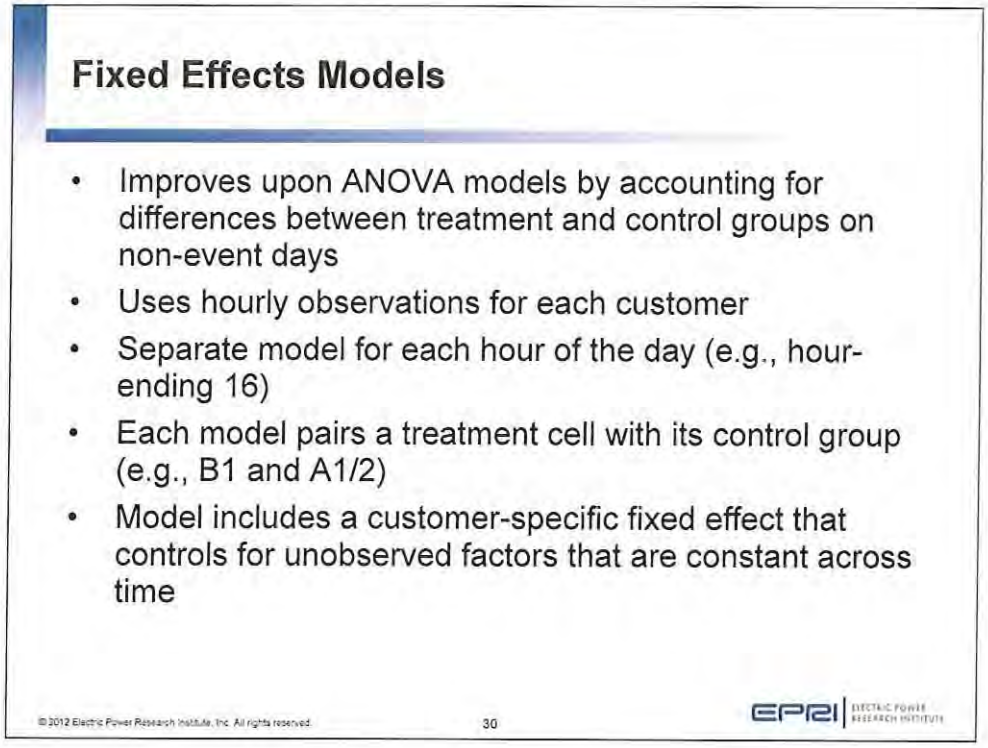


ANOVA provides a first-order estimate of the impacts of the treatments. But, because there are indications that the control groups are not representative a second level analysis using a fixed effects model is warranted before estimating a demand model to derive substitution price elasticities.

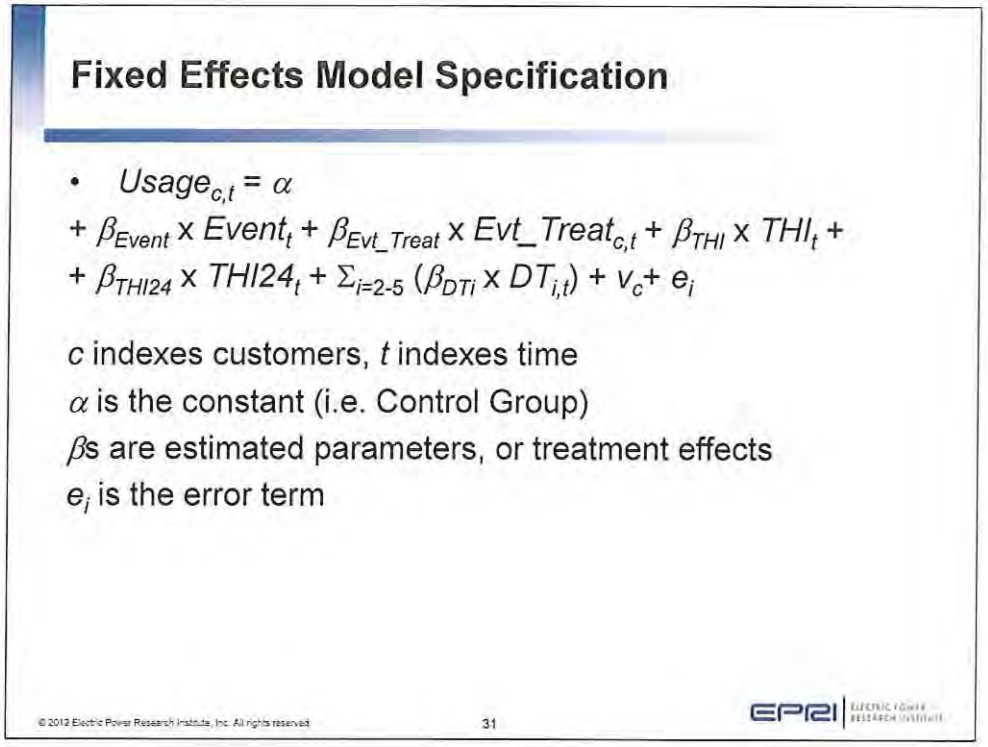
ANOVA Models: Conclusions (2)

- IHD + PTR (cells A3, B3):
  - ANOVA does not identify a difference between control and treatment event-hour usage level
  - It does identify a reduction in the peak to off-peak usage ratio on event days for IHD/PTR customers
  - Experimental design does not allow us to distinguish between the effects of IHD and PTR pricing


Fixed Effects Models
© 2012 Electric Power Research Institute, Inc. All rights reserved.
29
EPRI ELECTRIC POWER RESEARCH INSTITUTE



The idea is that there are differences among customer that affect their usage level absent the treatment, and these factors can influence and bias estimates of the treatment effects. A fixed effect model seeks to control for those individual customer factors to allow isolation of the treatment effect.



"**Event**" equals one for both treatment and control customers on event days. "**EventTreat**" equals one for only treatment customers on event days. These are the coefficients of interest. **THI24** is a 24-hour moving average of THI which better accounts for the implications for AC load on heat build up.

V_c represents the customer fixed effects. These are like customer-specific intercept terms, and they control for customer-level differences in average usage levels.

Fixed Effects Model Specification (2)

- $Event_t$ is an indicator variable that equals one if day t is an event day;
- $Evt\_treat_{t,c}$ is an indicator variable that equals one if day t is an event day and the customer is in a treatment (i.e. not control) cell;
- THI_t is the temperature-humidity index for the model hour on current day t;
- $THI24_t$ is the 24-hour moving average temperature-humidity index for the 24 hours prior to the model-hour on day t;
- $DT_{i,t}$ is a series of dummy variables for each day of the week;
- v_c is the fixed effect for customer c

Fixed Effects Model Results

Hour	Treatment Cell: PCT-Cust (B1)	PCT-FE, 4-hour (B2)	PCT-FE, 6-hour (C2)	IHD (B3)
14			-1.17	
15	-0.29	-1.18	-1.18	-0.19
16	-0.30	-1.12	-0.96	-0.21
17	-0.31	-0.86	-0.72	-0.22
18	-0.25	-0.60	-0.51	-0.19
19			-0.46	
Event Hour Average kWh Reduction	-0.29	-0.94	-0.83	-0.20
Control Group Average kWh Usage	3.07	3.07	3.03	1.63
Percent Usage Reduction	9%	31%	27%	12%

In the table, the rows indicate event hours, and the column the treatments. The value for each hour/treatment are % load reductions

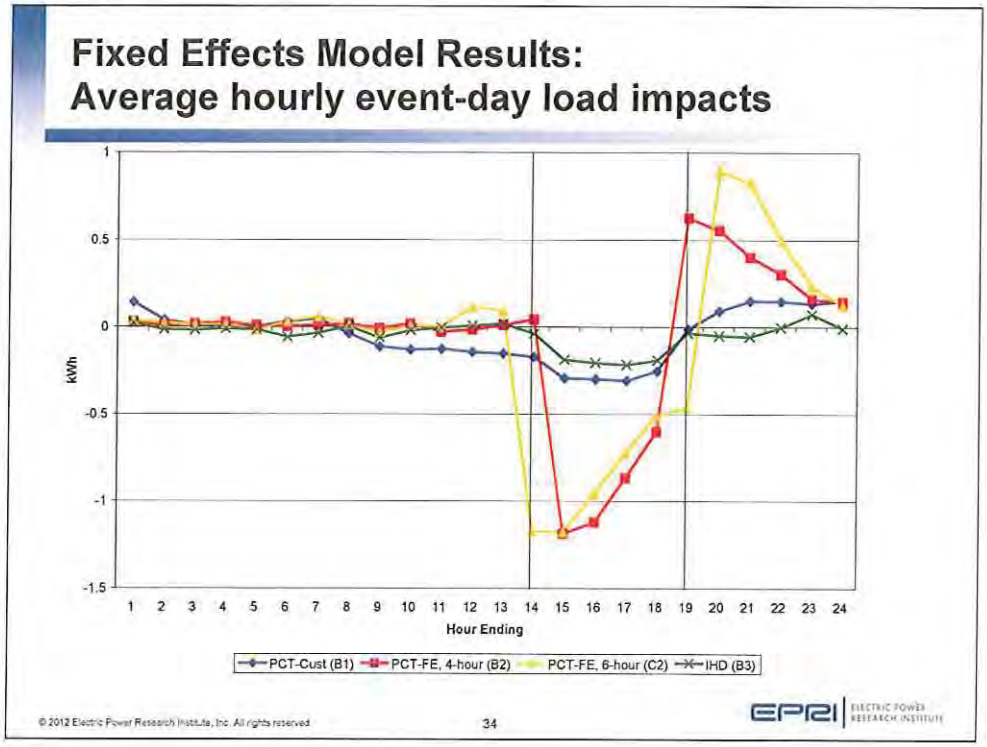
Comparison of fixed effects to ANOVA results for event-hour load impacts (fixed effects results listed first):

Comparison of ANOVA and Fixed effects coefficients :

Treatment	Fixed effects	ANOVA
B1:	-0.29,	-0.462
B2:	-0.94,	-1.013
C2:	-0.83,	-0.886
B3:	-0.20,	-0.068

B2 and C2 change relatively little as we move from ANOVA to fixed effects models, which makes sense since the control group appeared to be a pretty good proxy for their load.

The differences are larger for B1 and B3. B1 load impact estimates are decreased (by a third) by moving to fixed effects, which is consistent with the figures early in the presentation that showed that B1 loads tend to lie below A1/2 loads on all days (so ANOVA gives credit for that reduction on event days to the treatment, while fixed effects models do account for individual customer effects that may be the cause of the load being lower in general.



This slide shows hourly event-day load impacts by treatment cell.

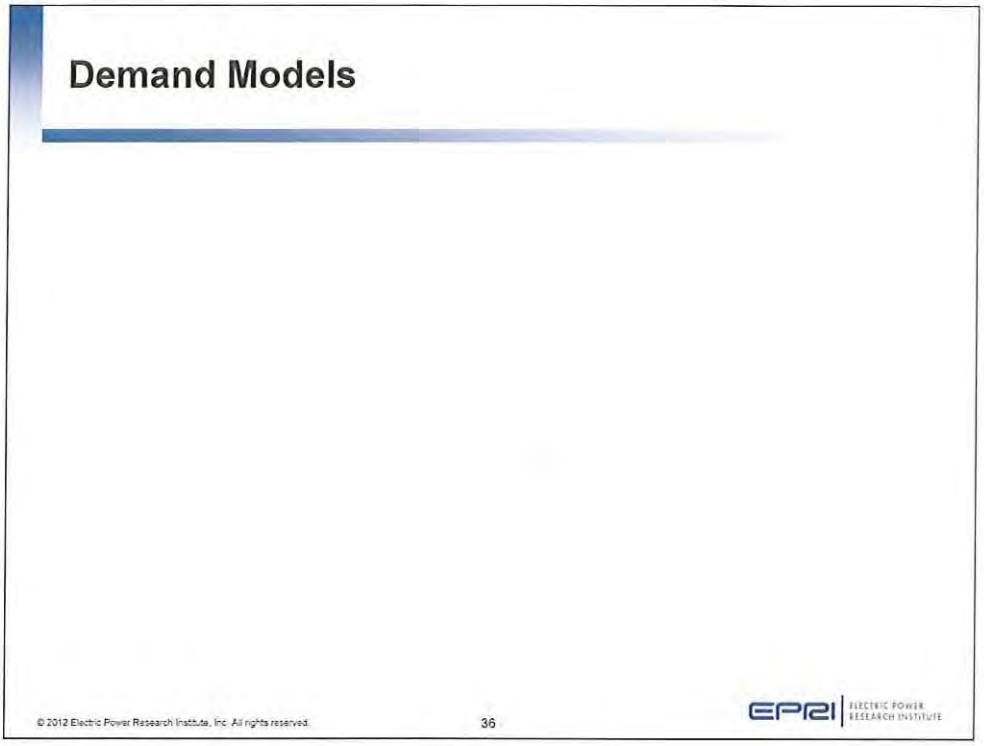
The B1 (the blue line) load shows load reductions well before the event starts, beginning at 8:00 a.m. This might be the result of customers changing their thermostat setting when they leave for work in the morning – these are customers that chose to control the PCT themselves during event and were notified a day ahead of the event. Perhaps they did not expect to be at home so they raise the thermostat level before leaving so they would have lower event hour AC loads. and then there is some additional incremental response during event hours. However, the low decreases even more when the event starts, perhaps because the setting they made at 8:00 has two stages- higher up to the event and then even higher during the event.

B2 and C2 show large event-hour load reductions and substantial snap-back in post-event hours. Notice that the load impacts are large in the first event hour and dissipate in subsequent event hours. This is due to FirstEnergy's practice of setting back everyone's thermostat in the first event hour, then re-setting it at the conclusion of the event (rather than phasing in the thermostat setting change over the course of the event).

B3 customers show only event-hour load reductions with no evidence of snap-back. This is consistent with the idea that these customers are controlling something other than air conditioning load.

Fixed Effects Model Summary

- 4-hour customer-controlled PCT customers (cell B1) show some pre-event hour usage reductions (customers setting thermostats up when they leave for work?) and some event-hour "notching"
- Results for FirstEnergy-controlled PCT customers (cells B2 and C2) are very similar to initial figures and ANOVA results
  - A1/2 customers serve as a very good control group for them, so the move to fixed effects models does not change the results much
- Larger differences between ANOVA and fixed effects results for B1 and B3 customers
  - Fixed effects controls for usage differences on non-event days


Demand Models
© 2012 Electric Power Research Institute, Inc. All rights reserved.
36
EPRI
ELECTRIC POWER RESEARCH INSTITUTE

Why a Demand Model ? (1)

- ANOVA and Fixed Effects models test load impacts
  - Test if measured impacts differ from the control
  - Require defining a metric – we established four
  - Models have their provenance in statistical theory
  - So, they do not have to comport with any overarching characterization of consumer behavior
  - Hard to rationalize a finding that is significant but not intuitive or consistent with a formal behavior model
- These are necessary elements of a CBS analysis because they provide structural insights and establish a foundation
- But, they do not inform a predictive behavior model
- Load impacts among pilots are not directly comparable unless every aspect of the pilot is the same

Why a Demand Model? (2)

- An electricity demand model begins by defining a structure for consumption (electricity usage) that comports with a few fundamental tenants of behavior
  - Consumers seek to maximize their own welfare
  - They do so in an orderly and logical way through tradeoffs among alternative goods and services, given available resources
- The conceptual model has an empirical formulation that allows for estimating the key drivers to observed behavior
- Behavior is encoded as price elasticity, a single measure of impact of treatments
- Hence, comparison of elasticities among pilots are meaningful

CES Models

- CES Models allow estimating elasticity of substitution (EOS), the percentage change in the quantity ratio (peak to off-peak) divided by the percentage change in the price ratio (off-peak to peak)
- The EOS facilitates comparisons of treatment impacts estimates across studies, because it normalizes for price and usage levels
- It also allows calculating the impact of prices different from those used in the pilot design
- CES Models are estimated using daily customer-level data
- Three CES specifications are estimated with varying assumptions about the nature of customer fixed effects and implications of bias associated with serial correlation

CES Model Specification (1)

$$\ln(PkWh_{t,c}/OPkWh_{t,c}) = \alpha + \ln(OPrice_t / Pprice_t) \times \{\beta_{Event1} \times Event1_t + \beta_{Event2} \times Event2_t + \beta_{Event3} \times Event3_t + \beta_{PCT\_FE} \times PCT\_FE_{t,c} + \beta_{Hr6} \times Hr6_{t,c}\} + \beta_{THI} \times THI_t + \beta_{THI\_Ratio} \times THI\_Ratio_t + \beta_{PCT\_FE} \times PCT\_FE_{t,c} + \beta_{Hr6} \times Hr6_{t,c} + e_t$$

Inverse price ratio is used so that load response (shifting of load from peak to off-peak hours) is represented by a positively signed elasticity of substitution.

Event1 is an indicator variable for stand-alone events or the first event in a series.

Event2 is an indicator variable for the second event in a series (there were three such instances) .

Event3 is an indicator for the third event in a series (there was one such instance).

CES Model Specification (2)

- $PkWh_t$ represents average usage during customer-specific (i.e., 4-hour or 6-hour) peak period on non-holiday weekday *t*;
- $OPkWh_t$ represents average usage during customer-specific off-peak hours on non-holiday weekday *t*;
- $Pprice_t$ represents average price during customer-specific (i.e., 4-hour or 6-hour) peak period on non-holiday weekday *t* ($0.093248 on non-event days, $0.493248 on event days);
- $OPprice_t$ represents average price during customer-specific off-peak hours on non-holiday weekday *t* ($0.093248 on all days);
- the β's are estimated parameters;
- *Event1* is an indicator variable that equals one on day *t* if day *t* a standalone event or the first in a string of multiple back-to-back events and equals zero otherwise;
- *Event2* is an indicator variable that equals one on day *t* if day *t* is the second in a string of back-to-back events and equals zero otherwise;
- *Event3* is an indicator variable that equals one on day *t* if day *t* is the third in a string of back-to-back events and equals zero otherwise;
- *PCT_FE* is an indicator variable that equals one if customer *c* has a FirstEnergy-controlled PCT and equals zero otherwise;
- *Hr6* is an indicator variable that equals one if customer *c* experiences a six-hour peak period (treatment cell C2) and equals zero otherwise;
- *THI* equals average hourly THI on day *t*;
- *THIratio* equals average hourly peak period THI divided by average hourly off-peak THI on day *t* where peak and off-peak periods are customer-specific (i.e., 4-hour or 6-hour).

CES Model Results: Elasticities of Substitution

	CES Fixed Effects	FE AR(1)	Prais-Winsten
Event 1			
PCT-Cust (B1)	0.10	0.07	0.10
PCT-FE, 4-hour (B2)	0.30	0.27	0.31
PCT-FE, 6-hour (C2)	0.27	0.24	0.28
IHD (B3)	0.09	0.08	0.09
Event 2			
PCT-Cust (B1)	0.15	0.07	0.13
PCT-FE, 4-hour (B2)	0.34	0.28	0.33
PCT-FE, 6-hour (C2)	0.31	0.25	0.30
IHD (B3)	0.12	0.09	0.10
Event 3			
PCT-Cust (B1)	0.13	0.08	0.13
PCT-FE, 4-hour (B2)	0.33	0.29	0.34
PCT-FE, 6-hour (C2)	0.30	0.26	0.31
IHD (B3)	0.10	0.07	0.08

This table shows the elasticities of substitution (% change in peak to off peak ratio of usage associated with a 1% change in the off-peak to peak price ratio) that are calculated from the estimated equation on the previous slide. It serves to translate price inducements into relative load changes, in the sins of a overarching action/ reaction metric (the price effect other things constant. Because it is derived from an estimated electricity demand relationship, those other factors are taken into account by using different levels for those factors in the demand model to estimate the result.

The first column is a CES electricity demand model estimated using conventional estimation techniques.

The second column is a CES model accounts for possible autoregressive effects-- that loads in one hour are related to load in a previous hour. The third corrects for bias due to estimation errors being larger for larger loads.

The rows correspond to the estimated treatment s impacts (substitution value) of the CES model where the elasticity of substitution was estimated separately for the three types of events:

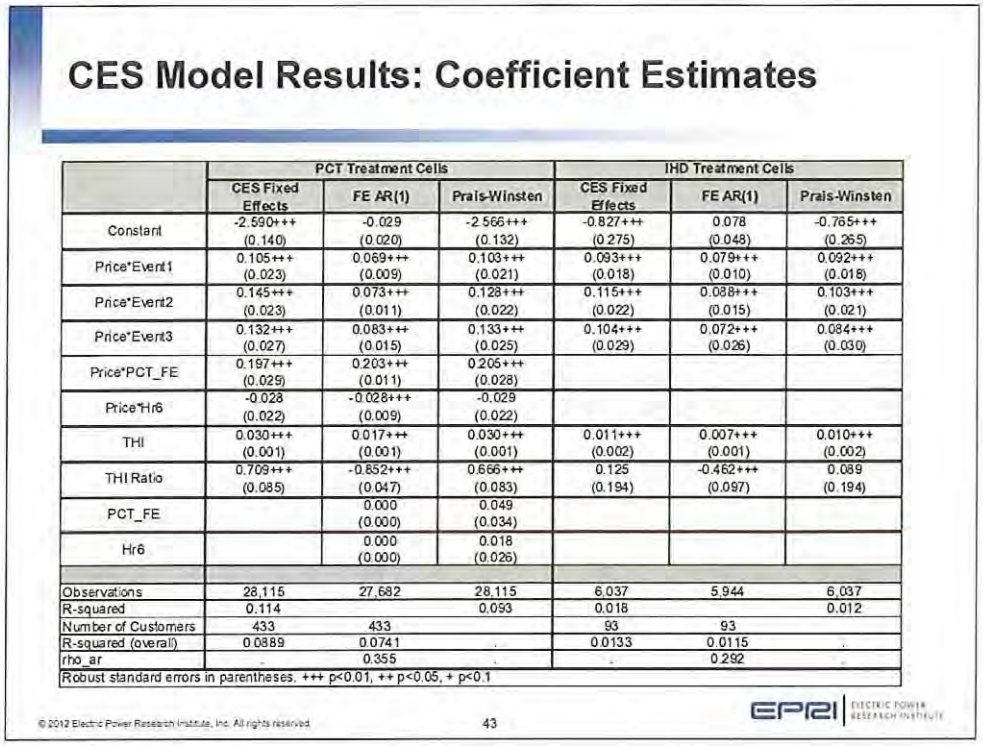
Event 1 is for single day events

Event 2 is for two consecutive day events

Event 3 is for three consecutive days of events

Comparing the estimates coefficients across the three models shows that the elasticity of substitution is quite robust to specification.

Event1 elasticities tend to be statistically significantly lower than Event2 and Event3 elasticities. This finding suggests that event response increases as consecutive days of event increases – no evidence of fatigue.



CES Model Results: Coefficient Estimates

	PCT Treatment Cells			IHD Treatment Cells		
	CES Fixed Effects	FE AR(1)	Prais-Winsten	CES Fixed Effects	FE AR(1)	Prais-Winsten
Constant	-2.590+++ (0.140)	-0.029 (0.020)	-2.566+++ (0.132)	-0.827+++ (0.275)	0.078 (0.048)	-0.765+++ (0.265)
Price*Event1	0.105+++ (0.023)	0.069+++ (0.009)	0.103+++ (0.021)	0.093+++ (0.018)	0.079+++ (0.010)	0.092+++ (0.018)
Price*Event2	0.145+++ (0.023)	0.073+++ (0.011)	0.128+++ (0.022)	0.115+++ (0.022)	0.088+++ (0.015)	0.103+++ (0.021)
Price*Event3	0.132+++ (0.027)	0.083+++ (0.015)	0.133+++ (0.025)	0.104+++ (0.029)	0.072+++ (0.026)	0.084+++ (0.030)
Price*PCT_FE	0.197+++ (0.029)	0.203+++ (0.011)	0.205+++ (0.028)			
Price*Hr6	-0.028 (0.022)	-0.028+++ (0.009)	-0.029 (0.022)			
THI	0.030+++ (0.001)	0.017+++ (0.001)	0.030+++ (0.001)	0.011+++ (0.002)	0.007+++ (0.001)	0.010+++ (0.002)
THI Ratio	0.709+++ (0.085)	-0.852+++ (0.047)	0.666+++ (0.083)	0.125 (0.194)	-0.462+++ (0.097)	0.089 (0.194)
PCT_FE		0.000 (0.000)	0.049 (0.034)			
Hr6		0.000 (0.000)	0.018 (0.026)			
Observations	28,115	27,682	28,115	6,037	5,944	6,037
R-squared	0.114		0.093	0.018		0.012
Number of Customers	433	433		93	93	
R-squared (overall)	0.0889	0.0741	.	0.0133	0.0115	.
rho_ar	.	0.355	.	.	0.292	.
Robust standard errors in parentheses. +++ p<0.01, ++ p<0.05, + p<0.1						

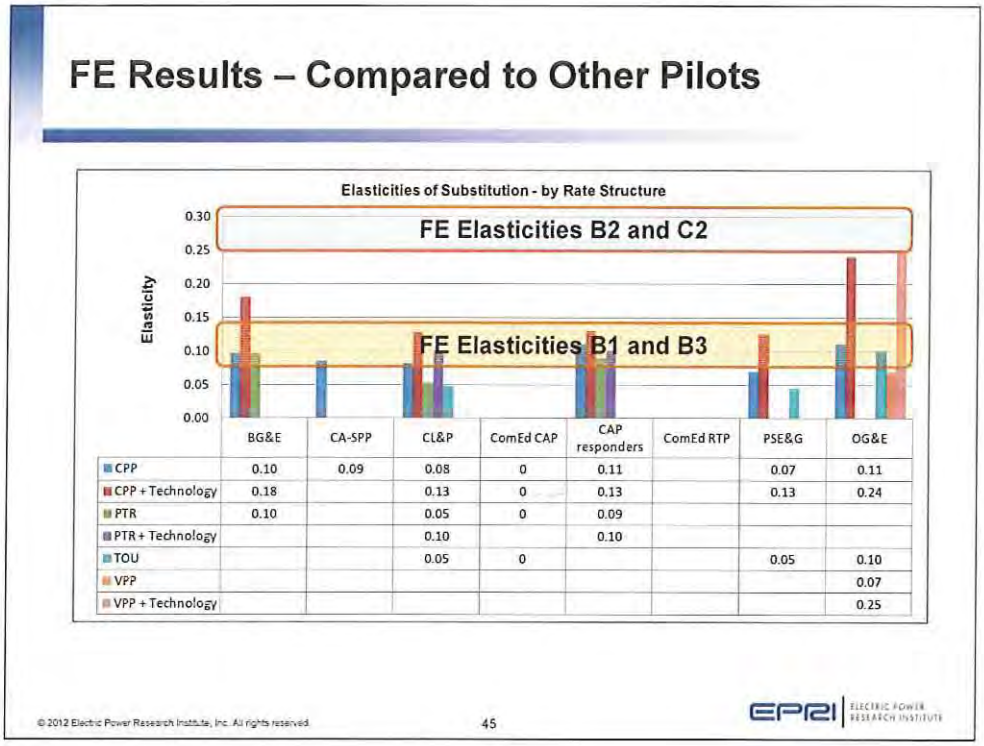
43

EPRI ELECTRIC POWER RESEARCH INSTITUTE

These are the actual estimates from the equation. The only thing to note in addition to the summary on the previous slide is the uniform statistical significance of the variables interacted with the price ratio term. This indicates that the estimated elasticities are statistically significantly different from zero.

CES Model Conclusions

- Results are fairly consistent across modeling methods (robust to specification)
- Similar results for 4-hour (B2) and 6-hour (C2) FirstEnergy PCT control customers
  - Elasticity of substitution ranges from 0.24 to 0.34
  - Event duration
    - B2 (4-hr. events) customers slightly more responsive than C2 (6-hr events) customers
- Lower elasticities for other treatments
  - B1 (PCT Self/4 hr)
  - B3 (PTR/4 hr +IHD) customers range from 0.07 to 0.15



This chart compares the estimates substitution elasticities with those of other pilots. The elasticities exceed those of most comparable, pilots. This suggests that the design is more effective and productive. The FE pilot achieve response equal to those of pilots that employed price incentives that were 4-5 times higher.

Key Findings

- This pilot has produced first of its kind results
  - Test for persistence over consecutive event days (and found that response increases slightly on added days)
  - Test of difference between a shorter and longer event hour definition (found very little difference in responses).
  - Tested the effect of a PTR where a PCT was controlled by the utility and by the customer (and found a much higher response from the utility controlled treatment group)
  - Tested PTR in homes with central air against those without (and found a substantially lower, but significant response by the non-AC treatment customers)

Next Steps

- Final model verification. Use other model specifications to verify that the modules developed are the best representation of the pilot experiences
- Population inferences. Extrapolate the findings to a larger population of interest
  - That which comprises the proposed Phase 2 footprint
  - The population of residential customers served by FE
- Propose alternative for Phase II

Questions

Contact

Bernie Neenan
865.218.8133
bneenan@epri.com

EPRI ELECTRIC POWER RESEARCH INSTITUTE

Ohio Smart Meter Pilot Program

Post Phase I Customer Survey

October 1, 2012

Shelton Grp

Background

In the first phase of FirstEnergy's pilot program, smart meters were deployed to almost 5,000 homes in a selected service area. About 290 customers opted out of the program and received no smart meter. As part of the pilot program, the remaining homes were assigned to the following designated treatment groups based on technology selection. Following are the counts of homes that had each technology installed:

- 342 – Smart meter with programmable thermostat that FirstEnergy utilized to "cycle down" their AC (including 172 four hour cycle and 170 six hour cycle)
- 91 – Smart meter with programmable thermostat that was controlled by the customer
- 93 – Smart meter with in-home display
- 4157 – Non-participants; customers were offered either the programmable thermostat or the in-home display but chose not to participate.

Background

Some households were also assigned to a control group – 250 with central air conditioning (AC) who matched the characteristics of the programmable thermostat group, and 200 without central AC who matched the characteristics of the in-home display group. hese households were never offered other technologies in the program. A separate analysis comparing actual electric consumption among the various groups is currently underway.

 hus far, FirstEnergy has conducted 15 planned peak time “events” during which customers were encouraged to reduce their electric consumption. hose with technologies were informed through their technologies, and other web-based and traditional media communication vehicles were also utilized to communicate these events to all households. All pilot participants were offered a 0.40 peak-time rebate for participation.

b ectives ethodology

er E funding re uirements, FirstEnergy must evaluate the success of the program. As this first phase concludes, FirstEnergy has engaged Shelton Group to conduct an attitudinal study of the non-control group participants (and non-participants) of the pilot program.

ue to the compressed timeframe, a combination of online and telephone interviewing was utilized to maximize response rates. he survey was fielded from August 31 to September 1 , and in this time frame, a total of 554 surveys were completed (395 by telephone). Average length of the survey was 17 minutes for program participants with technology and 12 minutes for non-participants.

he margin of error for the overall sample was 3.9 at a 95 confidence level. Among the subsamples, the margin of error was .3 for company-controlled thermostats, 12. for customer-controlled thermostats, 11.9 for in-home display and 5.1 for non-participants.

Note: no interviewing was completed on September 3 in observance of abor ay.

he survey oversampled customers who installed the thermostat and in-home display.

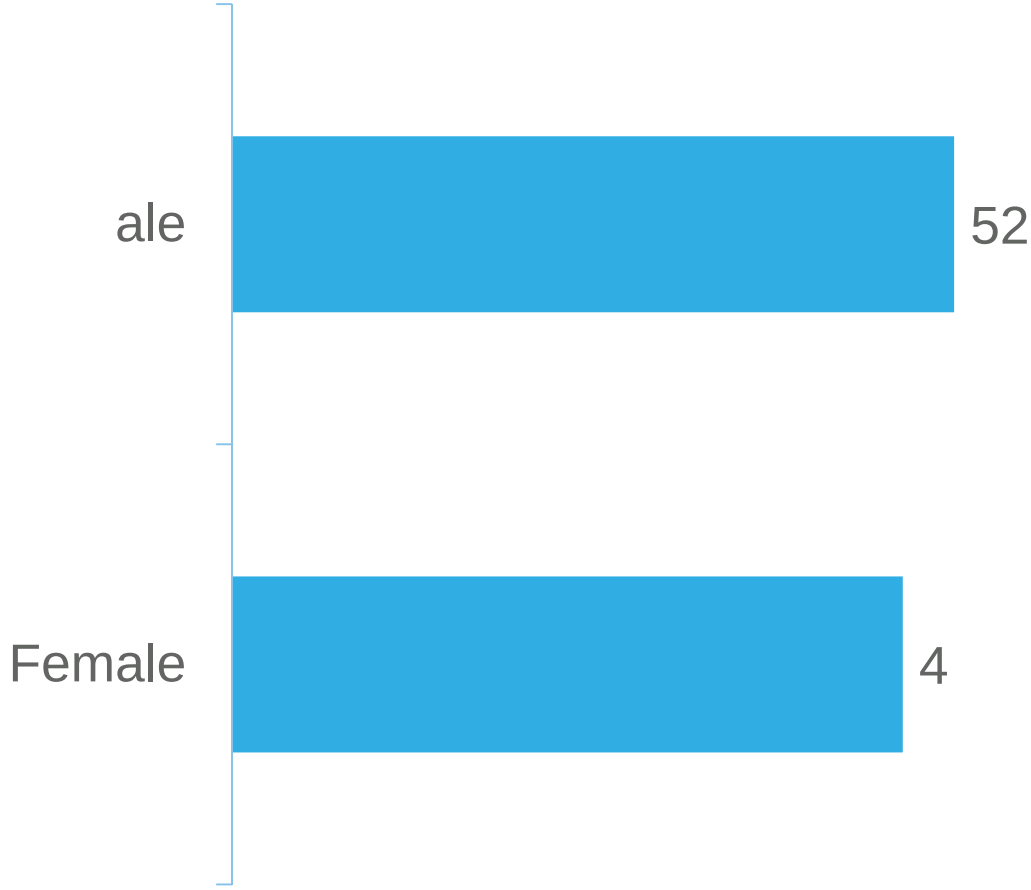
	Total number of customers in each treatment group	% customers in each treatment group	Total customers surveyed in each treatment group	% of customers in each treatment group surveyed
4 hour cycle thermostat	172	3.7	0	34.9
hour cycle thermostat	170	3.	7	45.9
Customer controlled thermostat	91	1.9	35	3 .5
In-home display	93	2.0	3	40.9
Non-participants	4157	.	343	.3
otal	4, 3	100	554	11.

Demographic Characteristics

Shelton Grp

Study participants surveyed were relatively evenly distributed by gender.

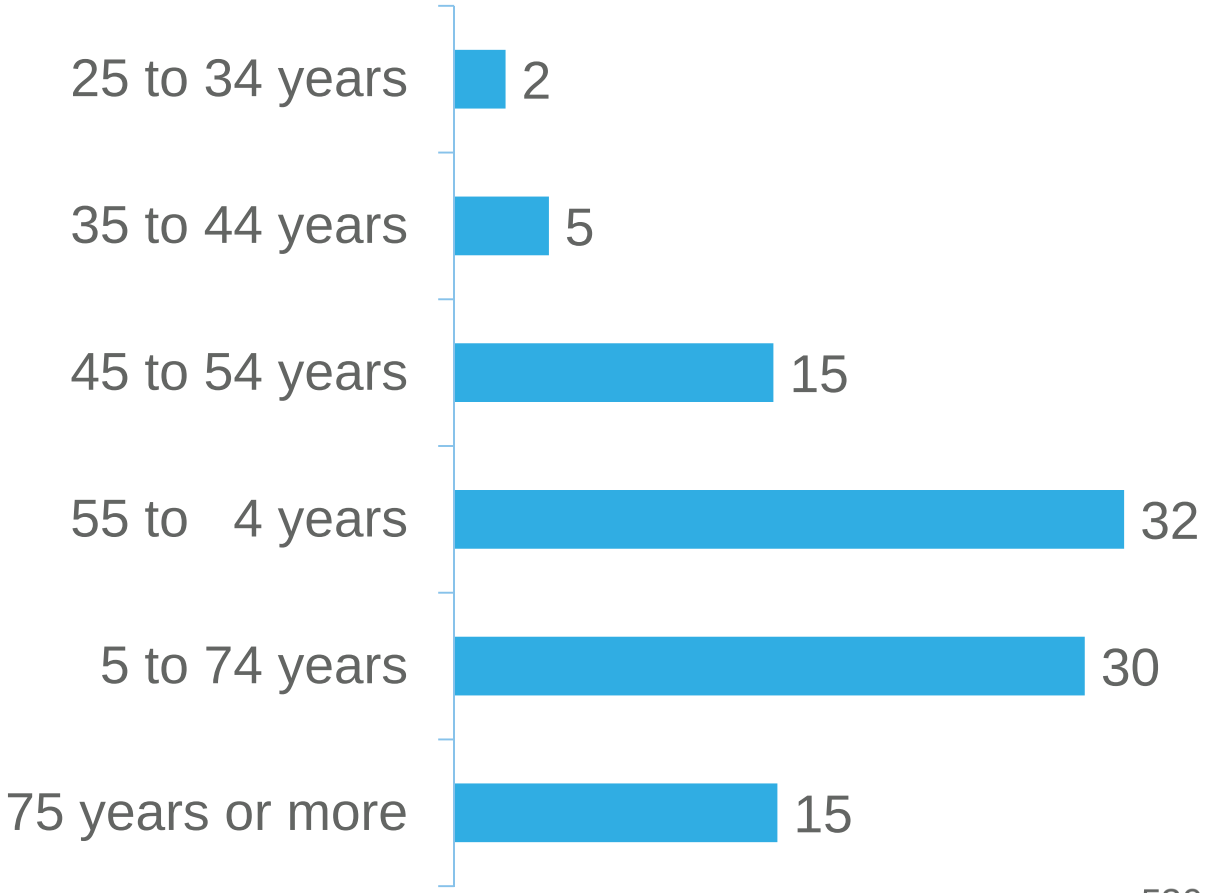
hat is your gender



n 542

Almost half of those surveyed were 5 or older, which is generally reflective of overall program participation.

For classification purposes only, would you please tell me your age

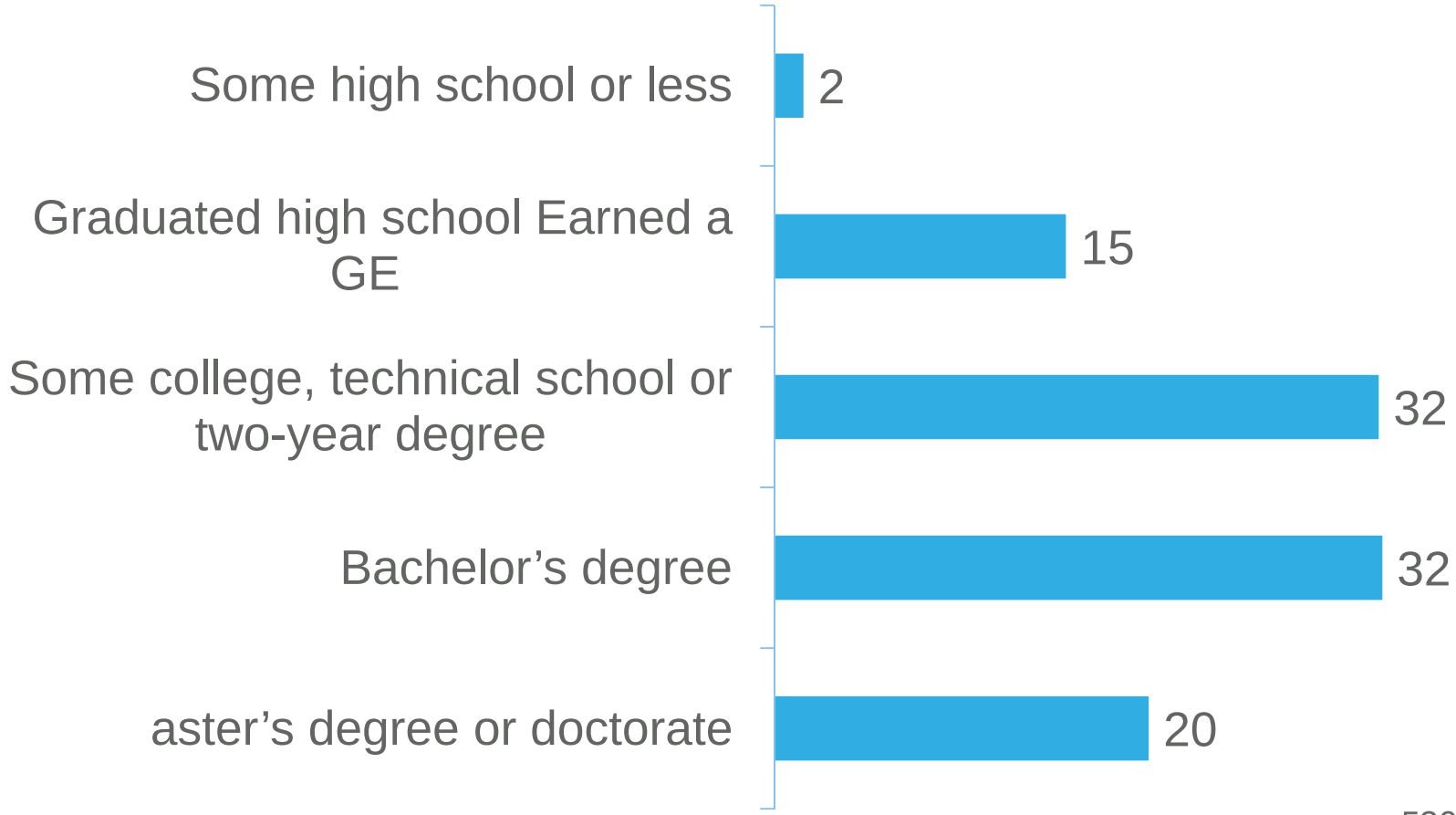


n 530

Shelton Grp

Survey participants were well educated, with 52 holding a bachelor's or more advanced degree.

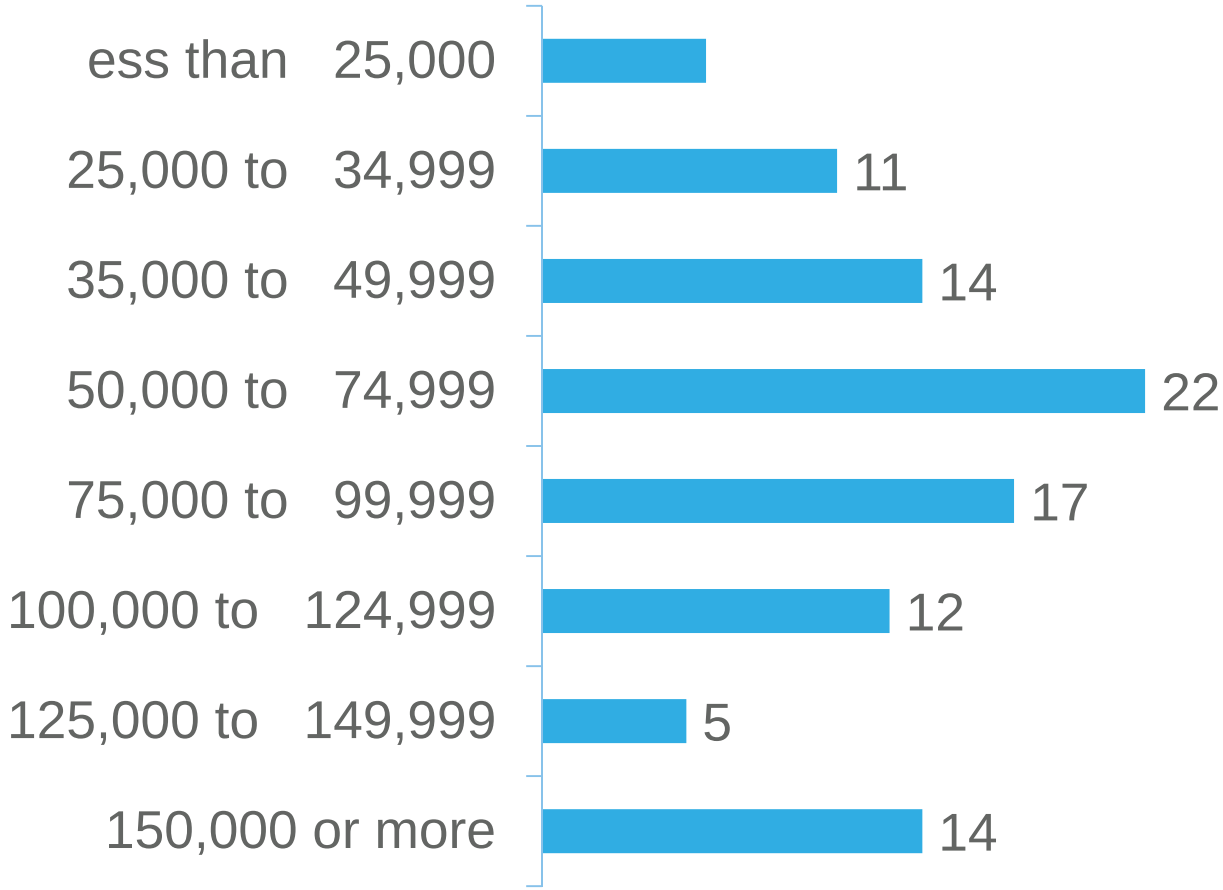
hat is the highest level of education that you have completed



n 530

hey were also generally affluent, with a median household income of 71,591, which is in line with the higher incomes in the overall pilot test market.

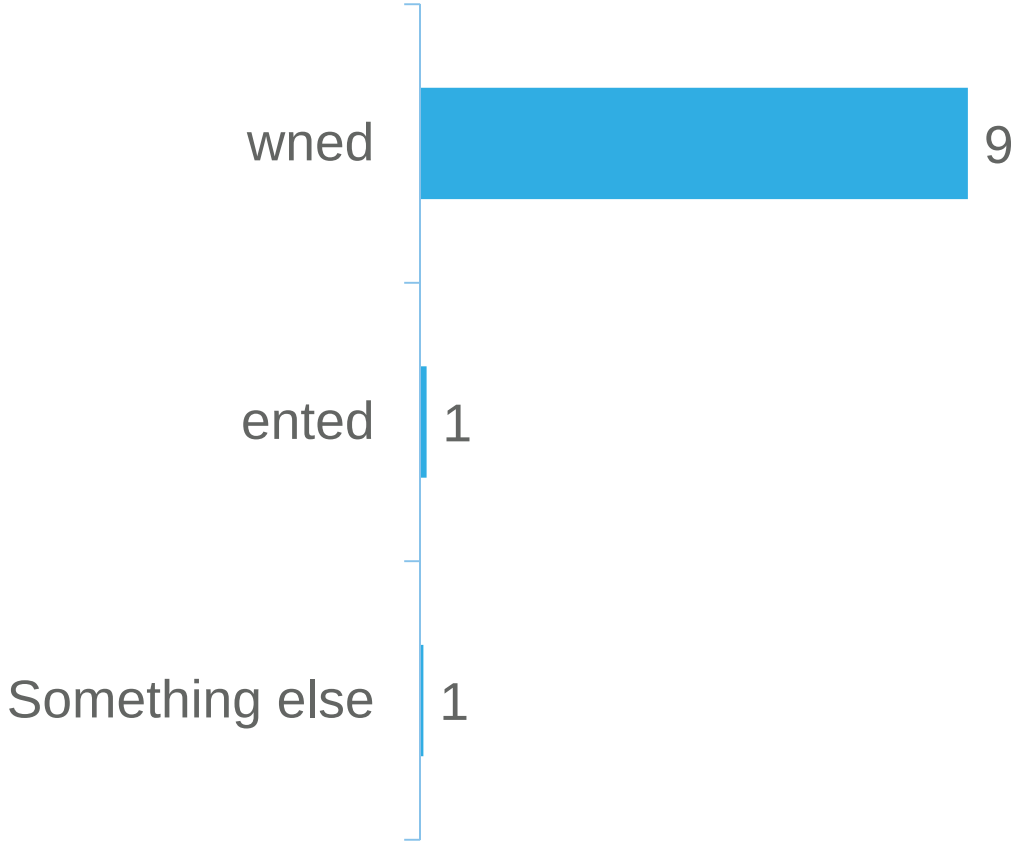
hich category best describes your household income last year



n 425

Almost all respondents were homeowners.

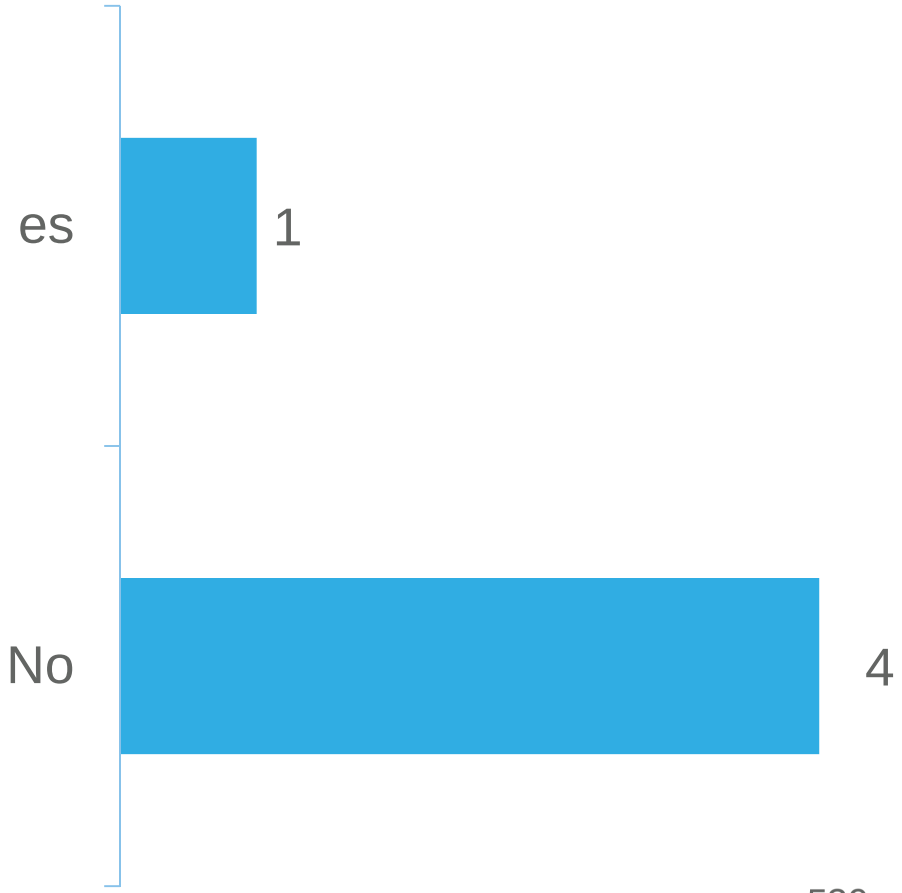
Is the house or apartment in which you live owned by someone in your household or rented



n 535

nly 1 had children under 1 living at home.

o you have any children under the age of 1 living at home with you



n 539

emographic Characteristics by echnology

	Total Respondents	4 Hour Cycle Thermostat	6 Hour Cycle Thermostat	Customer Controlled Thermostat	In-Home Display	Non-participants
ale Female	52 4	40 0	57 43	7 33	37 3	53 47
25 to 54 years 55 to 4 years 5 to 74 years 75 years	22 32 30 15	14 30 39 1	17 2 34 21	1 3 33 12	35 32 30 3	24 33 2 1
igh school diploma or less Some college Bachelor's degree aster's or more	17 32 32 20	22 40 24 14	19 30 31 20	12 45 30 12	22 32 43 3	15 29 32 23
ess than 50,000 50,000 to 99,999 100,000 or more	30 39 31	33 33 35	35 40 25	19 52 30	50 30 20	27 39 34
ome-owner	9	9	99	100	97	99
ave children 1 years	1	14	17	15	21	1
	n 554	n 0	n 7	n 35	n 3	n 343

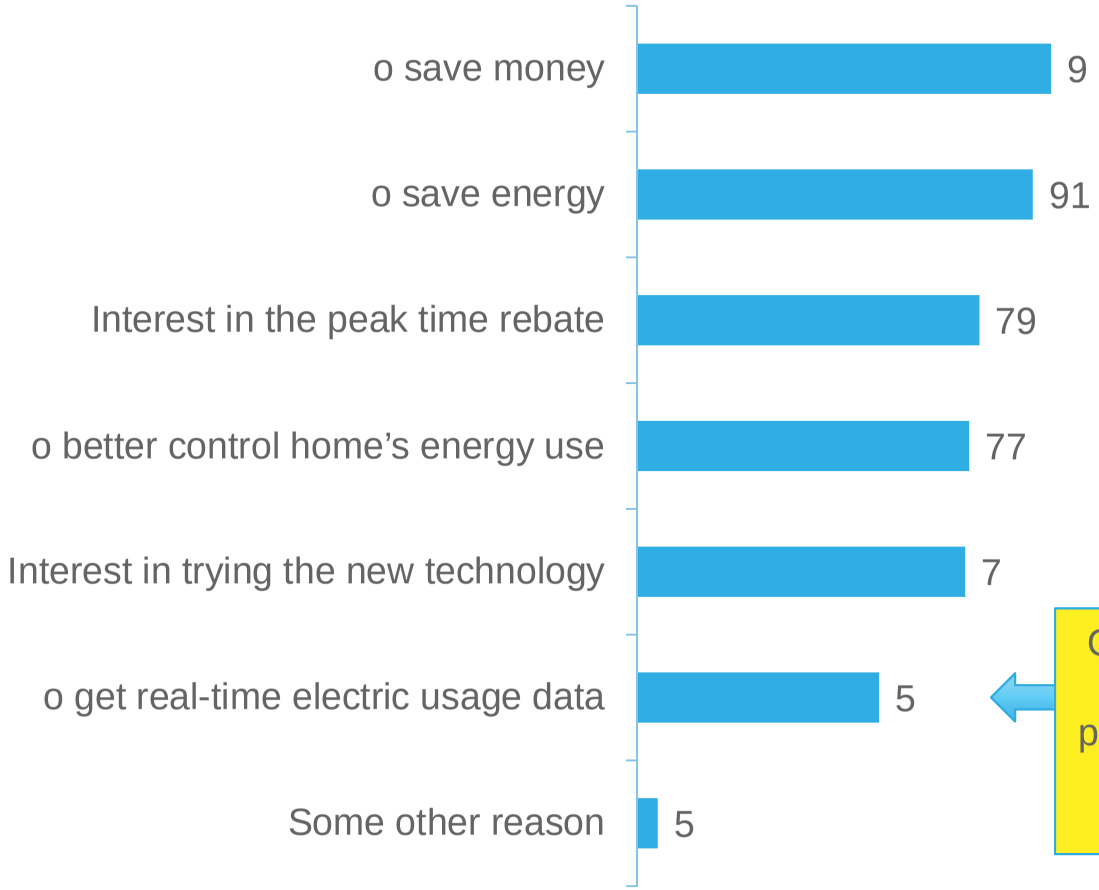
Significant differences noted by technology group

Program Participation

Shelton Grp

op reasons for participation centered around savings, controlling their home's energy usage, and interest in trying new technology.

2 – hich of the following reasons describe why you chose to participate in this program

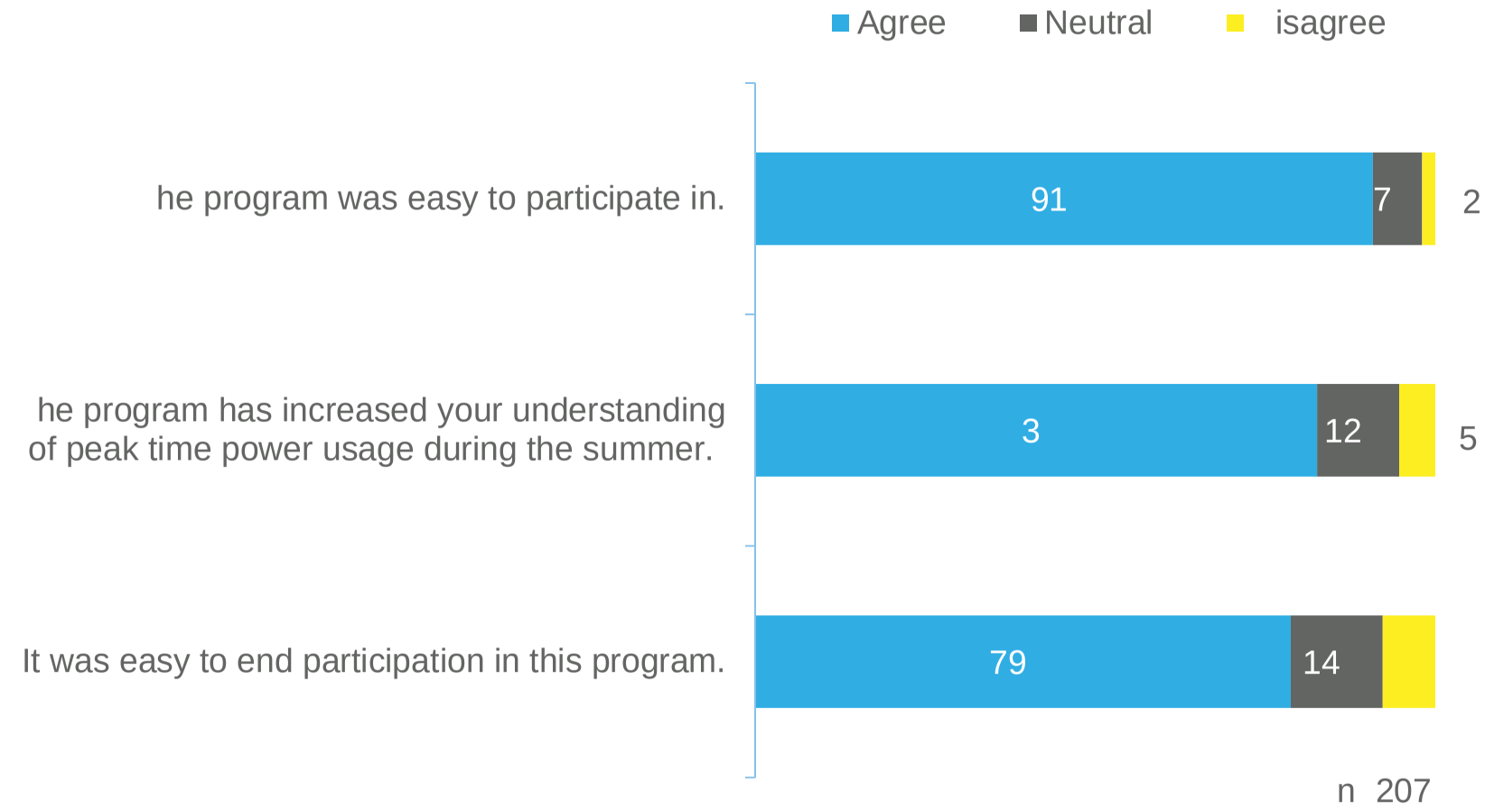


Customers with the ower ab in-home display were more likely to say they participated because they wanted to get real-time electricity usage information (7 vs. 5 overall).

n 211

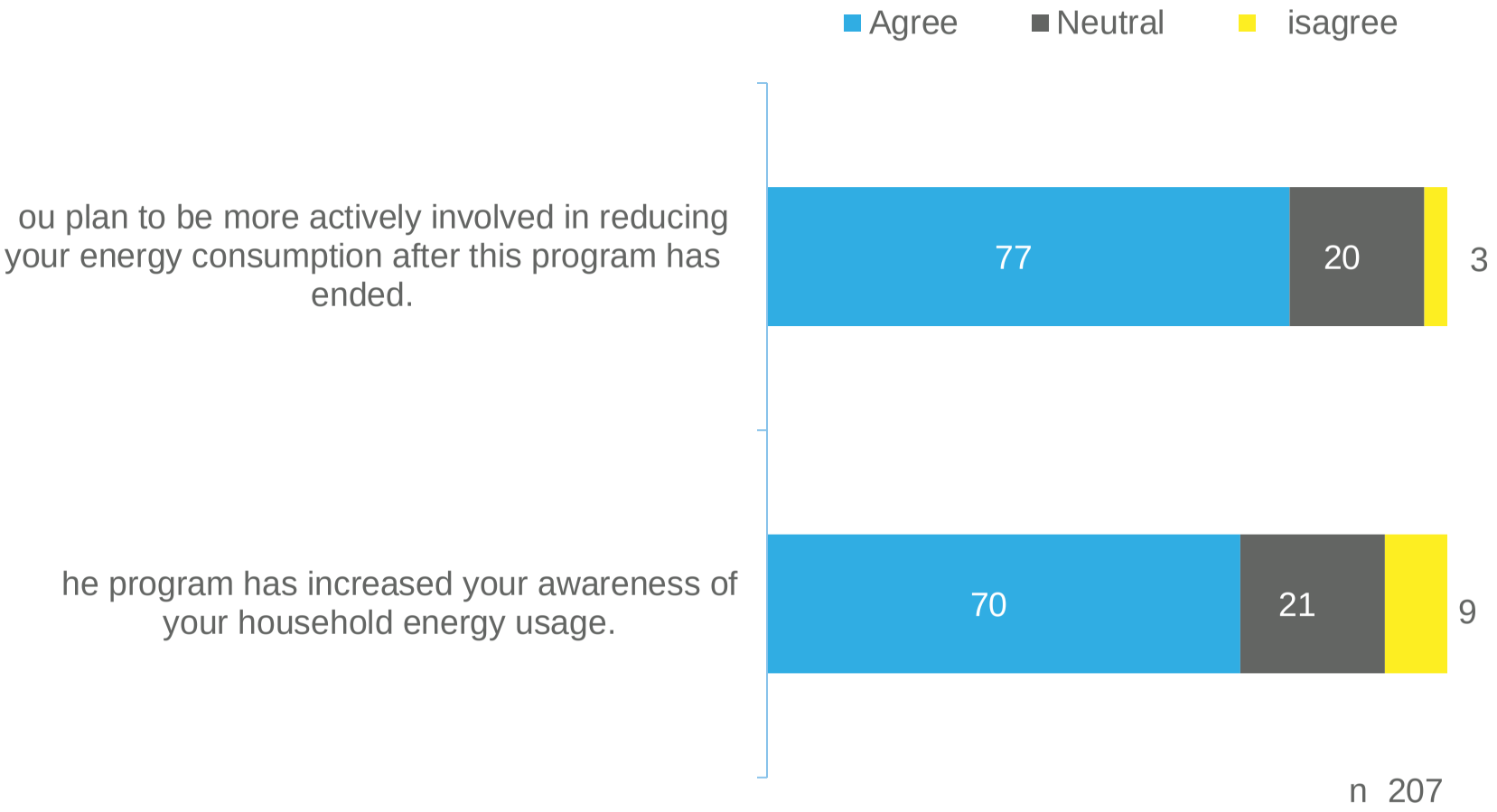
ost participants found the program easy to participate in and opt out of; 3 believed that it increased their understanding of summer peak time power usage.

32 – sing a scale of 1 to 5, with 1 being " isagree" and 5 being "Agree," please indicate your level of agreement with the following statements.



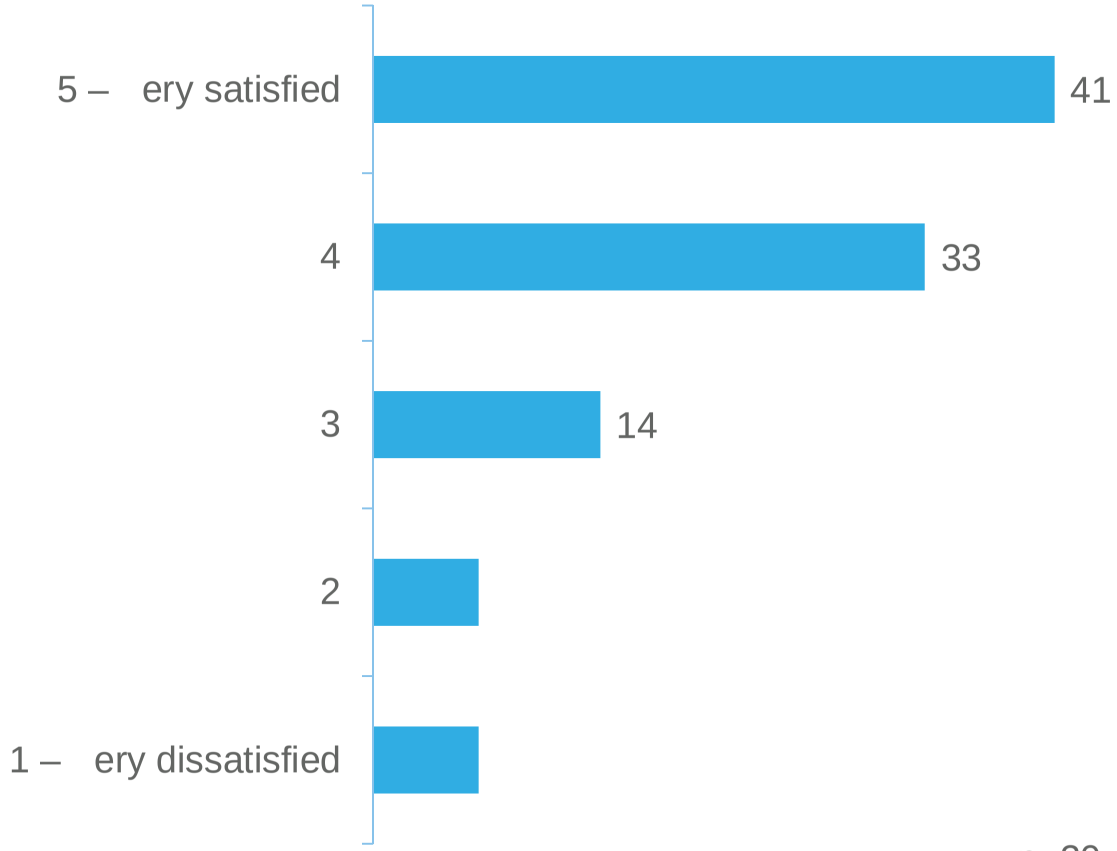
ore than seven out of 10 participants plan to be more aware of their household energy usage and more actively involved in reducing their energy consumption.

32 – sing a scale of 1 to 5, with 1 being “ isagree” and 5 being “Agree,” please indicate your level of agreement with the following statements.



ost customers were satisfied with the program; only 12 of participants were dissatisfied overall.

33 – n a scale of 1 to 5, with 1 being “ ery dissatisfied” and 5 being “ ery satisfied,” what is your overall level of satisfaction with this program



n 20

eaction to the program was mostly positive.

I did not have to remember' to do anything. It was automatic. I could opt out if I wanted. It saved electric power and saved me money, too.

here was not enough rebate it; it was not worth it for 1. 0 a month to be uncomfortable.

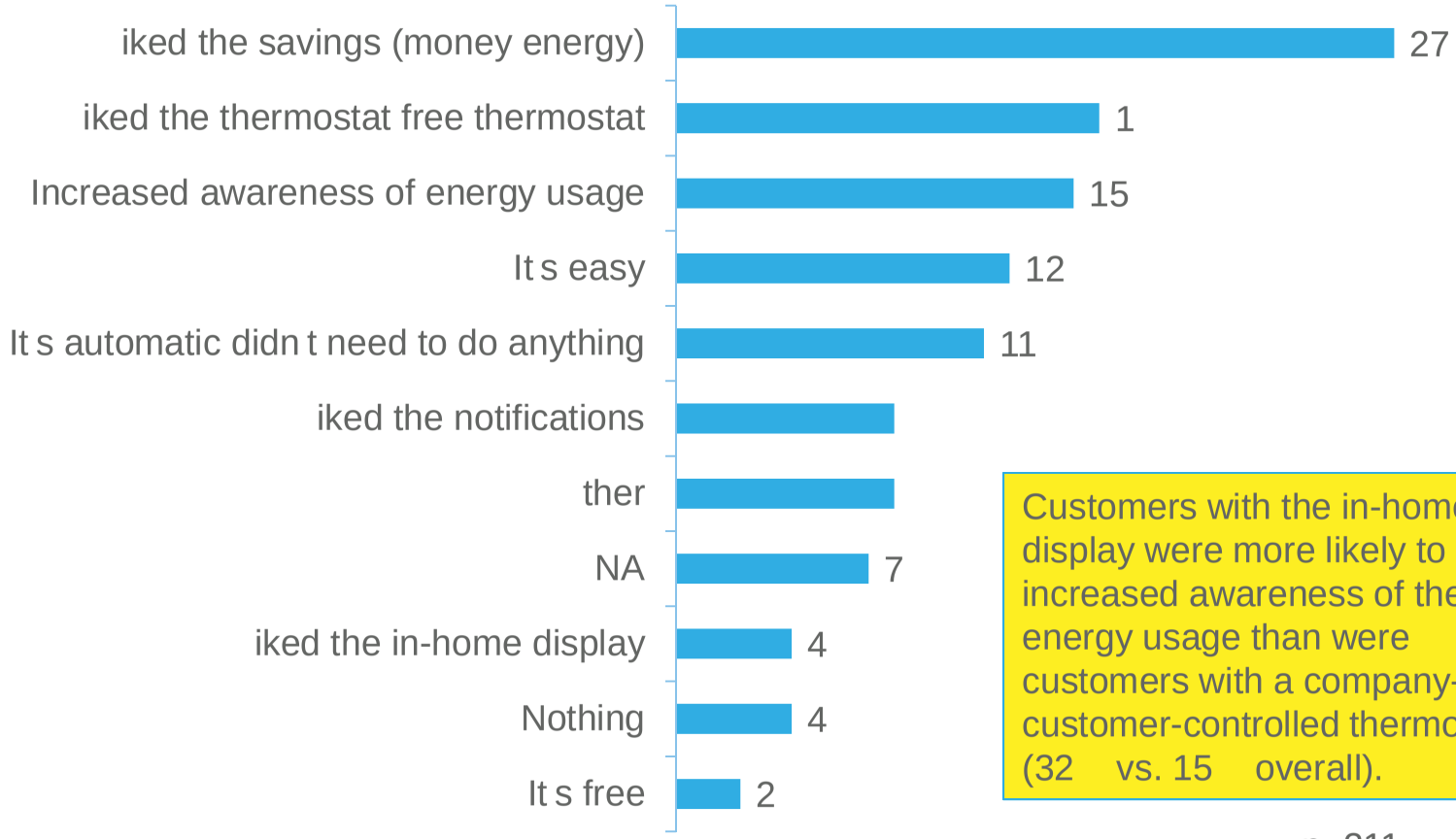
hile the dollar savings are of no concern to me whatsoever, energy savings are.

his program was not well explained. Numerous calls to customer service were fruitless. No one could explain how the baseline was calculated. Every time I called, I received a different answer. ne of my baseline numbers was IN S 5. I am going to write FirstEnergy to express my overall disappointment in what should have been a positive experience.

he program is rewarding in more ways than saving money. It has replaced my old way of thinking about energy use. In the past I have used my ma or appliances at any time. I now use my appliances early morning or late at night. I believe the program is a success

ne-fourth of customers cited savings as the feature they liked best about the programming.

34a – hat did you like best about this program (N E: erbatim responses have been coded and categorized).

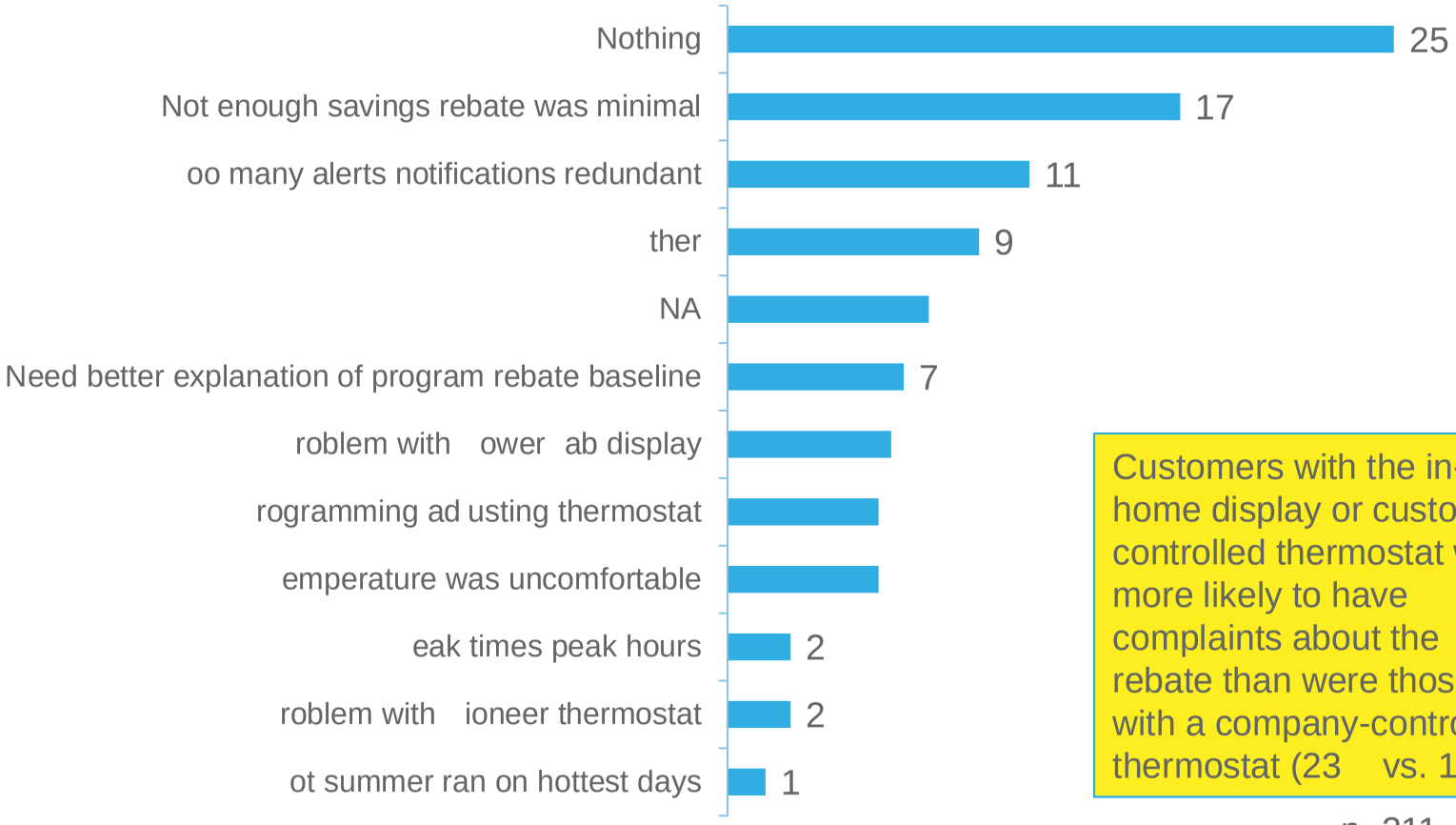


Customers with the in-home display were more likely to cite increased awareness of their energy usage than were customers with a company- or customer-controlled thermostat (32 vs. 15 overall).

n 211

About one-fourth of customers liked “nothing” least; 17 mentioned dissatisfaction with the rebate savings.

35 – hat did you like least about this program (N E: erbatim responses have been coded and categorized).



Customers with the in-home display or customer-controlled thermostat were more likely to have complaints about the rebate than were those with a company-controlled thermostat (23 vs. 14).

n 211

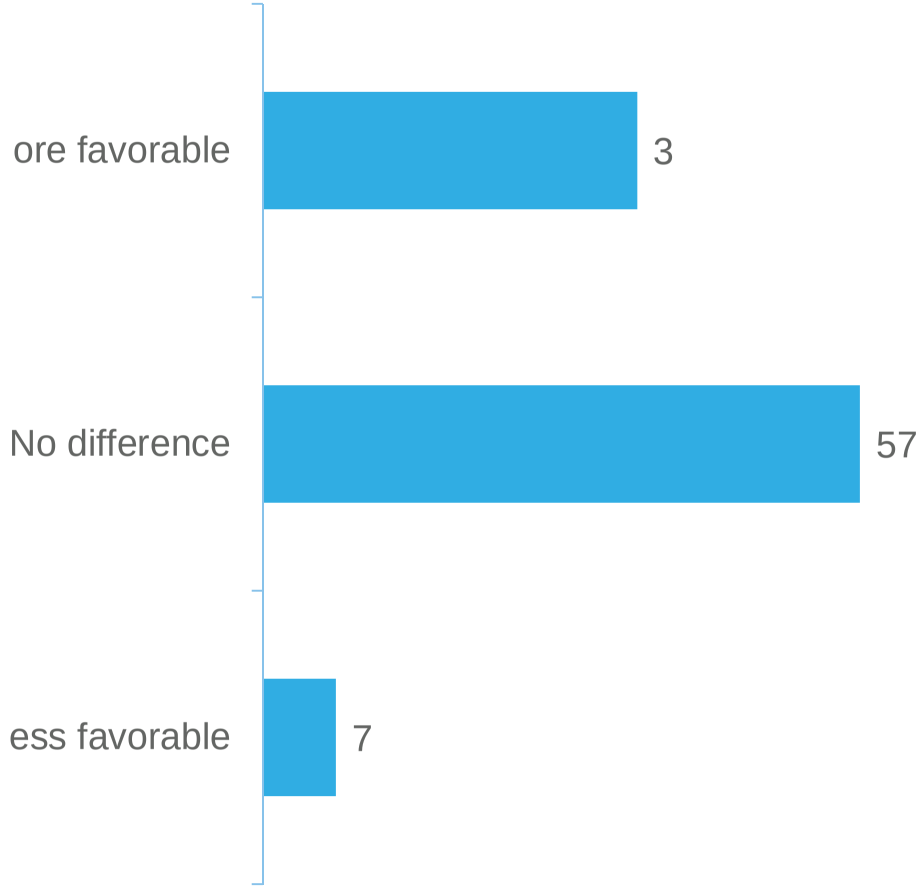
Easy simple was the word given most often to best describe the program.

34b – hat three words best describe this program (N E: erbatim responses have been coded and categorized).

n 211

verall program impact was neutral to positive, with 93 saying that their perception was the same or more favorable.

3 – verall, how has this program impacted your overall perception of he Illuminating Company

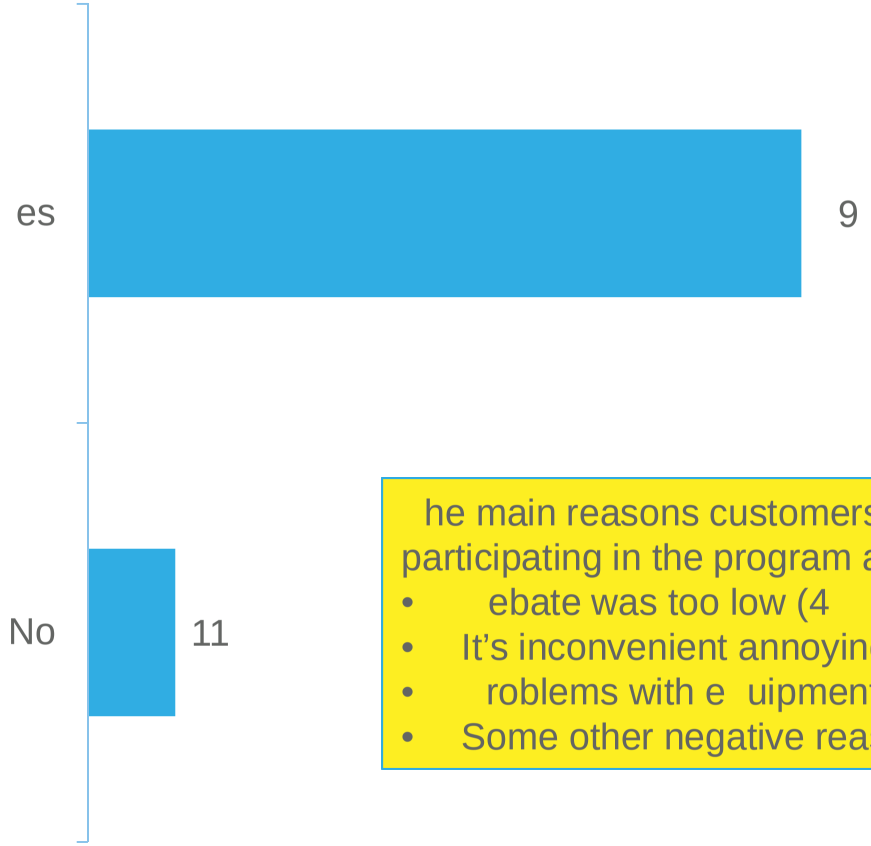


Customers with company-controlled thermostat (70) or in-home display ( ) were significantly more likely to have a favorable rating than those with a customer-controlled thermostat (4) or no technologies (1).

n 544

Based on their experiences, most would be interested in participating in the program again.

30 – Based on your experience with the program so far, would you be interested in participating if this program was offered again



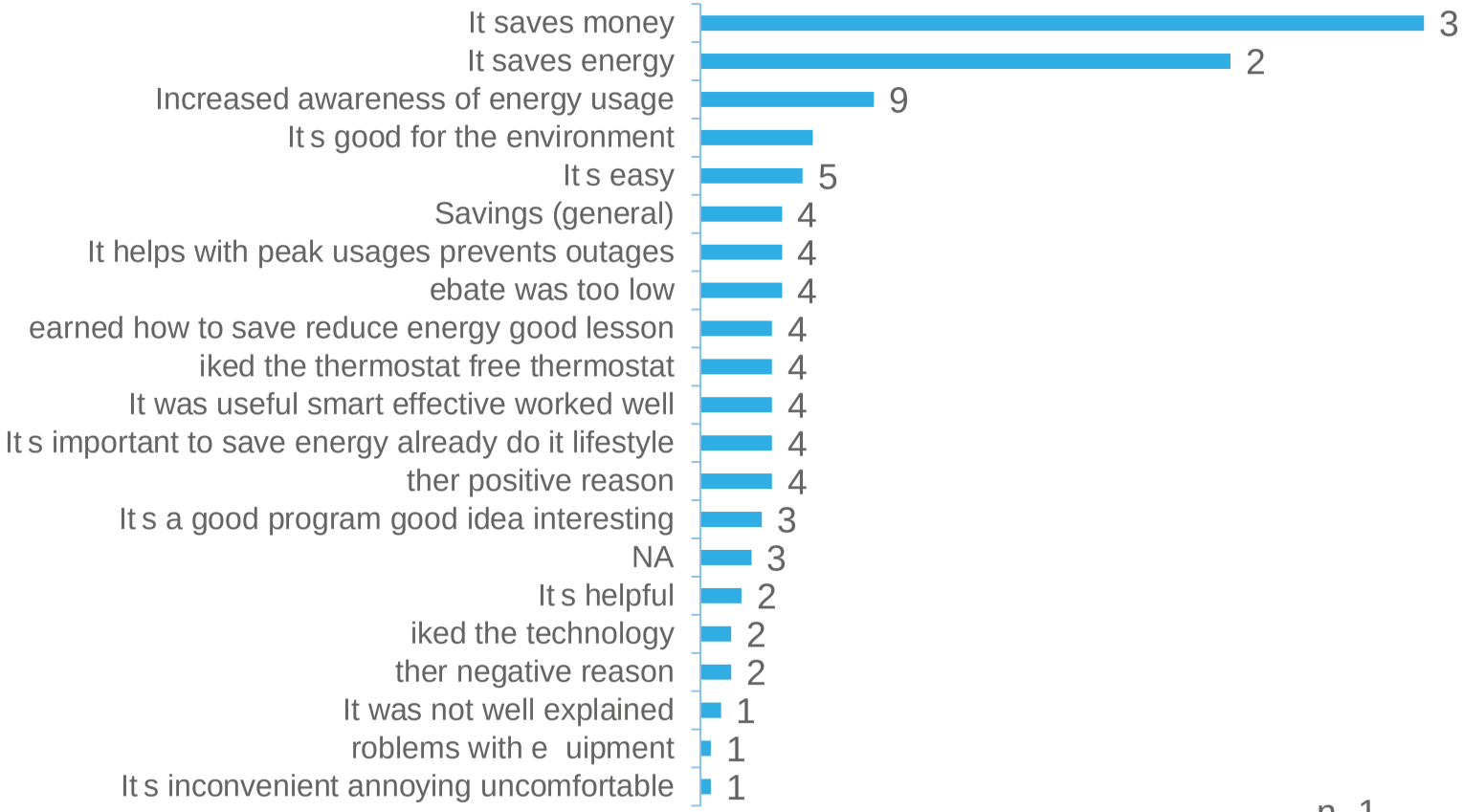
he main reasons customers would not be interested in participating in the program again included:

- ebate was too low (4)
- It's inconvenient annoying uncomfortable (22)
- roblems with e uipment (13)
- Some other negative reason (13)

n 211

Saving money and energy were the top reasons customers would be interested in participating again.

If interested in participating in this program if it was offered again, asked:
31a – hy or why not (N E: erbatim responses have been coded and categorized).



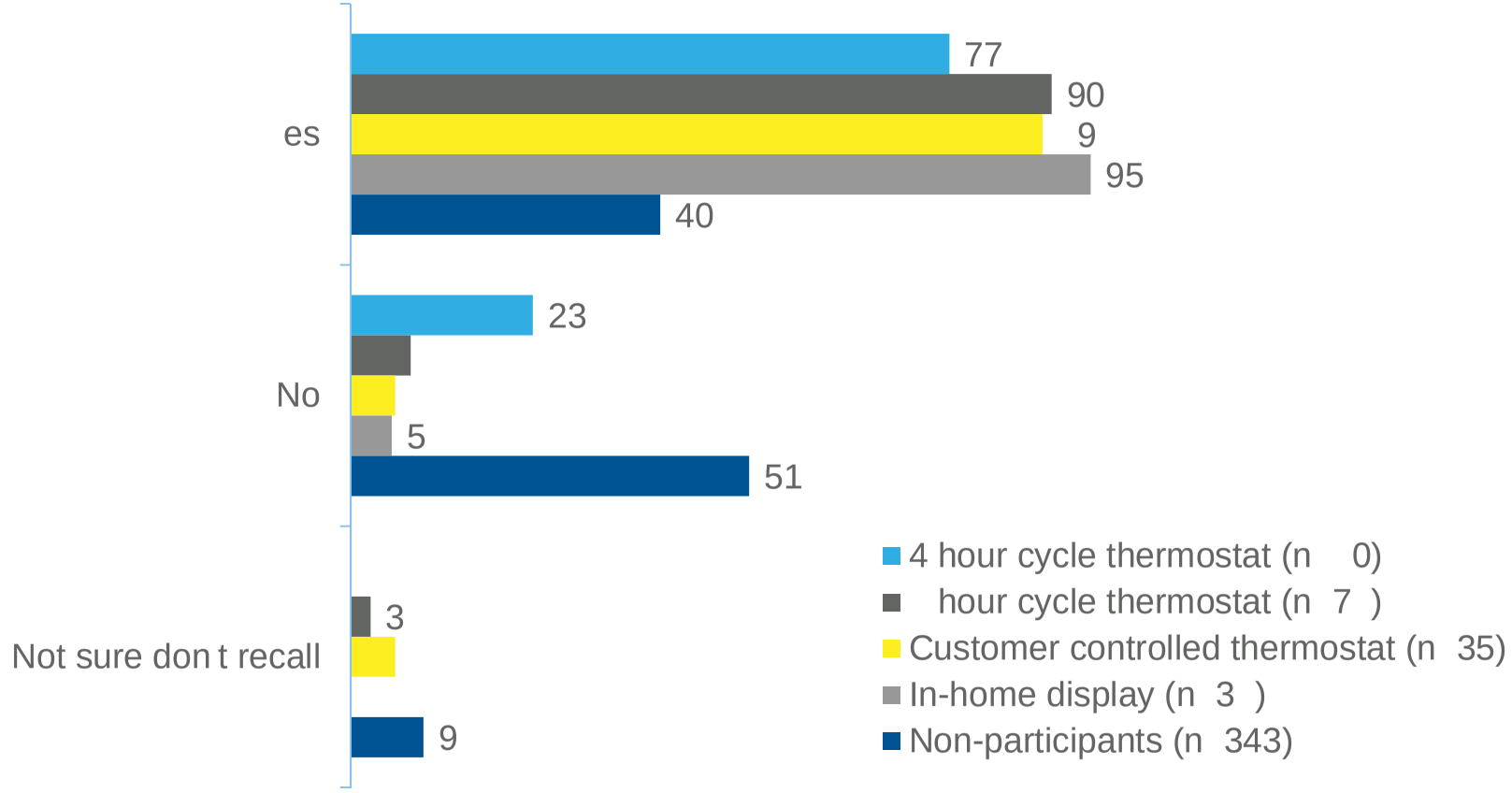
n 1

Reaction to Rebate

Shelton Grp

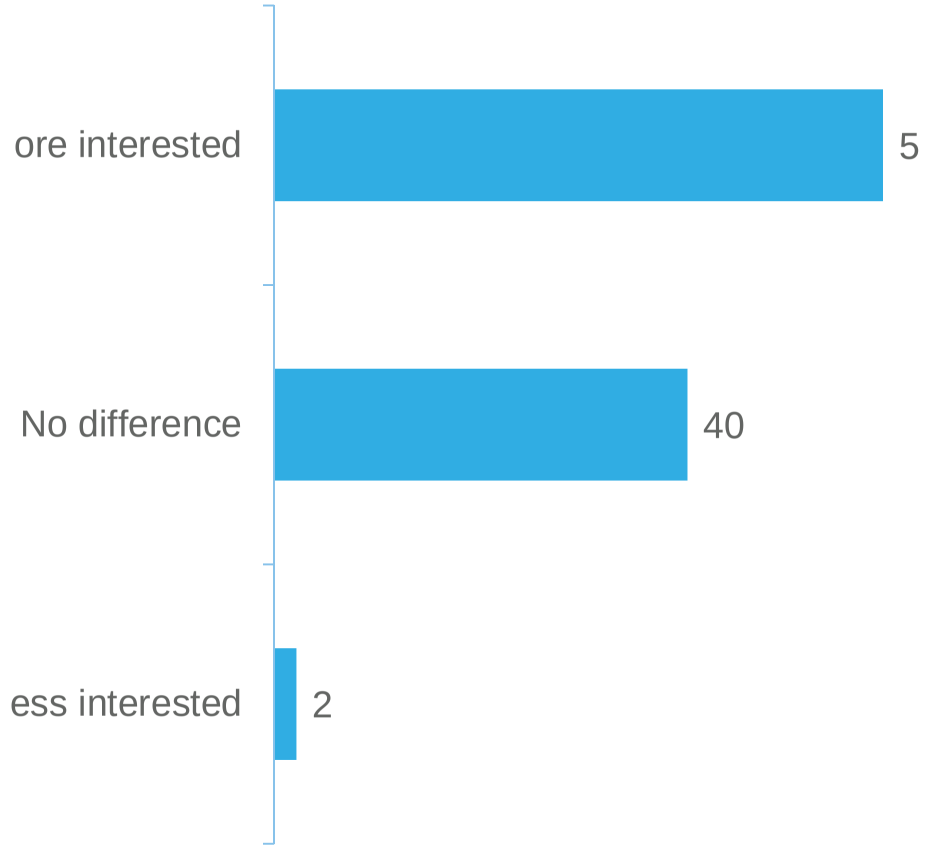
As you would expect, awareness of the rebate was significantly higher among technology participants.

3 – rogram participants received a rebate for reducing their energy usage during peak time periods. ere you aware of this rebate



Awareness of the rebate impacted interest levels – six out of 10 who were not aware would have been more interested.

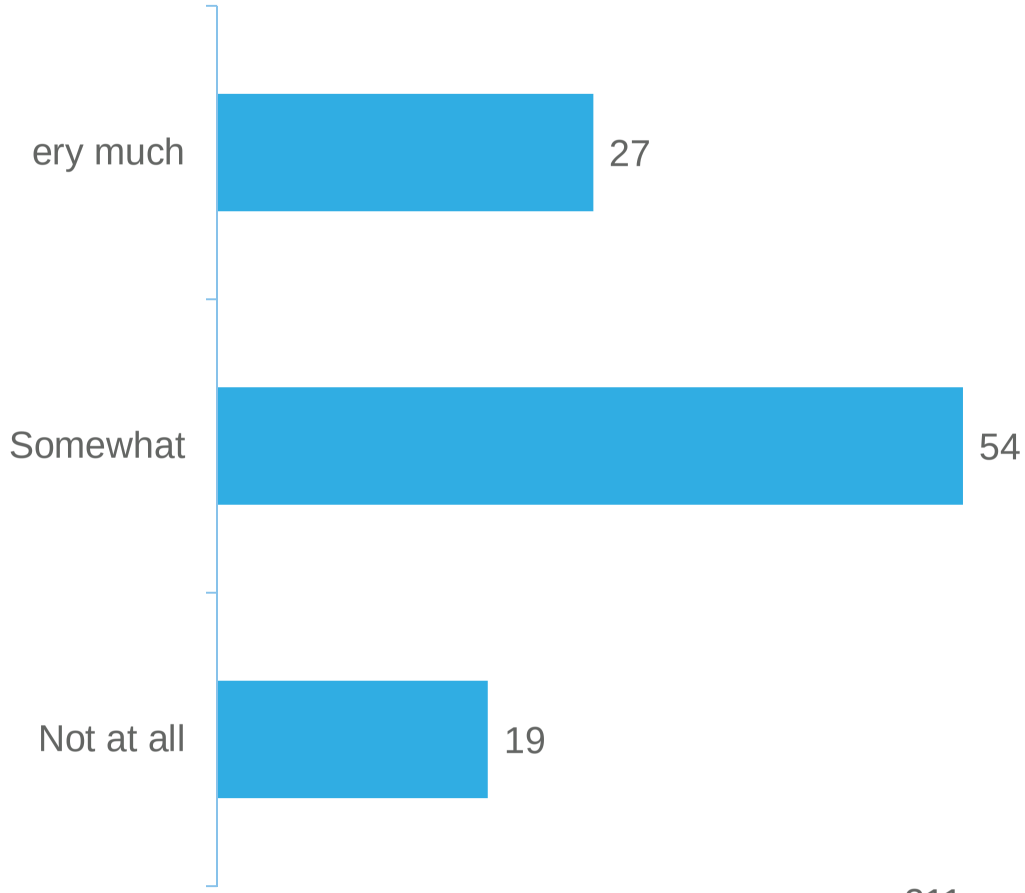
rogram participants who were not aware of the peak time rebate were asked:
4 – ould you be more interested, less interested, or would it make no difference to you



n 235

In fact, eight out of 10 participants said the rebate had impacted their decision to participate in the program.

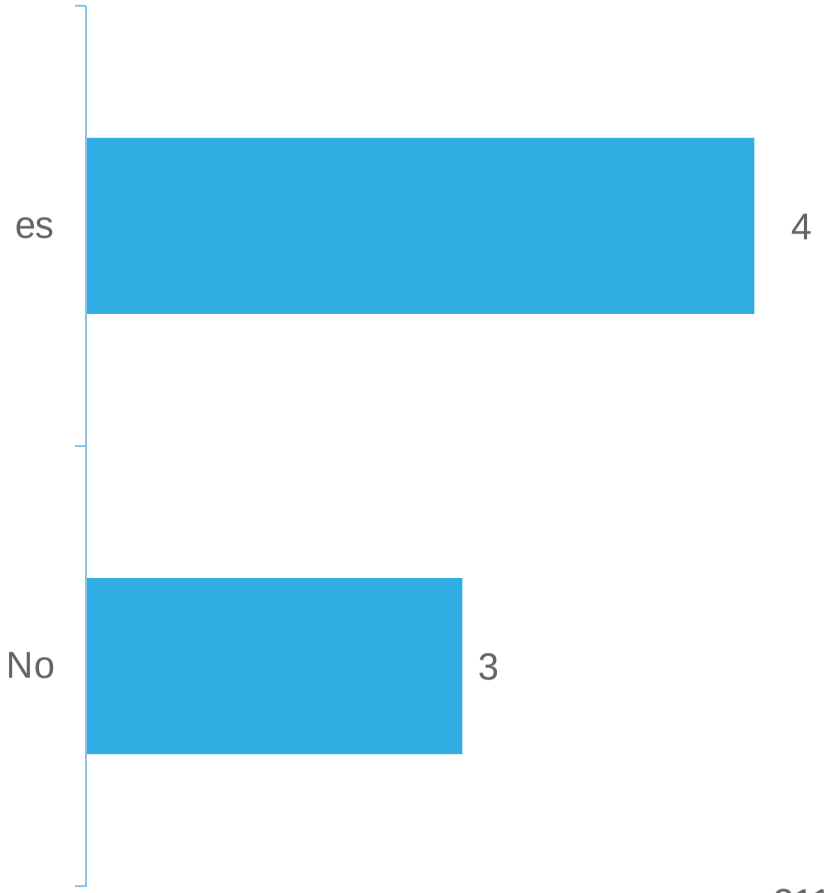
5 – ow much did the peak time rebate offer impact your decision to participate in this program



n 211

nly two-thirds of participants, however, recalled seeing the peak time rebate on their bill.

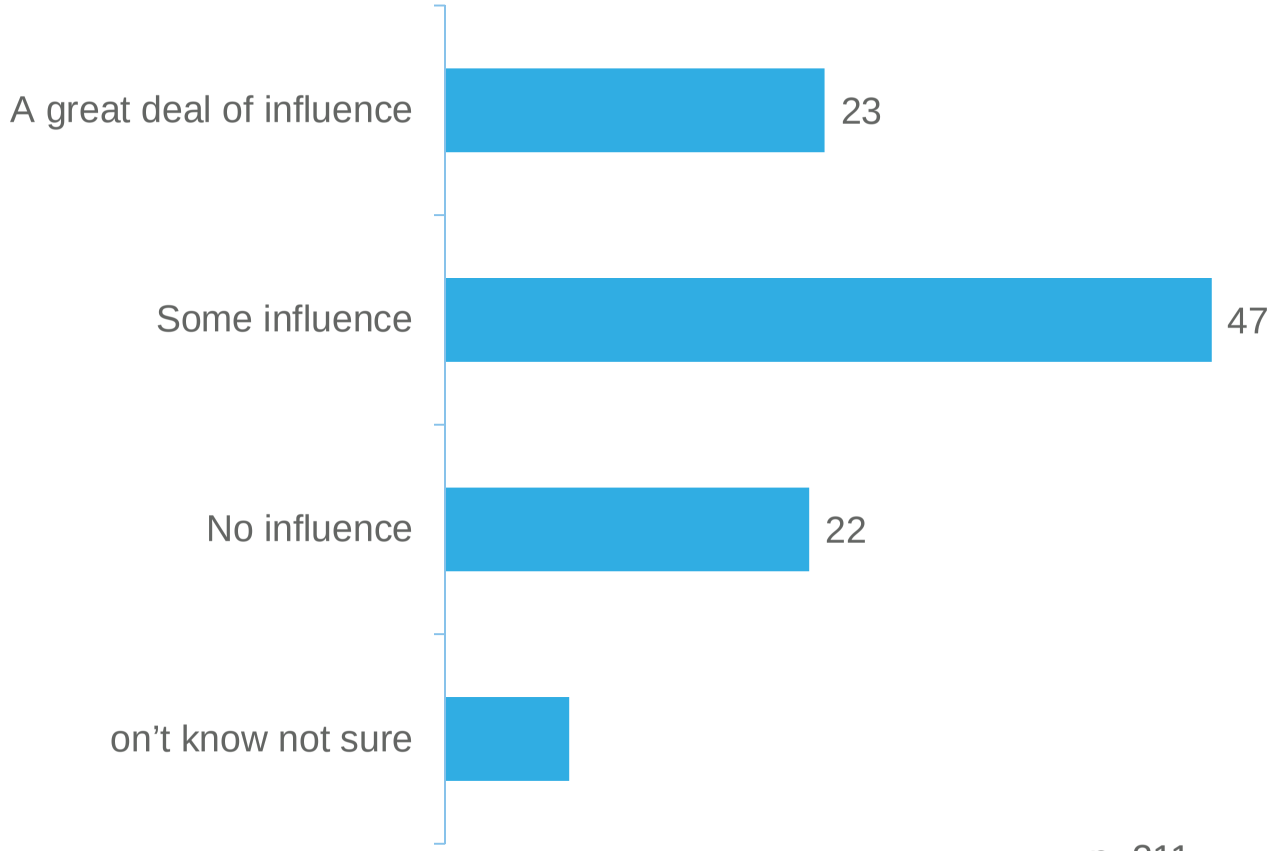
– o you recall seeing the peak time rebate displayed on your electric bill



n 211

Seven out of 10 participants said that the rebate positively influenced their behavior

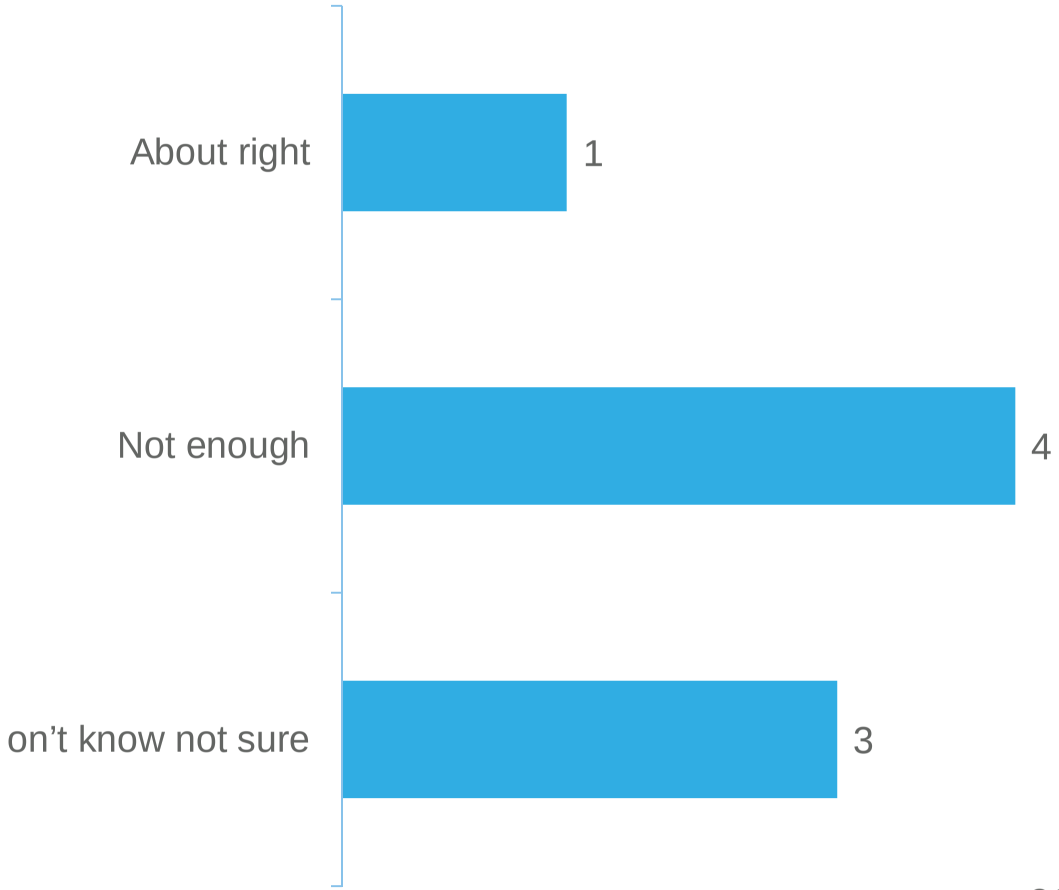
– ow much did the rebate influence your behavior or habits in reducing your energy usage during peak events



n 211

but the consensus among participants was that the rebate was less than they expected.

7 – hat did you think about the amount of the rebate you received for participating in the program



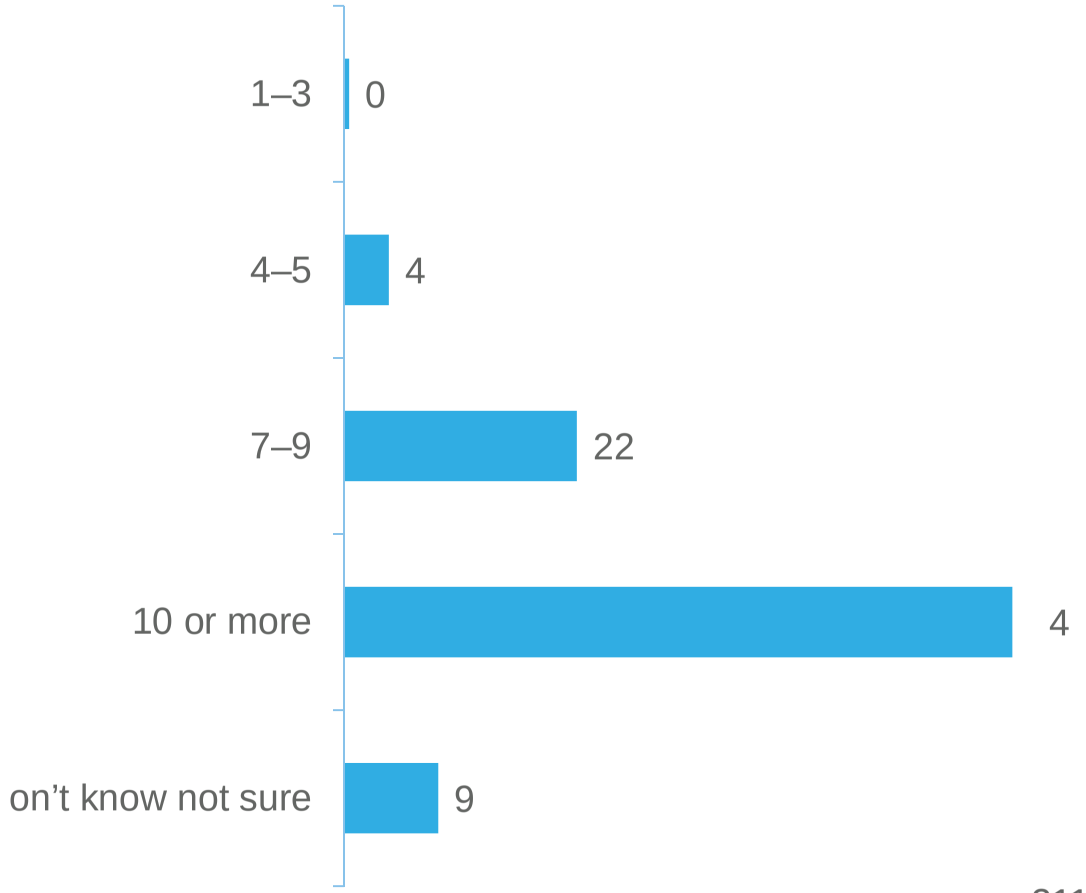
n 211

Reaction to Events

Shelton Grp

wo-thirds of participants could accurately estimate how many peak time events had occurred.

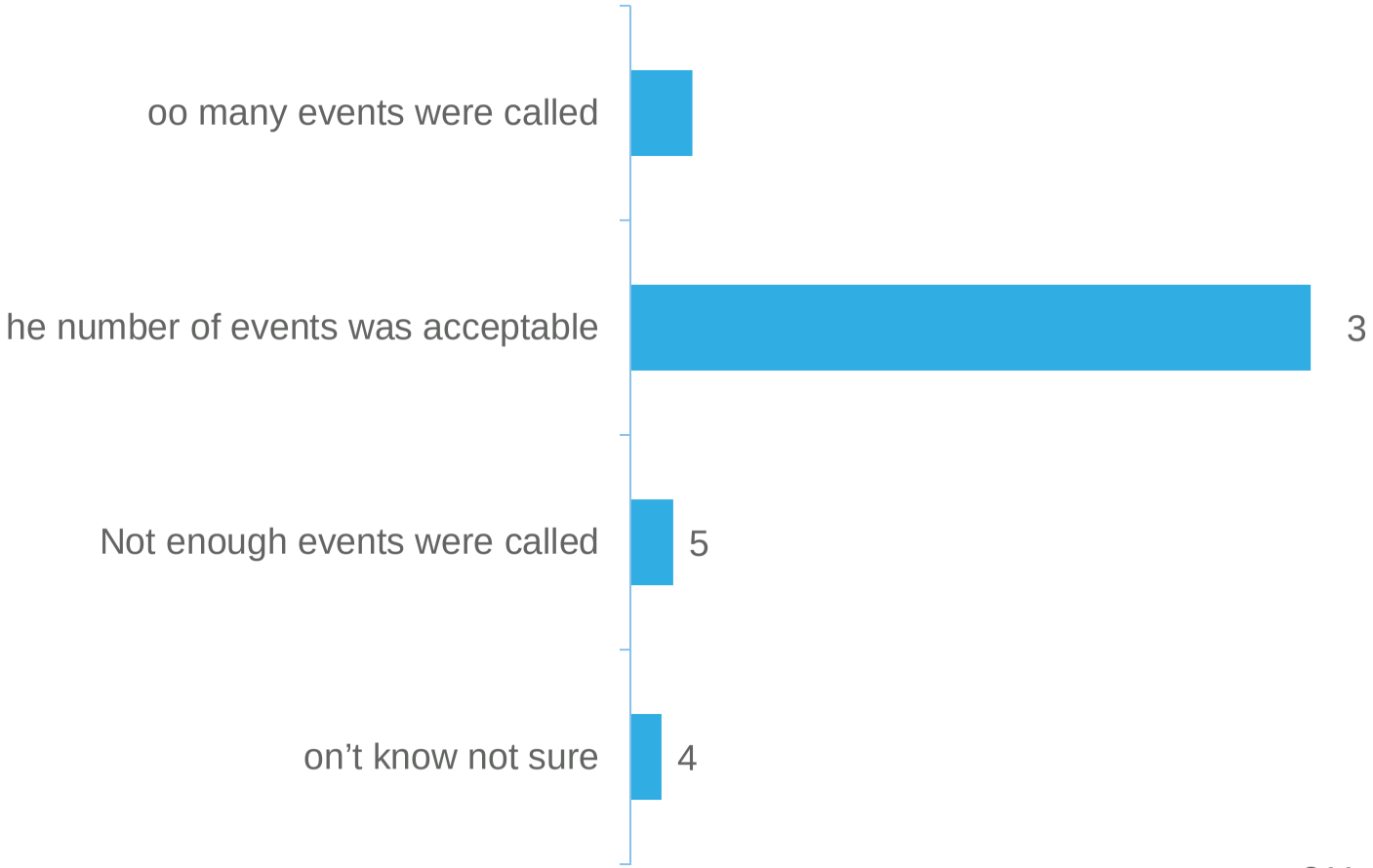
25 – Can you please estimate how many events there have been since the program began in une



n 211

he ma ority were satisfied with the number of events called.

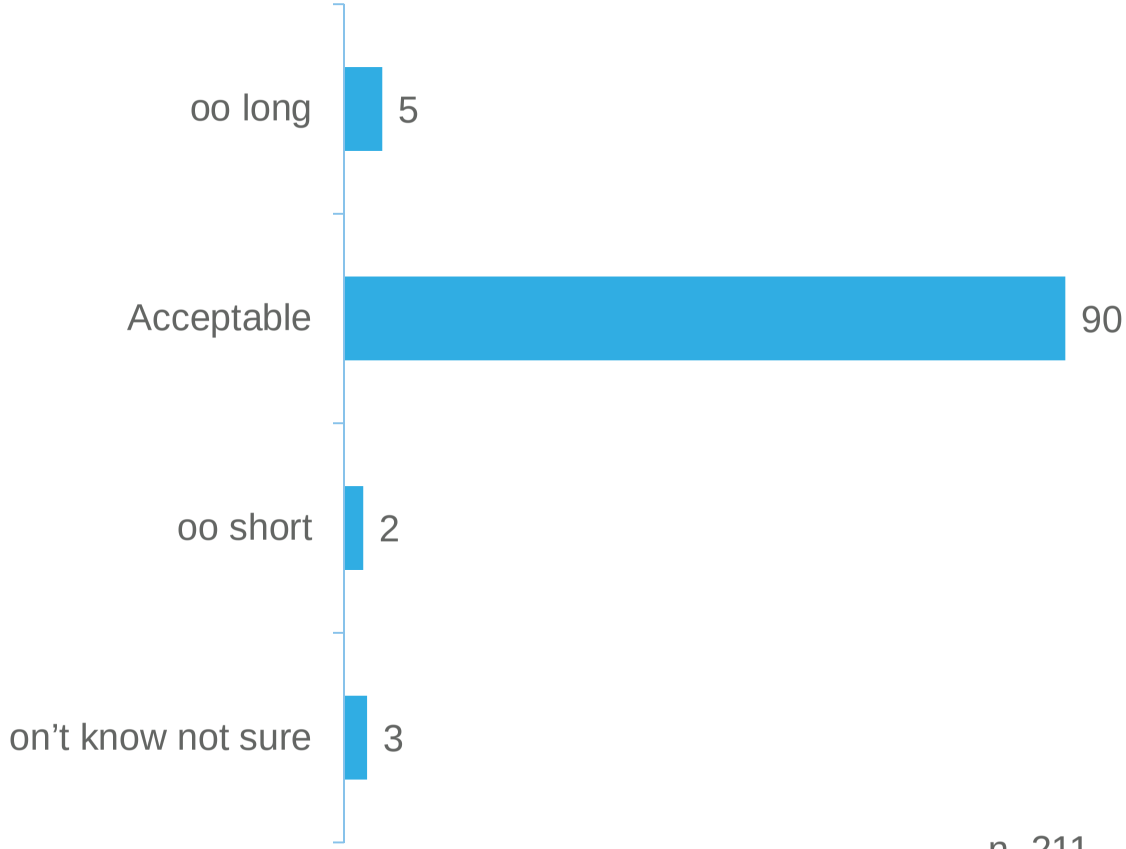
2 – here have been 15 of these events since the program began this une. o you feel like



n 211

Nine out of 10 program participants considered the length of the events acceptable.

29 – hat about the length of each peak event A typical event usually lasted four to six hours. id you think this length was



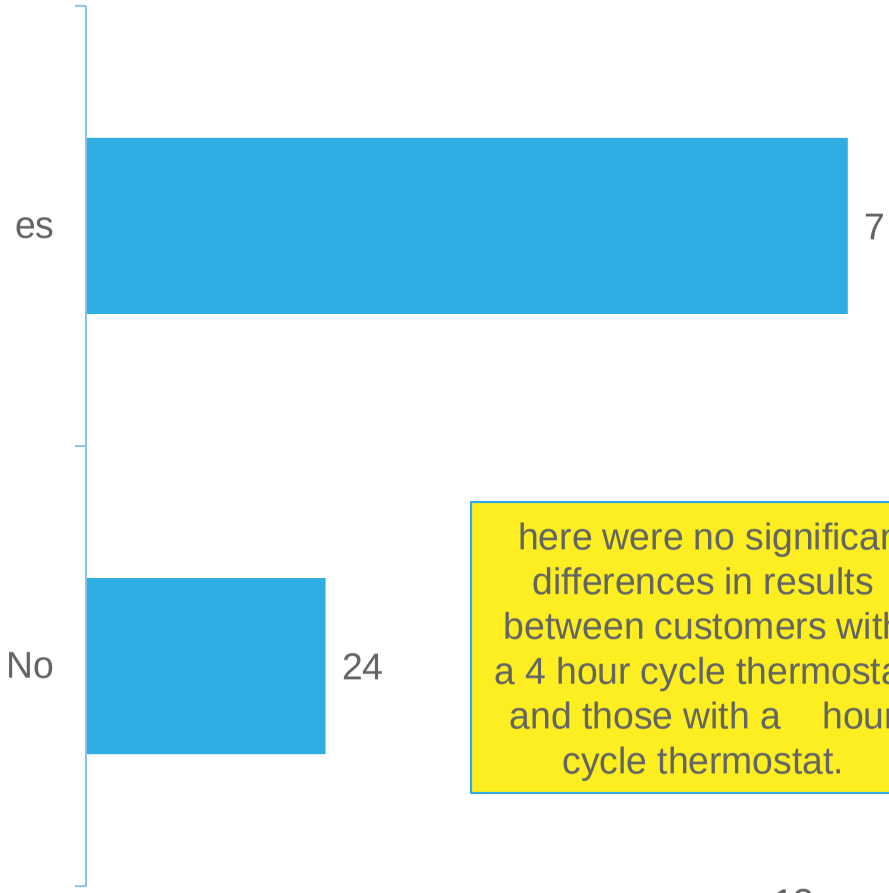
n 211

Pioneer Z100 Smart Thermostat
Company-Controlled Option

Shelton Grp

nly three- uarters of those with a company-controlled thermostat noticed a temperature change during peak events.

27 – id you notice a change in temperature in your home during peak time events

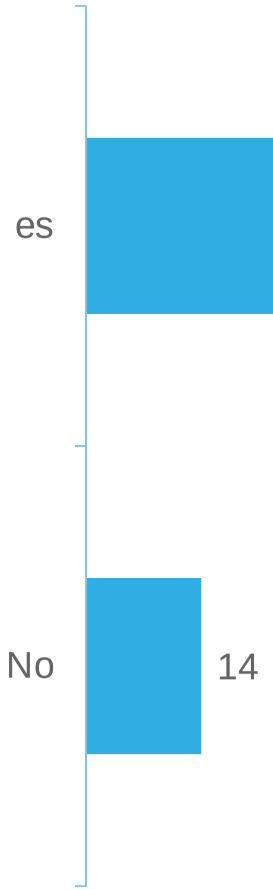


here were no significant differences in results between customers with a 4 hour cycle thermostat and those with a hour cycle thermostat.

n 13

he ma ority of customers with a company-controlled thermostat found the change in temperature during peak events comfortable.

2 – as the change in temperature during peak time events within a comfortable range for you

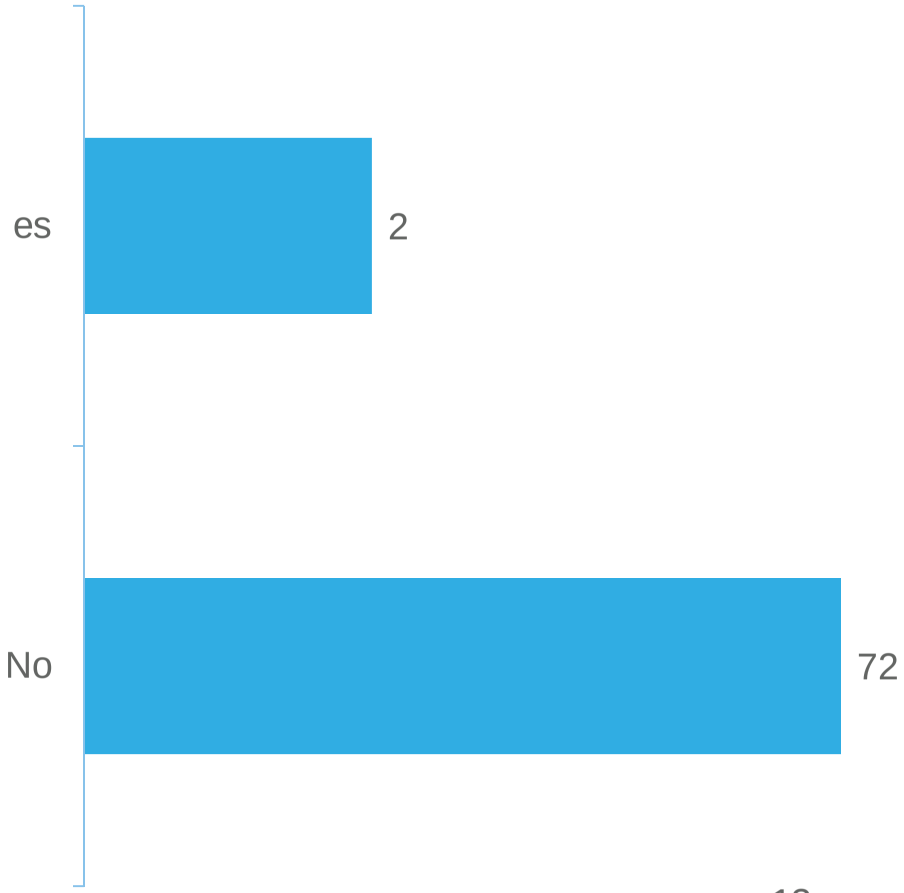


here were no significant differences in results between customers with a 4 hour cycle thermostat and those with a hour cycle thermostat.

n 13

ust over one-fourth of those with a company-controlled thermostat used the override feature.

2 b – id you ever override the thermostat during peak time events



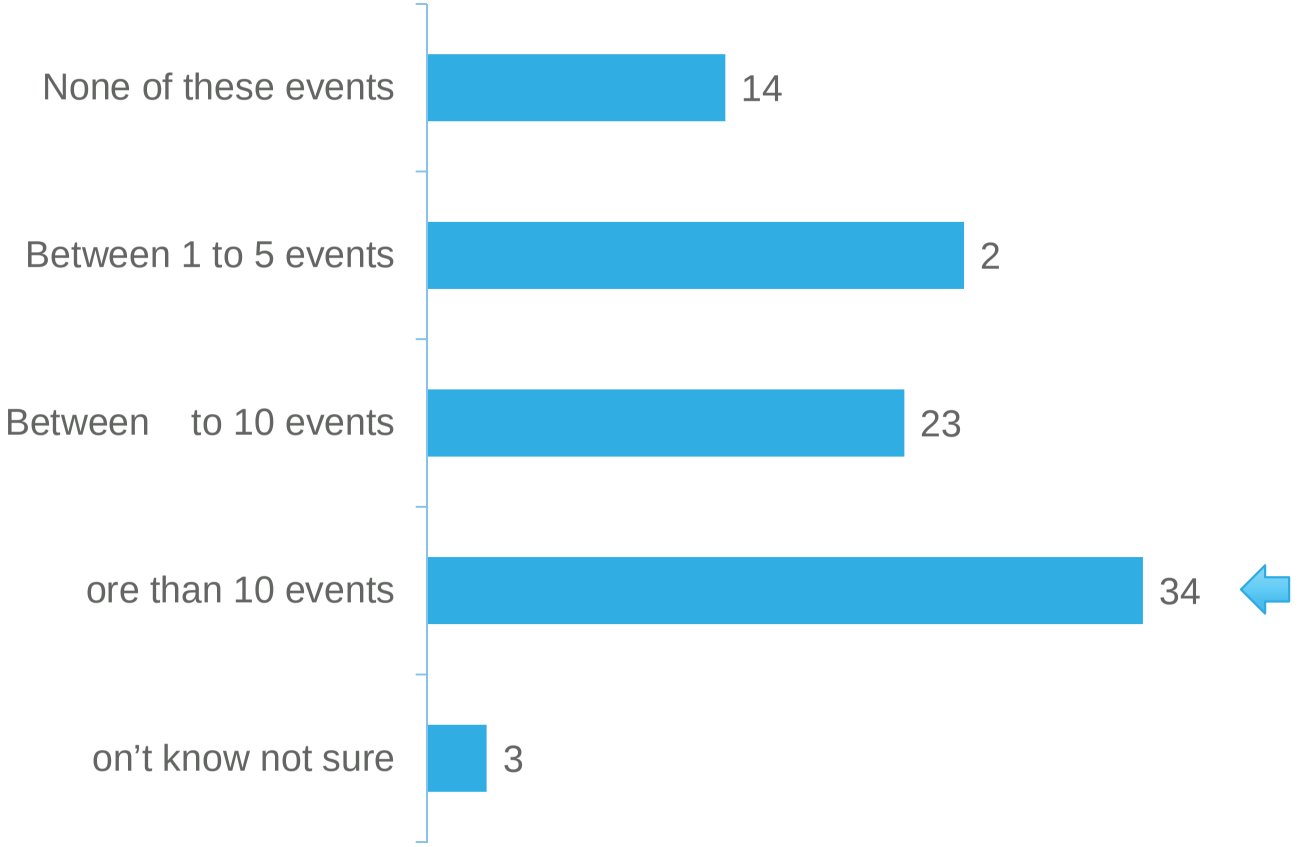
n 13

Pioneer Z100 Smart Thermostat
Customer-Controlled Option

Shelton Grp

he notification alerts were effective; more than eight out of 10 participants with a customer-controlled thermostat ad usted their thermostat for one or more peak events.

2 c – f the 15 peaks events called this year, would you say that you have ad usted your thermostat for

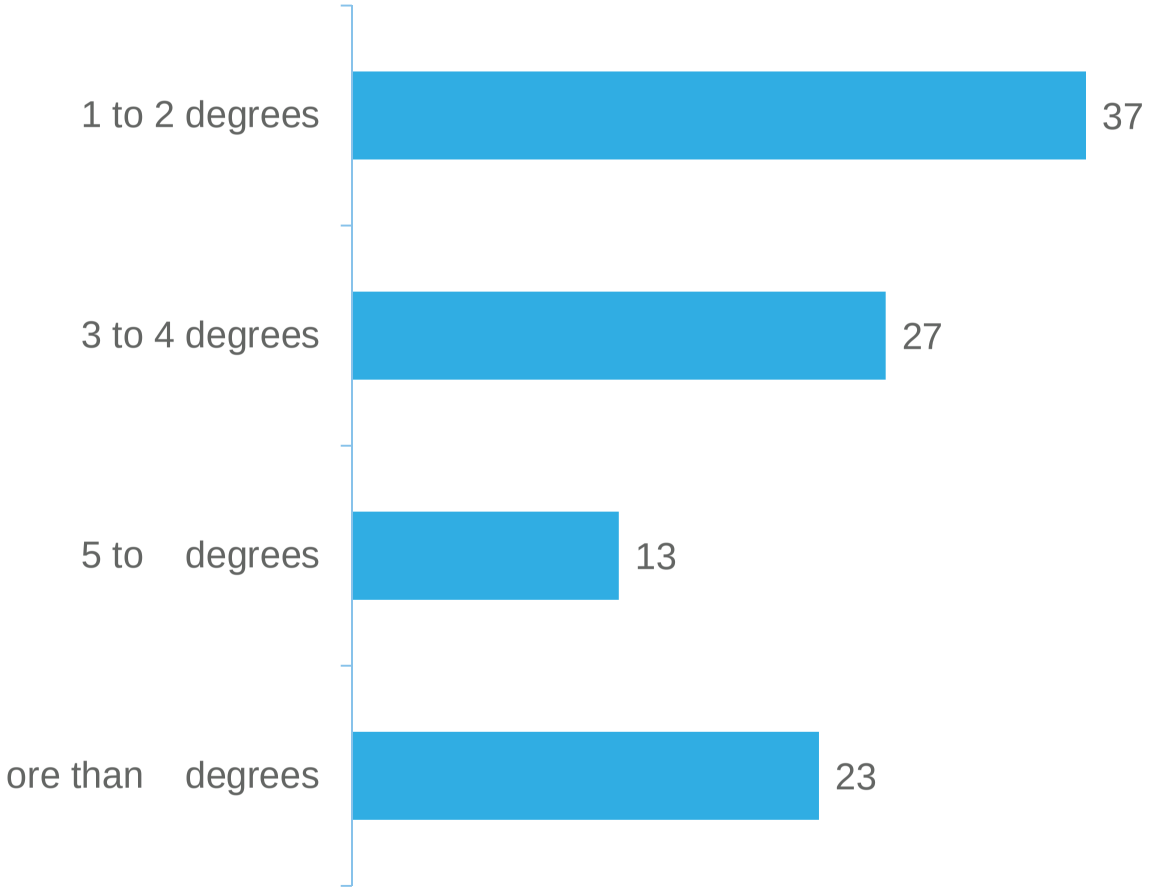


nly one-third of those with a customer-controlled thermostat, however, ad usted their thermostat for the ma ority of events.

n 35

he median temperature ad ustment for customer-controlled thermostats was between three and four degrees.

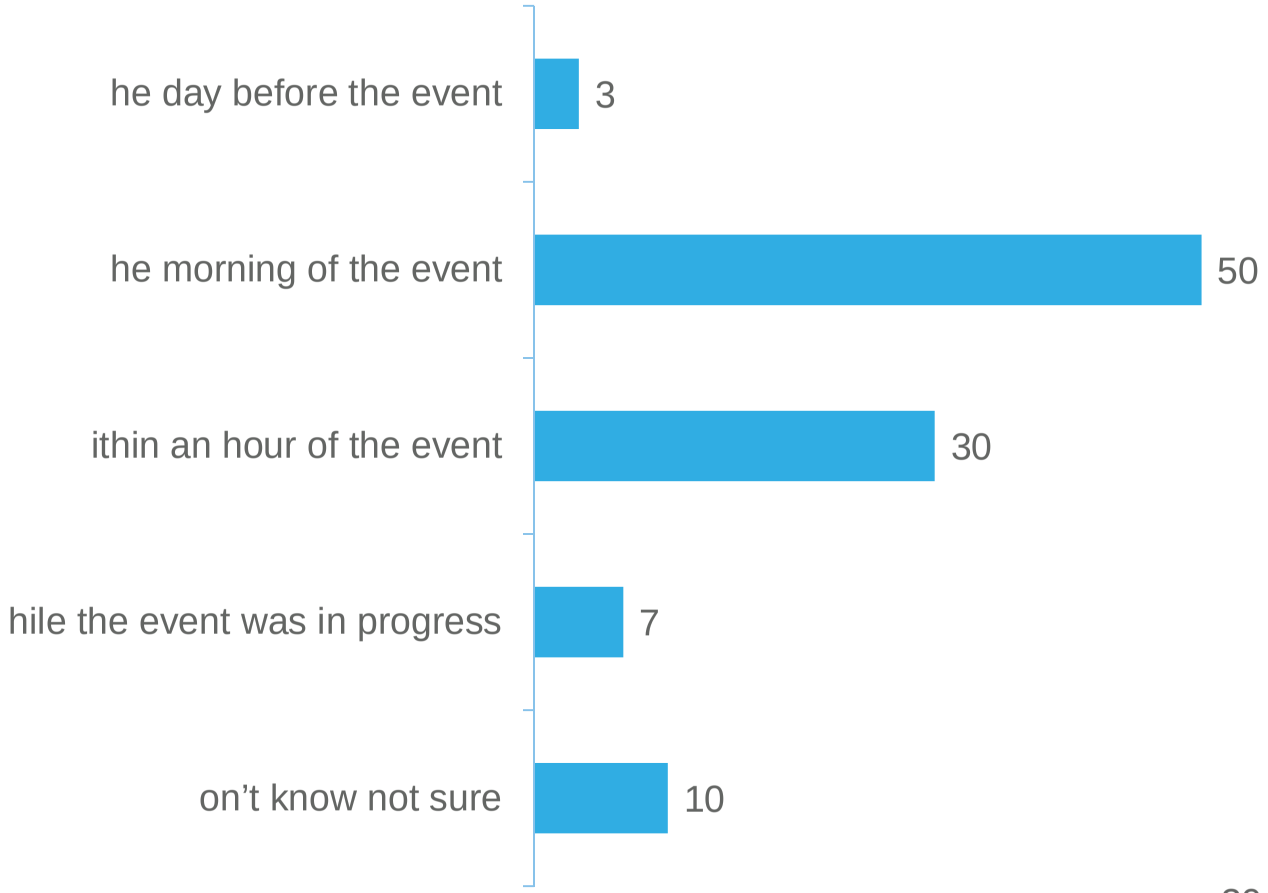
2 d – hat is your typical ad ustment



n 30

ore than half of customers with that technology made the temperature ad ustment in the morning of the event.

2 e – hen did you usually make the ad ustment for the peak event



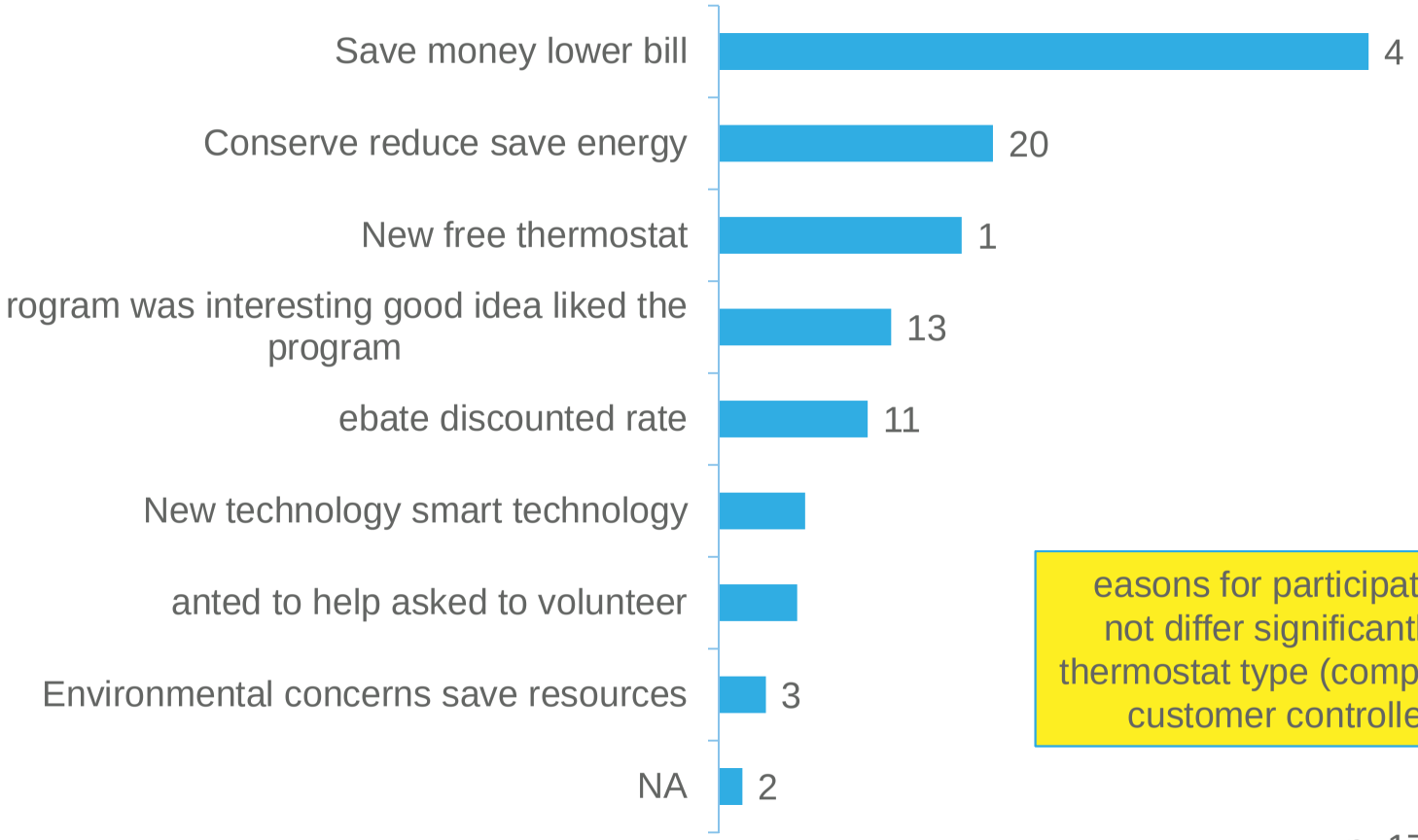
n 30

Overall Customer Reaction to the Pioneer Z100 Smart Thermostat

Shelton Grp

Almost half of those who opted to install a ioneer thermostat did so for the potential savings.

1a1 – hy did you choose to participate in this program ioneer 100 smart thermostat (N E: erbatim responses have been coded and categorized).

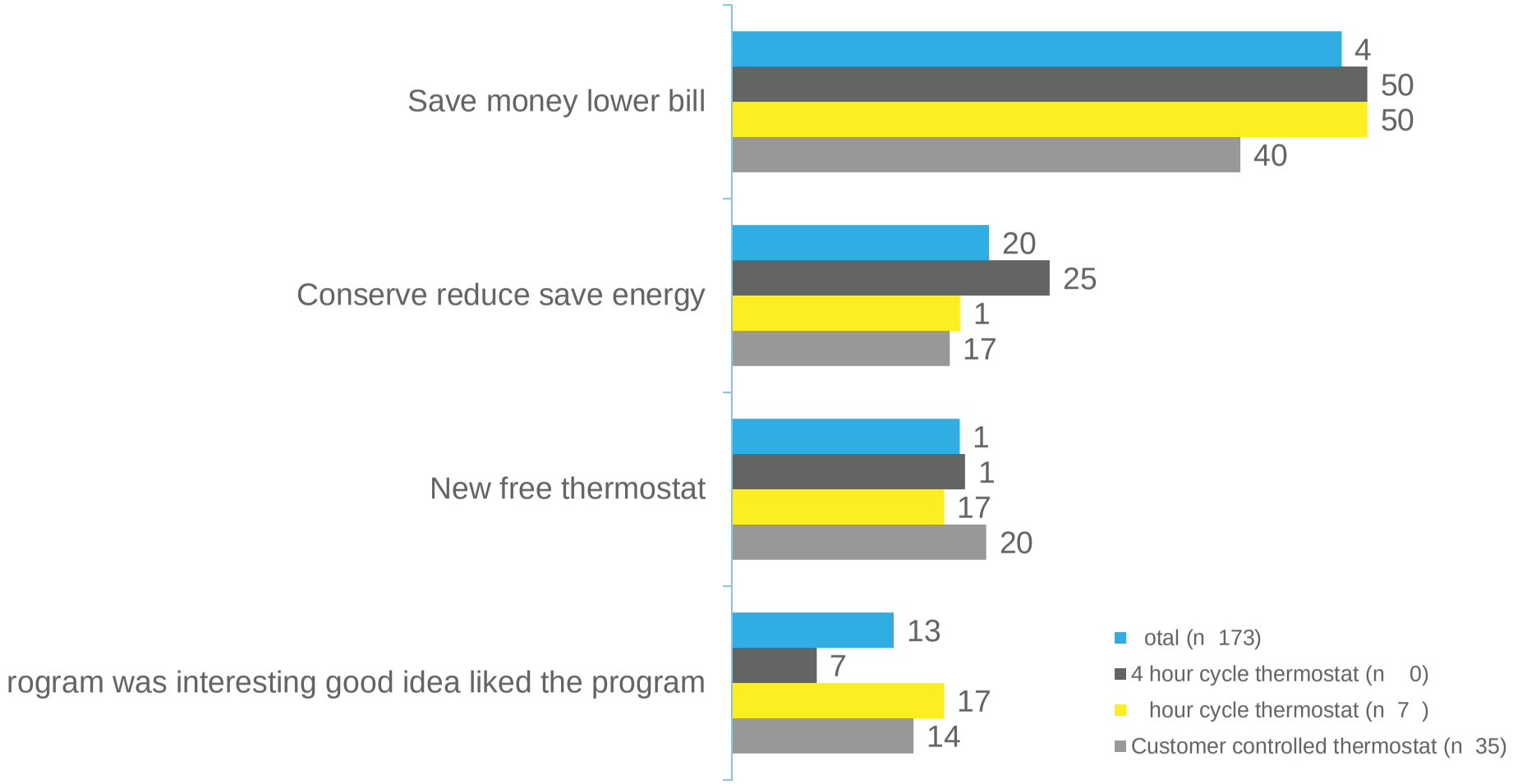


easons for participation did not differ significantly by thermostat type (company vs. customer controlled).

n 173

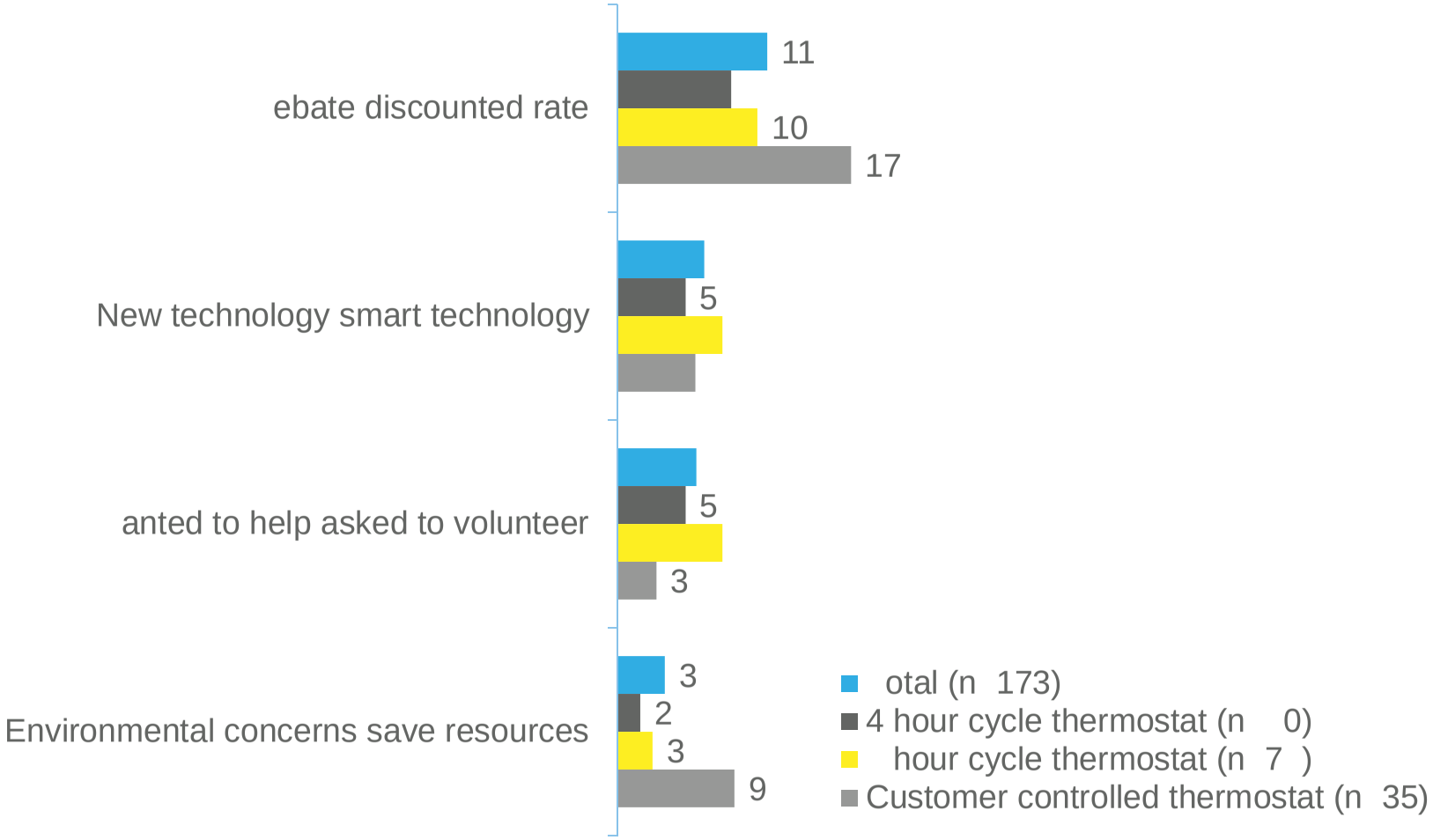
easons for participation did not differ significantly by thermostat type (company vs. customer controlled).

1a1 – hy did you choose to participate in this program ioneer 100 smart thermostat 1 of 2



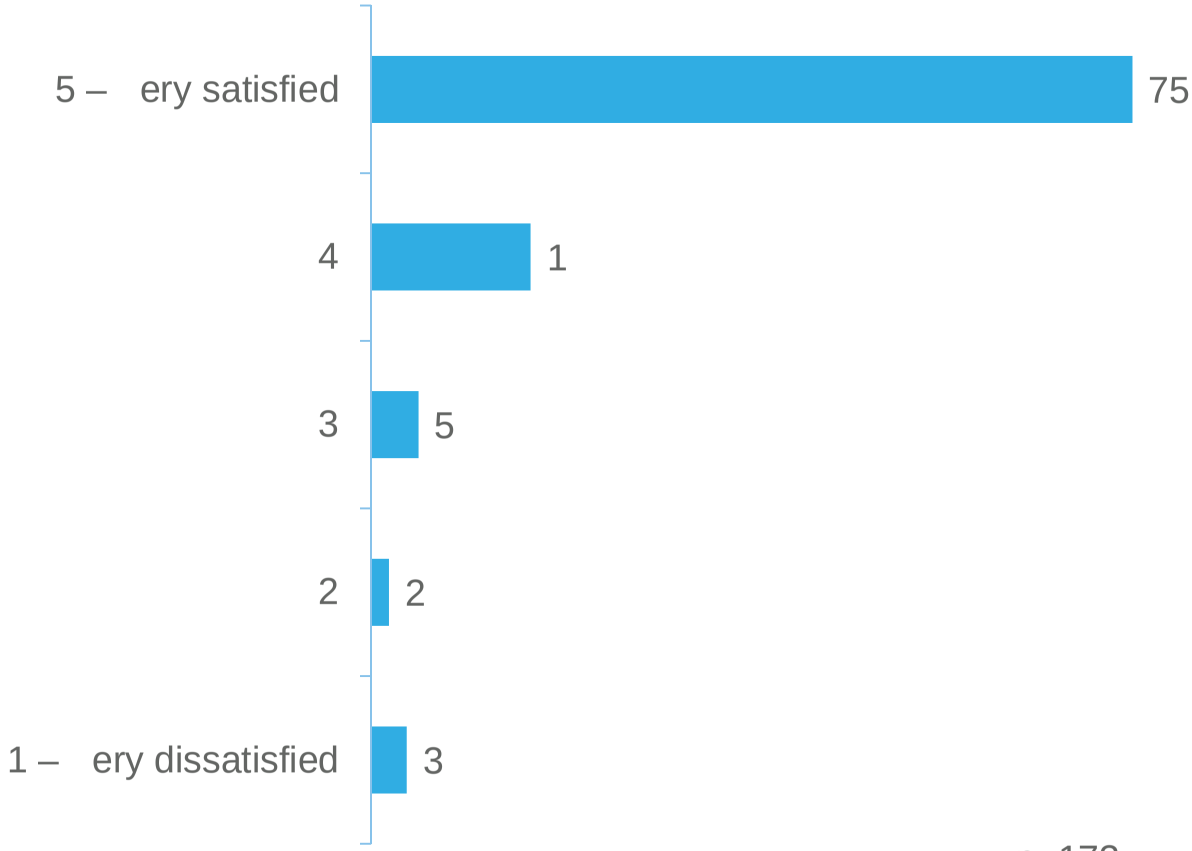
easons for participation did not differ significantly by thermostat type (company vs. customer controlled).

1a1 – hy did you choose to participate in this program ioneer 100 smart thermostat 2 of 2



Nine out of 10 participants are satisfied with the ease of installing the thermostat.

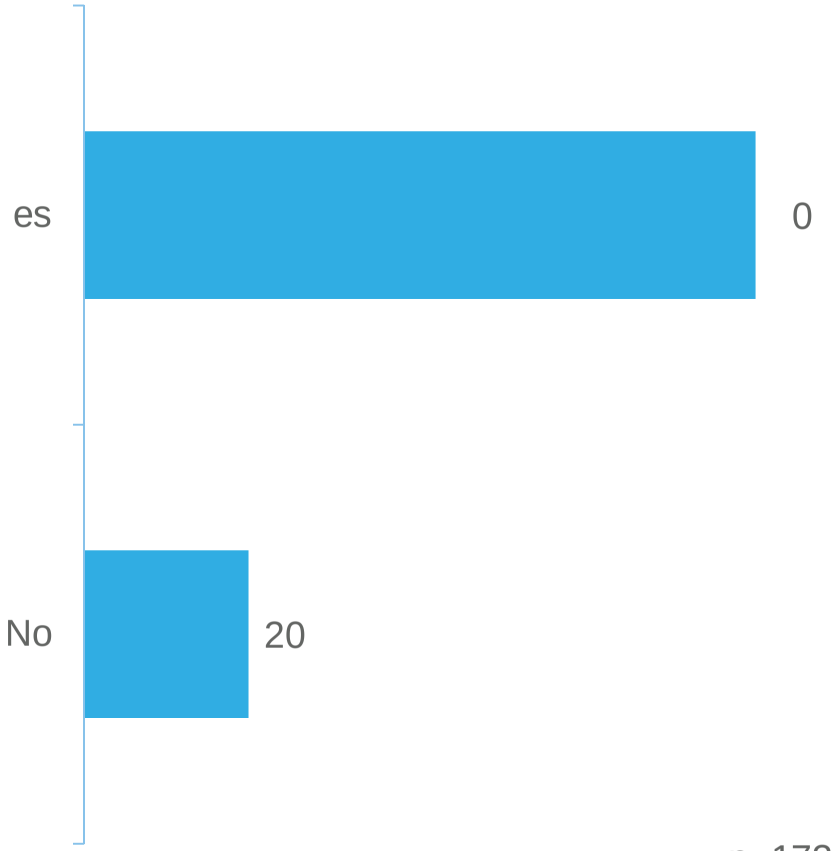
20a – n a scale of 1 to 5, with 1 being " ery dissatisfied" and 5 being " ery satisfied," how would you rate your satisfaction with the ease of installation of the ioneer 100 smart thermostat



n 173

wo out of 10 customers, however, did not feel like they received enough information and support on the device.

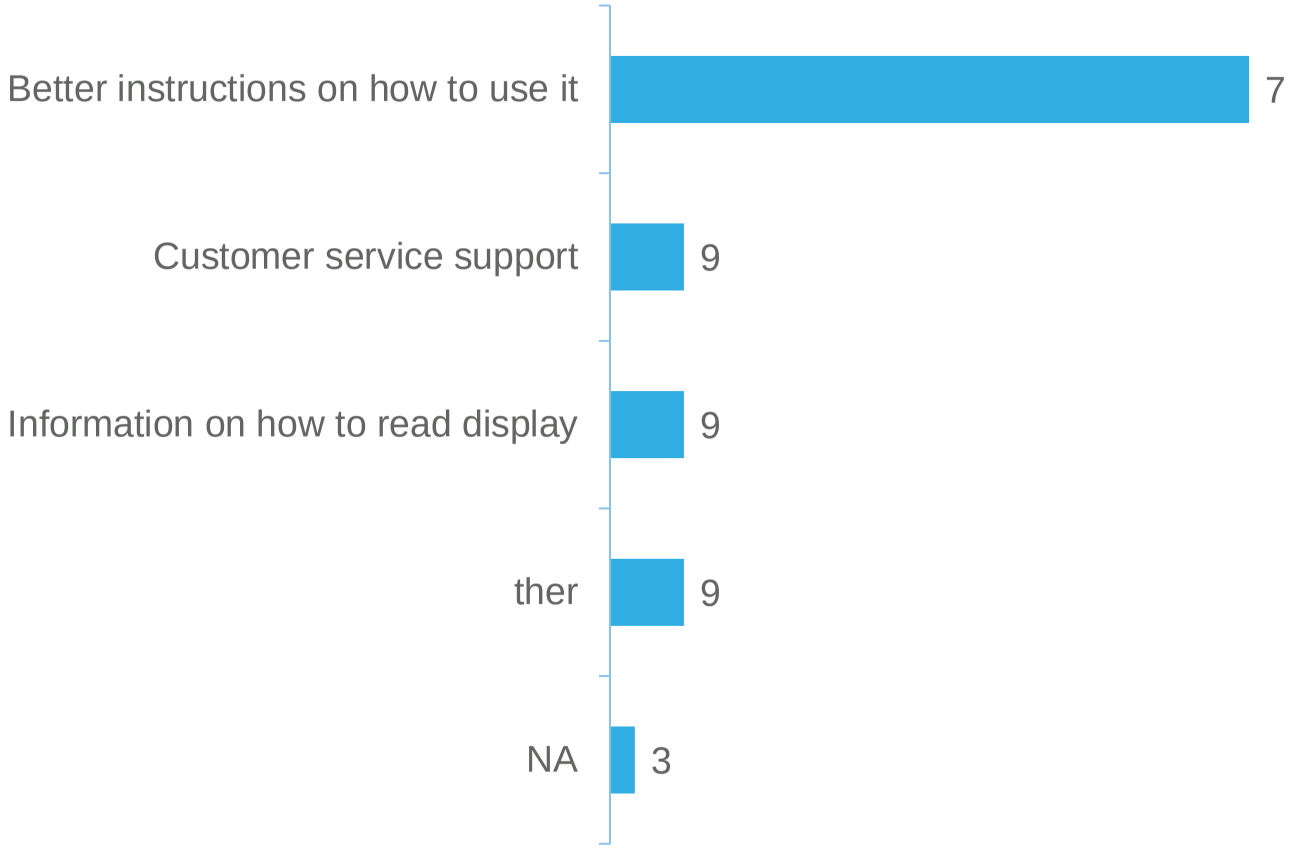
21a – hinking about the ioneer 100 smart thermostat, do you feel like you received enough information and support on how to use this device



n 173

Among those who wanted more information, better instructions on usage was the most desired kind.

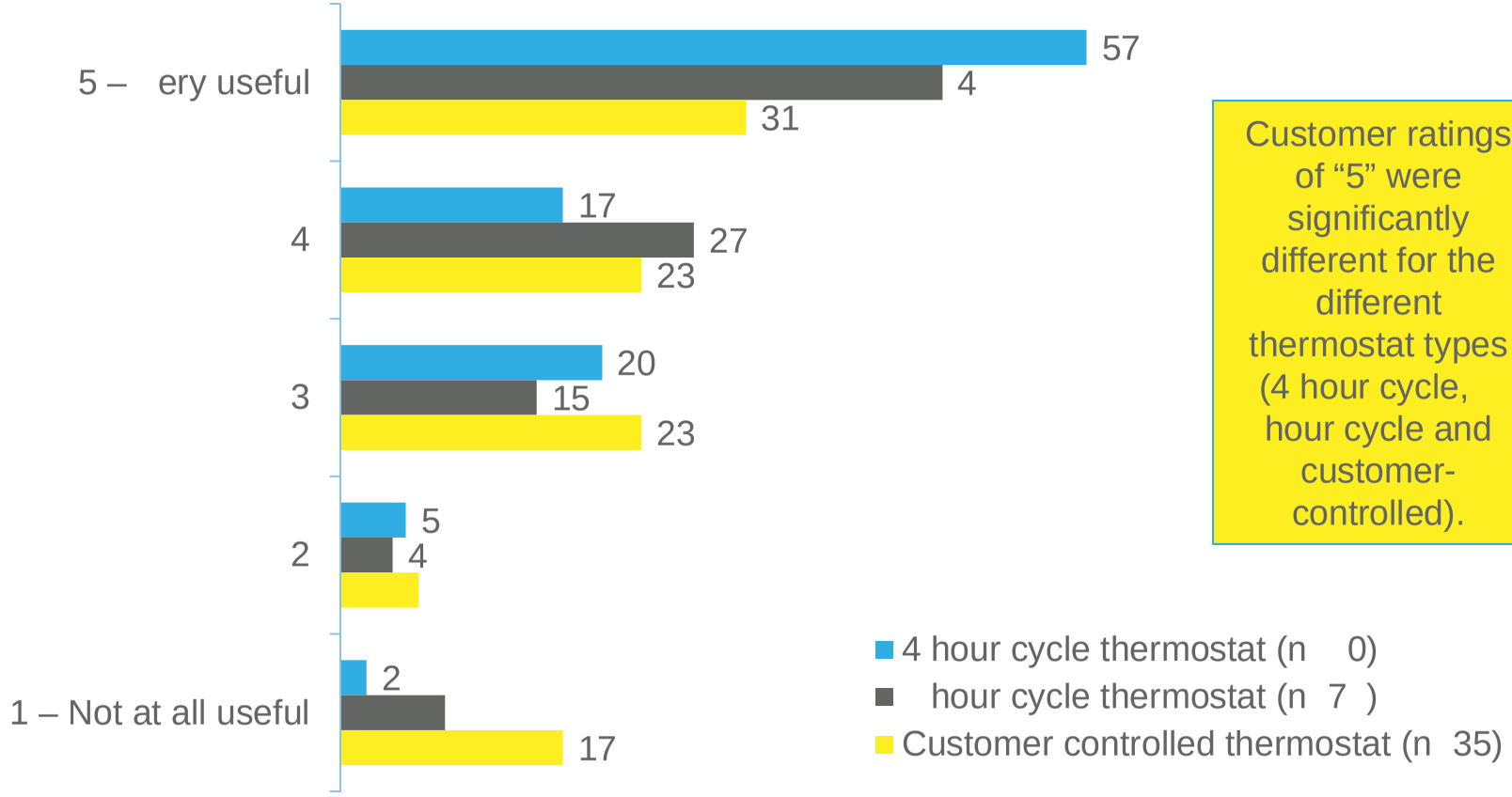
22 – hat other kind of information or support would you like to have received on this device ioneer 100 smart thermostat (N E: erbatim responses have been coded and categorized).



n 34

he 4 hour cycle thermostat had higher ratings than the hour cycle or customer-controlled thermostat in helping reduce energy usage during peak time periods.

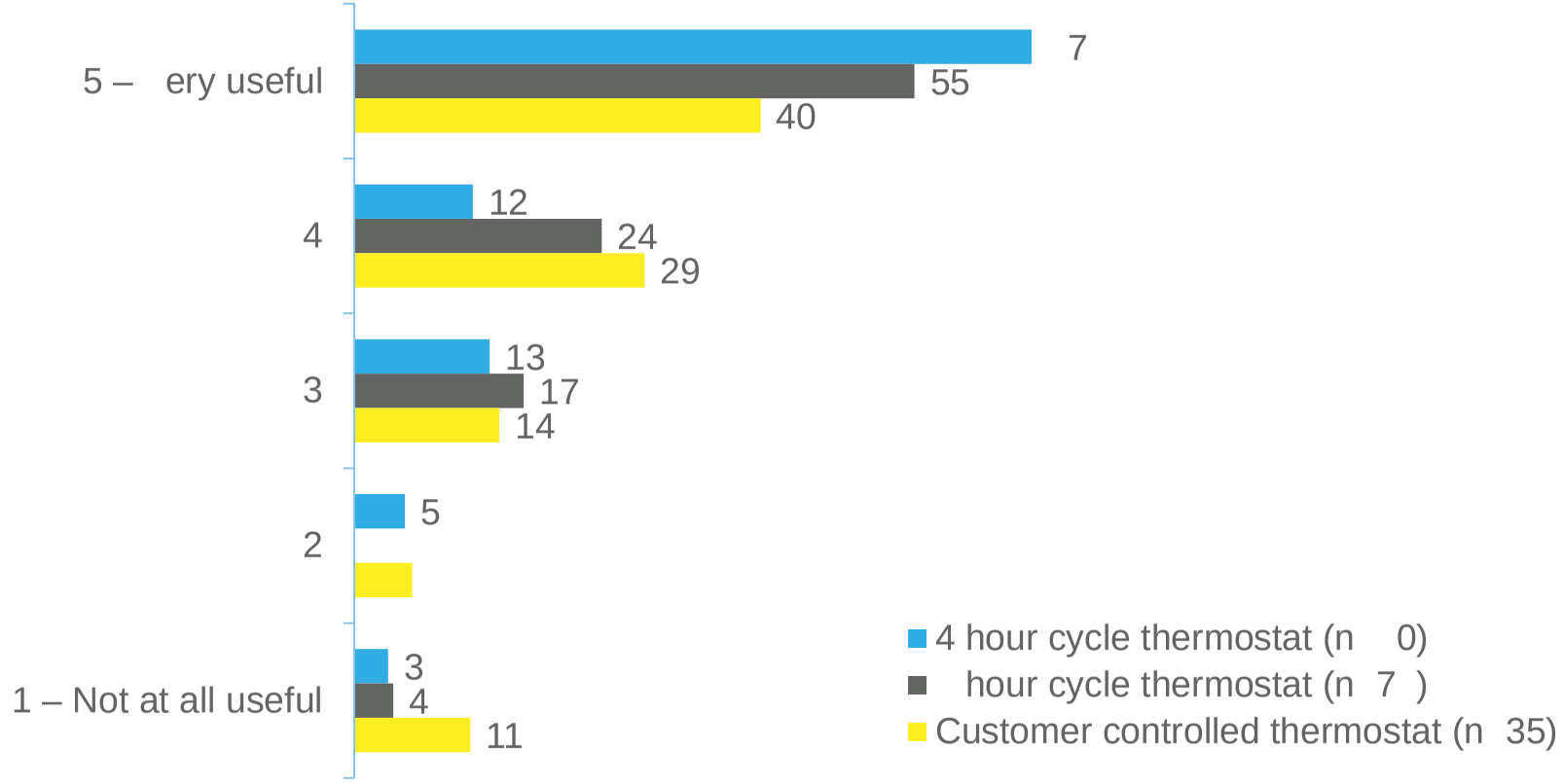
23 – n a scale of 1 to 5, with 1 being "Not at all useful" and 5 being " ery useful," how useful was this device in helping you reduce your energy usage specifically during peak energy time periods



Customer ratings of "5" were significantly different for the different thermostat types (4 hour cycle, hour cycle and customer-controlled).

he 4 hour cycle thermostat also had higher ratings in regard to the usefulness of messaging on the device.

24 – he ioneer 100 smart thermostat and the ower ab in-home display devices both included messaging to let you know about upcoming peak events. n a scale of 1 to 5, with 1 being "Not at all useful" and 5 being " ery useful," how would you rate the usefulness of the messaging on the devices

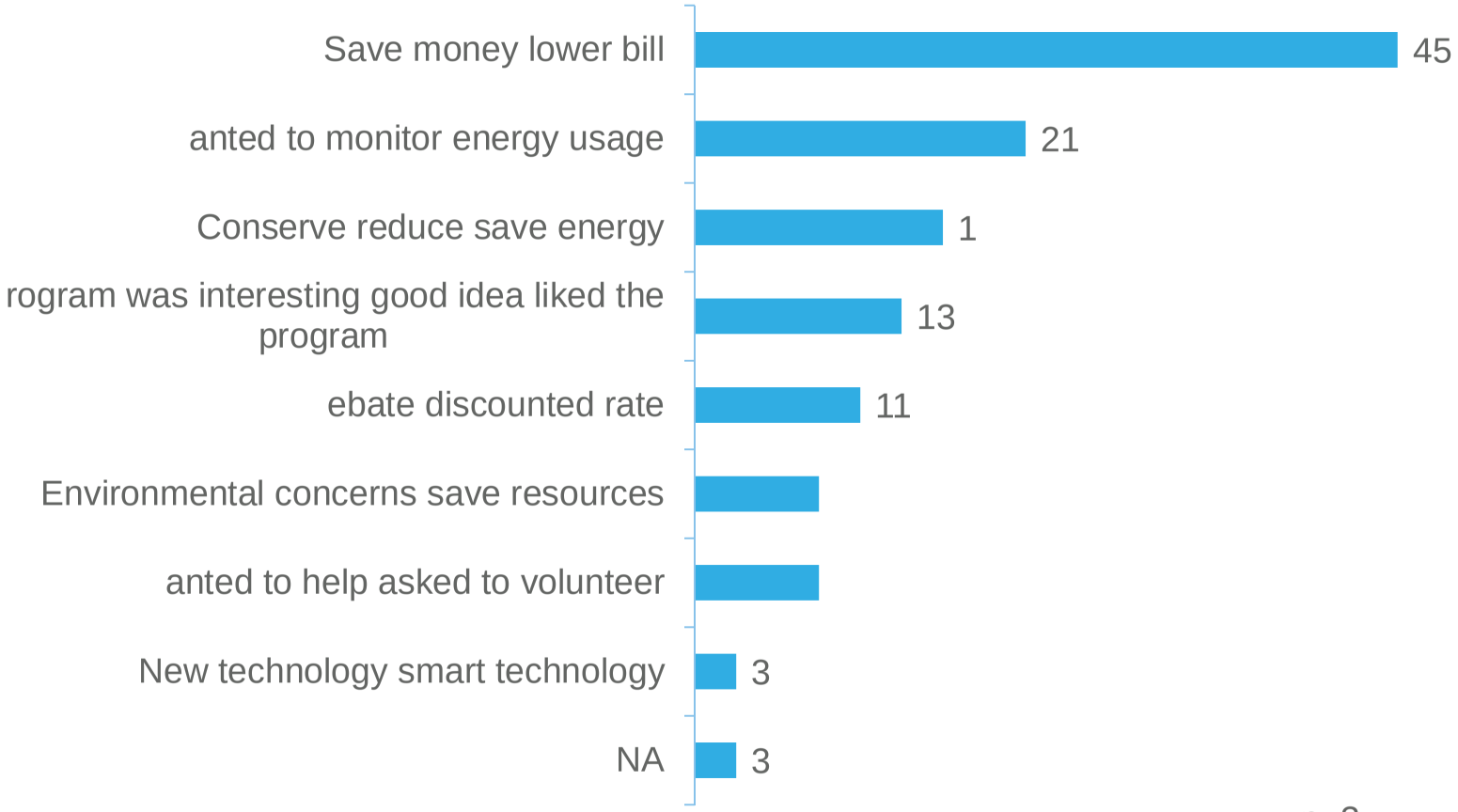


PowerTab In-Home Display

Shelton Grp

otential savings were also the primary motivator for participation with the ower ab display device.

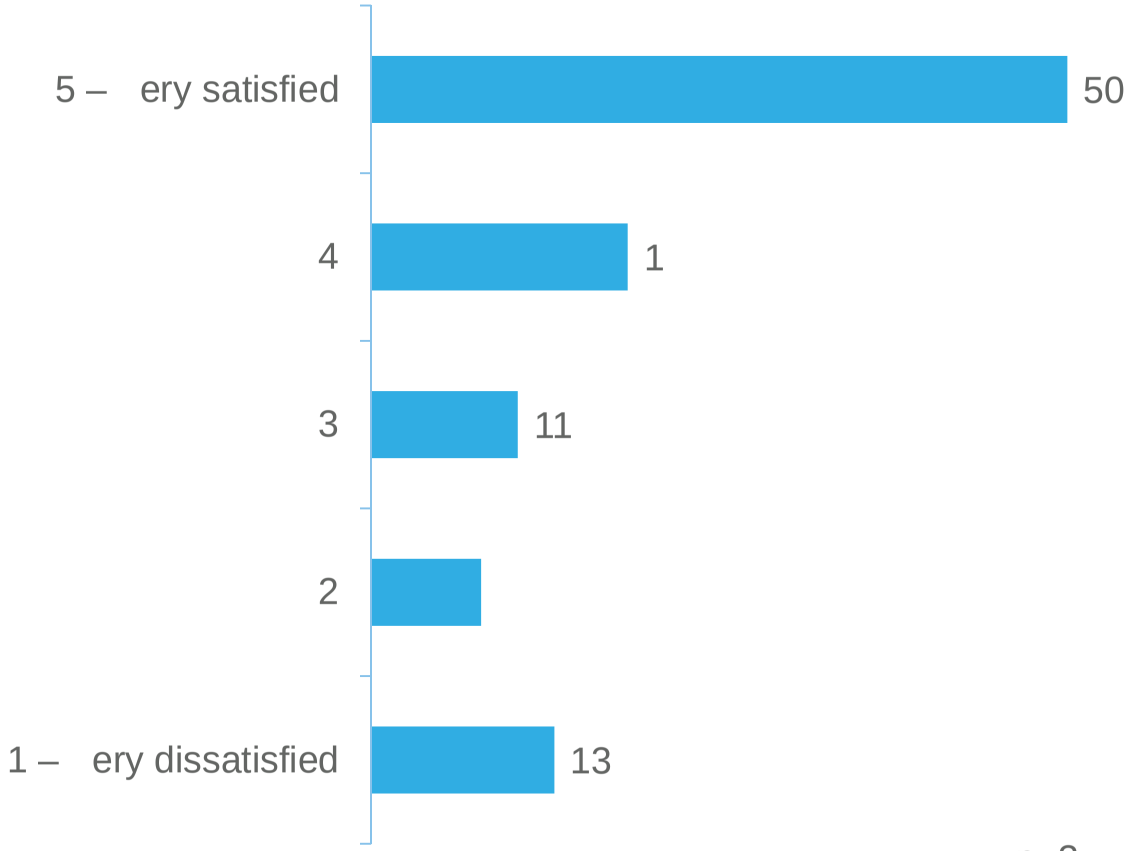
1a2 – hy did you choose to participate in this program ower ab in-home display (N E: erbatim responses have been coded and categorized).



n 3

Sixty-eight percent were satisfied with the ease of installation.

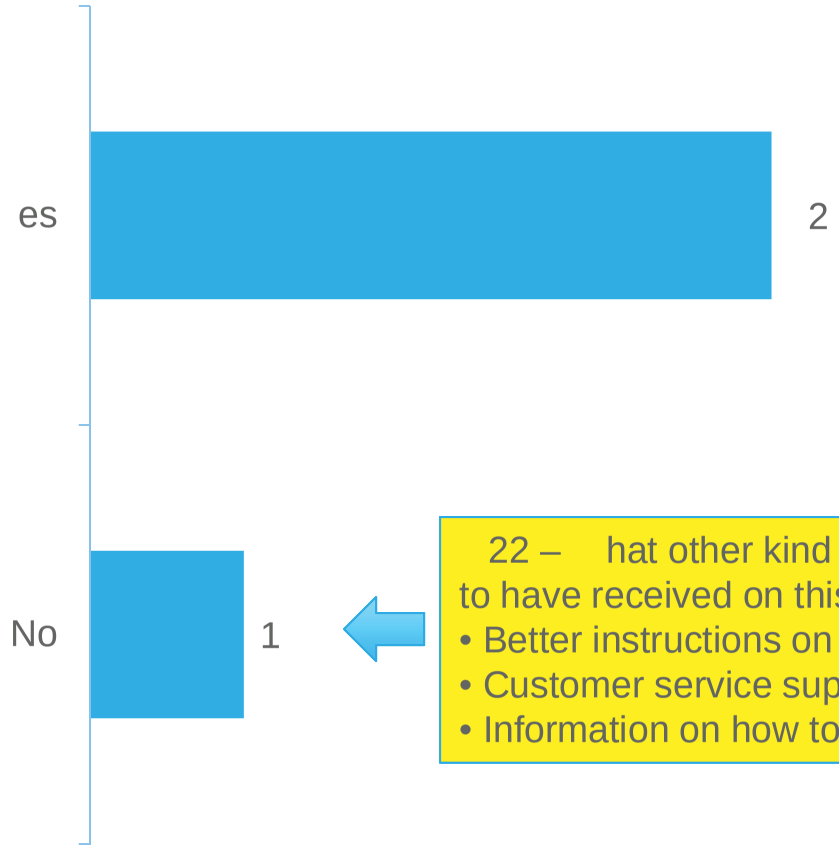
20b – n a scale of 1 to 5, with 1 being " ery dissatisfied" and 5 being " ery satisfied," how would you rate your satisfaction with the ease of installation of the ower ab in-home display



n 3

nly 1 felt that they did not receive enough information and support on the use of the device.

21b – hinking about the ower ab in-home display, do you feel like you received enough information and support on how to use this device



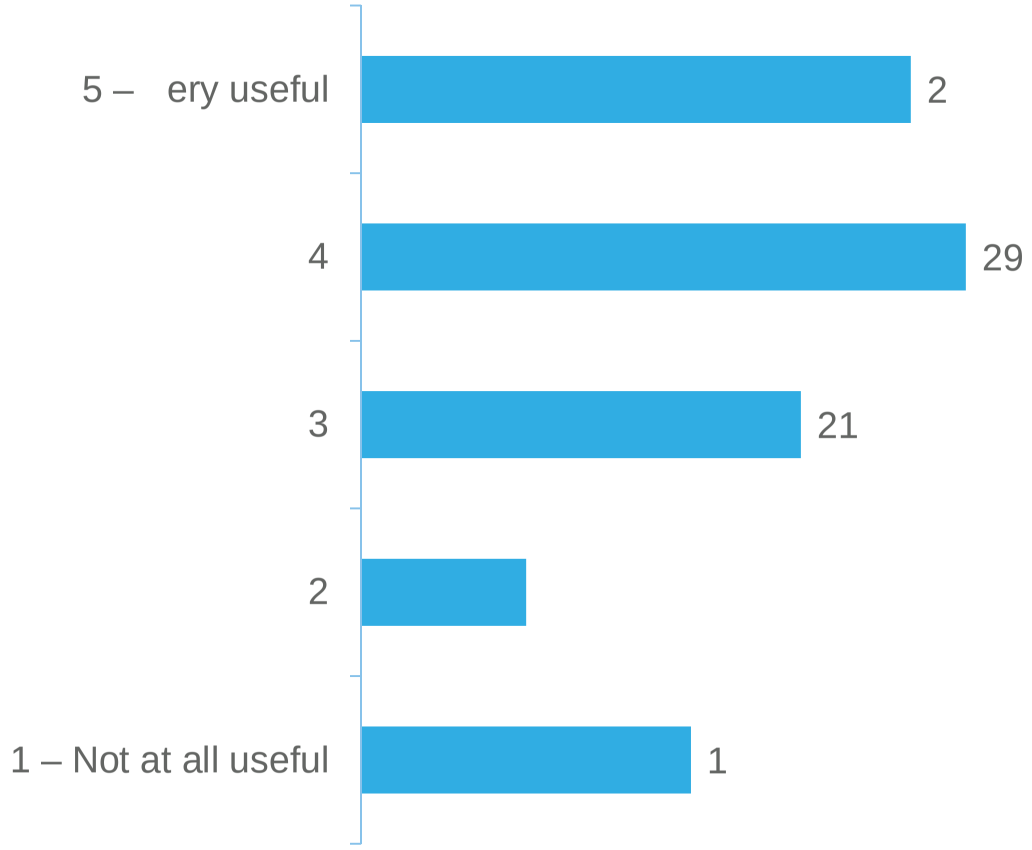
22 – hat other kind of information or support would you like to have received on this device ower ab in-home display

- Better instructions on how to use it (43)
- Customer service support (29)
- Information on how to read display (14)

n 3

Fifty-seven percent of customers found the ower ab display helpful in reducing energy usage during peak periods.

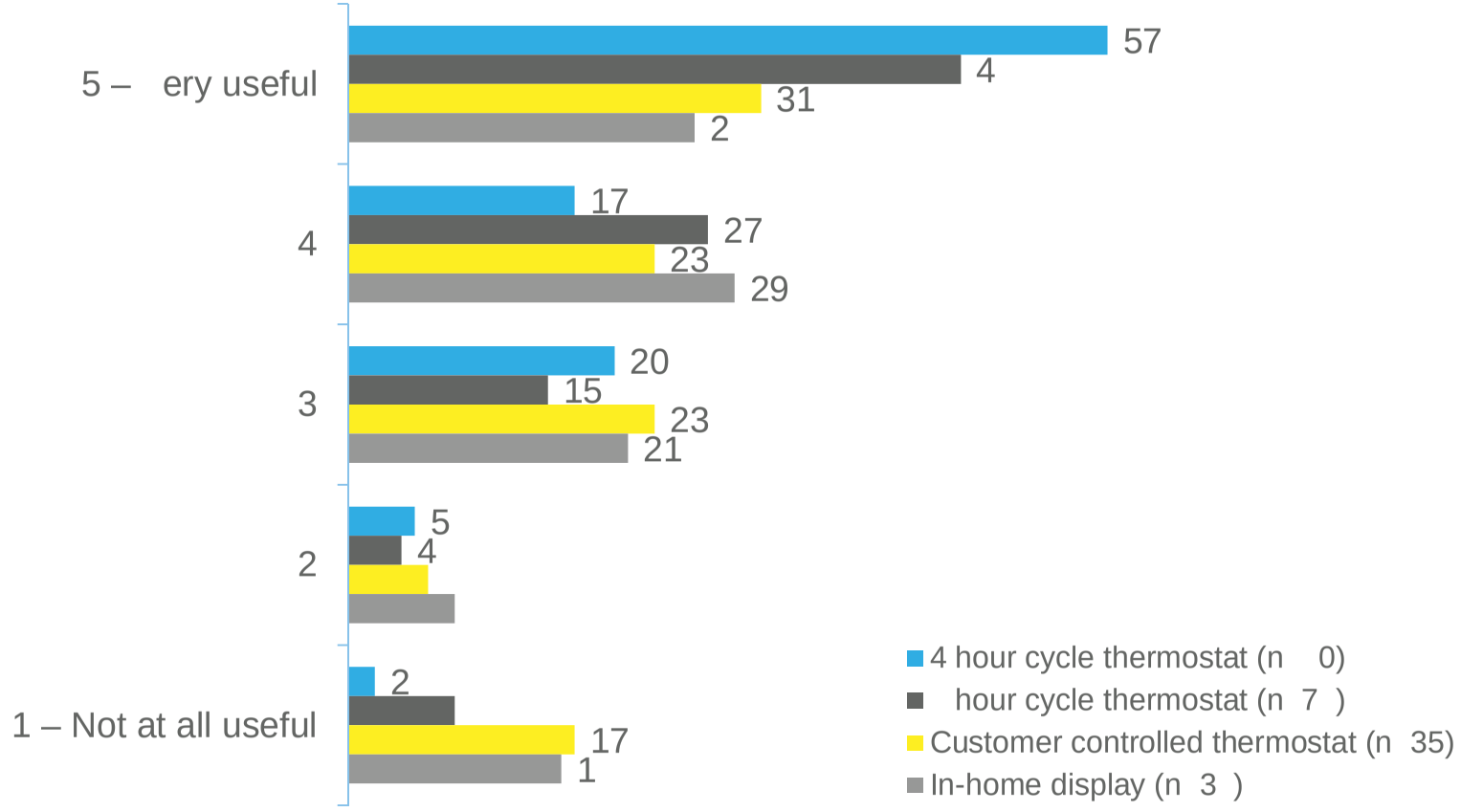
23 – n a scale of 1 to 5, with 1 being “Not at all useful” and 5 being “ ery useful,” how useful was this device in helping you reduce your energy usage specifically during peak energy time periods



n 3

hile overall customer usefulness ratings for the ower ab in-home display were good, the ratings were lower than those for the company-controlled thermostats.

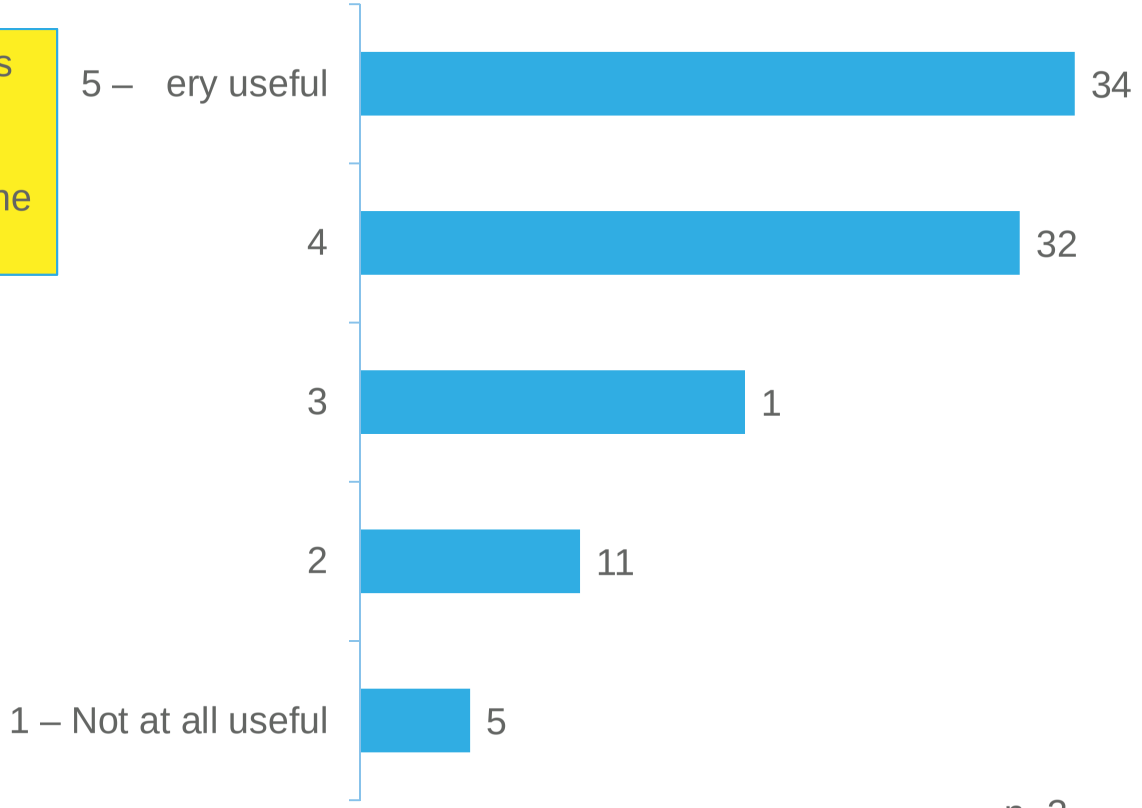
23 – n a scale of 1 to 5, with 1 being “Not at all useful” and 5 being “ ery useful,” how useful was this device in helping you reduce your energy usage specifically during peak energy time periods



About two-thirds of customers found the messaging on the ower ab device useful.

24 – he ioneer 100 smart thermostat and the ower ab in-home display devices both included messaging to let you know about upcoming peak events. n a scale of 1 to 5, with 1 being “Not at all useful” and 5 being “ ery useful,” how would you rate the usefulness of the messaging on the devices

In contrast, the other technologies received higher ratings (79 top two for company-controlled thermostat and 9 top two for the customer-controlled thermostat).



n 3

Reaction to Program Materials

Shelton Grp

CBS - Flowchart for Recruitment

elcome acket (Sample of aterials)

Follow-up aterials: irect ail (Sample)

Follow-up aterials: Eblasts (Sample)

RULE
THE ROOST

The PowerTab™ in-hom
see your real-time energ
better understand how y
run the show – with the

Visit ruletheroostohic

RULE
THE ROOST

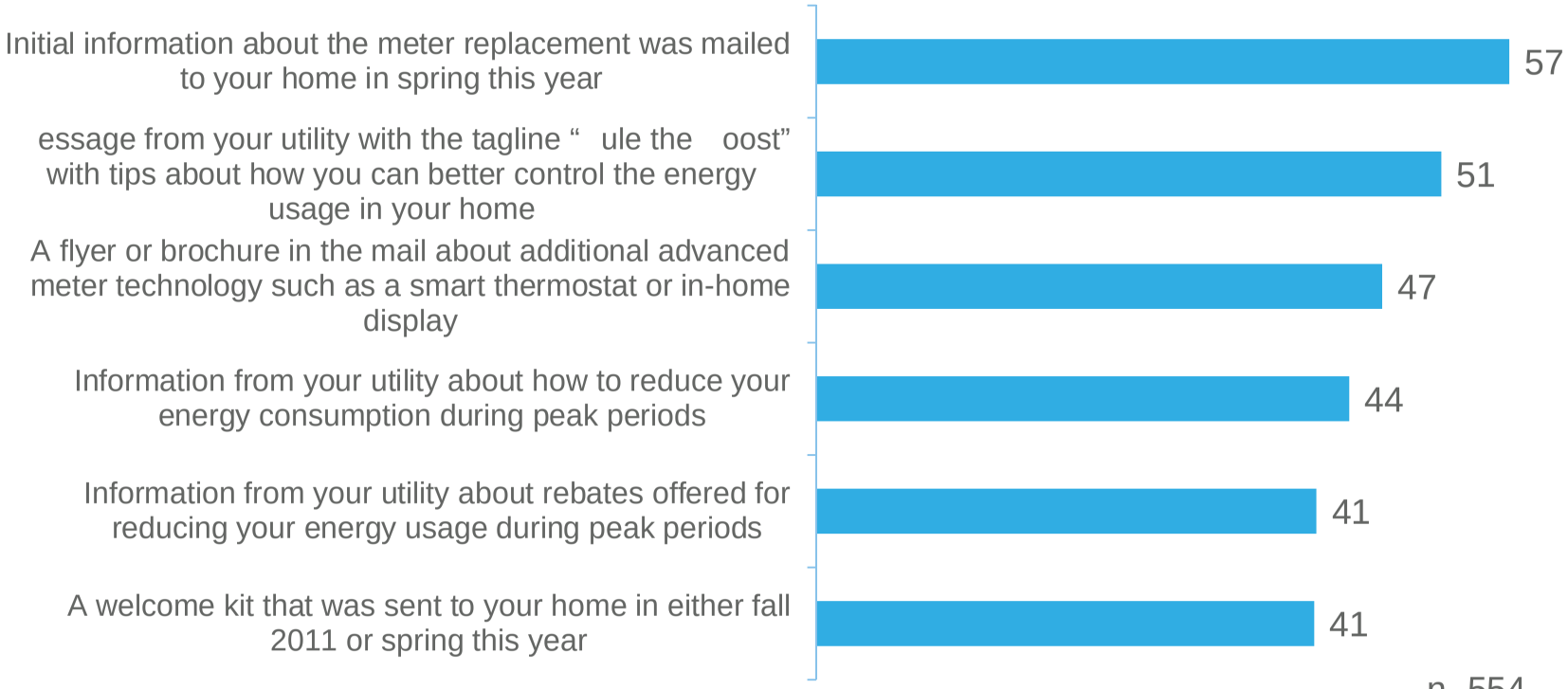
Your Energy, Your Way

The Pioneer Z100 smart thermostat from The Illuminating Company was designed with you in mind – which means you can use and control energy on your terms. Its smart meter technology means more information, greater options and ease of use. It helps you save energy and take advantage of price rebates when customer demand is high. And you can even choose to have The Illuminating Company manage your thermostat – so you don't have to think about it. It's technology that fits your lifestyle, so you can rule the roost.

Show your home who's boss. Call 1-877-862-7041 to schedule installation of your new thermostat (a $250 value). For more information on the program or how to save energy, visit us online at ruletheroostohio.com.

Baseline recollection of materials was moderate relative to industry averages; customers recalled seeing 3.5 of these marketing materials on average.

12 – Information about the program was initially mailed to your home in spring this year, and a welcome kit was sent to your home when your automated meter was installed in either fall 2011 or spring this year. e understand that many customers receive a large volume of mail, and may or may not have time to look at everything they receive. lease be honest – which of the following materials do you recall seeing 1 of 2



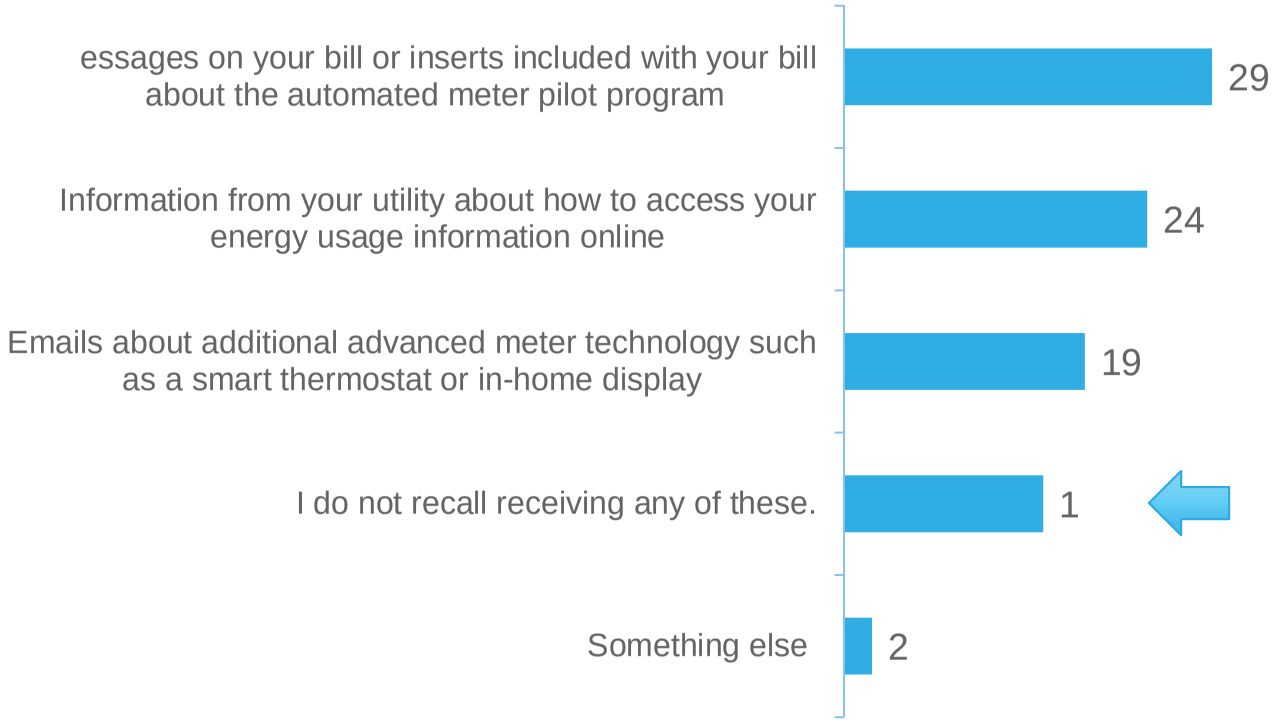
n 554

C EC I N: Initial information about the meter replacement was actually mailed in Spring 2011

Shelton Grp

nly sixteen percent of customers do not recall receiving any of the materials about the program.

12 – Information about the program was initially mailed to your home in spring this year, and a welcome kit was sent to your home when your automated meter was installed in either fall 2011 or spring this year. e understand that many customers receive a large volume of mail, and may or may not have time to look at everything they receive. lease be honest – which of the following materials do you recall seeing 2 of 2



n 554

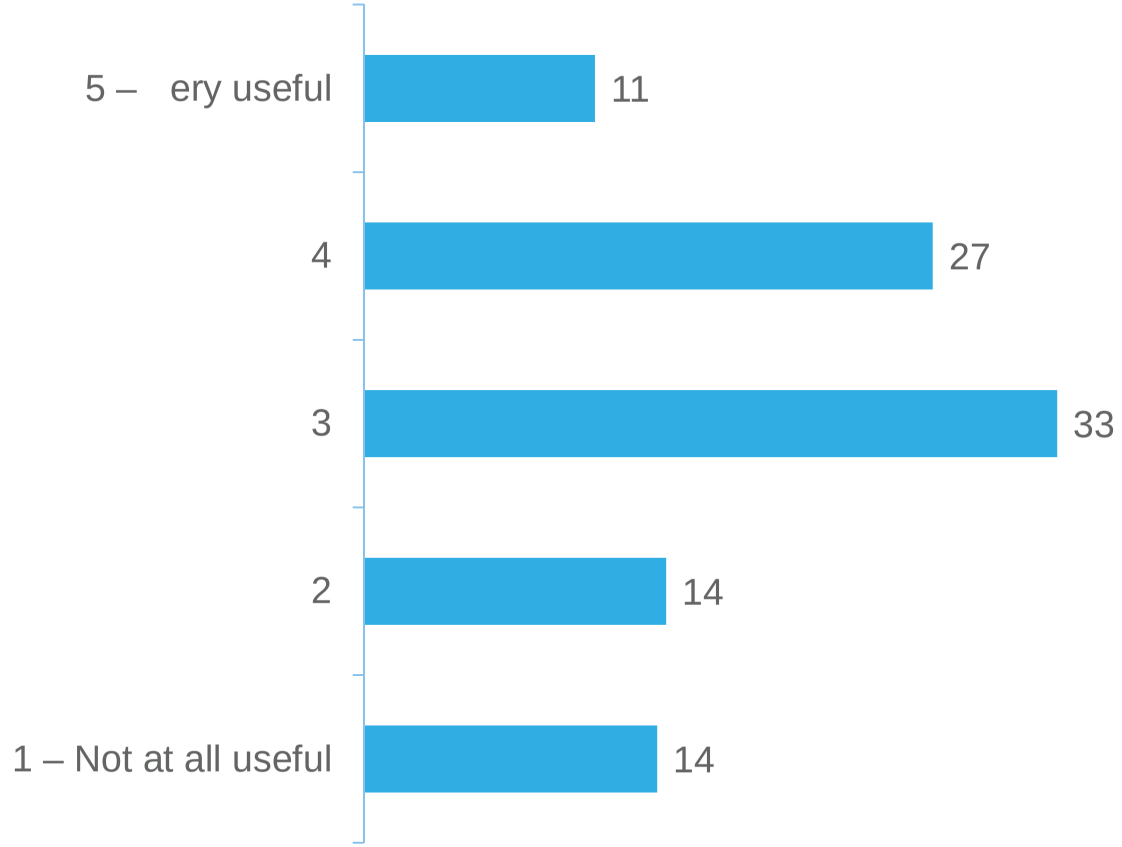
ecall of materials is higher among participants.

	Total Respondents	4 Hour Cycle Thermostat	6 Hour Cycle Thermostat	Customer Controlled Thermostat	In-Home Display	Non-participants
Initial information about the meter replacement was mailed to your home in spring this year	57	77	77	9		47
essage from your utility with the tagline “ ule the oost” with tips about how you can better control the energy usage in your home	51	77	79	0	2	34
A flyer or brochure in the mail about additional advanced meter technology such as a smart thermostat or in-home display	47	4	51	51	3	43
Information from your utility about how to reduce your energy consumption during peak periods	44	3	4		79	34
Information from your utility about rebates offered for reducing your energy usage during peak periods	41	57	4	3	7	27
A welcome kit that was sent to your home in either fall 2011 or spring this year	41	7	3		79	25
essages on your bill or inserts included with your bill about the automated meter pilot program	29	3	37	49	47	21
Information from your utility about how to access your energy usage information online	24	3	23	34	32	19
Emails about additional advanced meter technology such as a smart thermostat or in-home display	19	27	32	34	21	13
I do not recall receiving any of these.	1	3	4		3	23
	n 554	n 0	n 7	n 35	n 3	n 343

Significant differences noted by technology group

Customers who had a device installed were more likely to consider the materials useful overall.

13 – n a scale of 1 to 5, with 1 being “Not at all useful” and 5 being “ ery useful,” how would you rate the usefulness of these materials overall

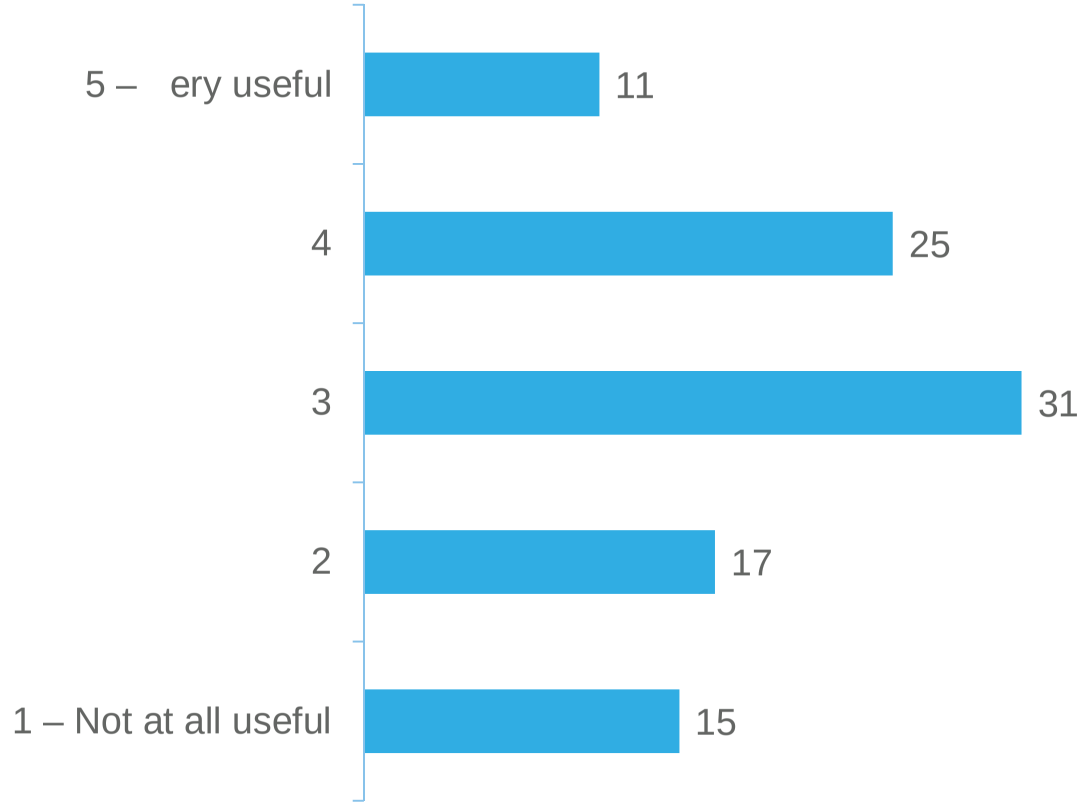


Customers with a company-controlled 4 hour or hour cycle thermostat (5 top two) were more likely to consider the materials useful than those with a customer-controlled thermostat (39 top two) or in-home display (49 top two) or non-participants (2 top two).

n 470

hirty-six percent of customers generally considered the tips and suggestions useful in reducing their energy usage.

14 – n a scale of 1 to 5, with 1 being “Not at all useful” and 5 being “ ery useful,” how would you rate the usefulness of the tips or suggestions offered in these materials to help you reduce your energy usage

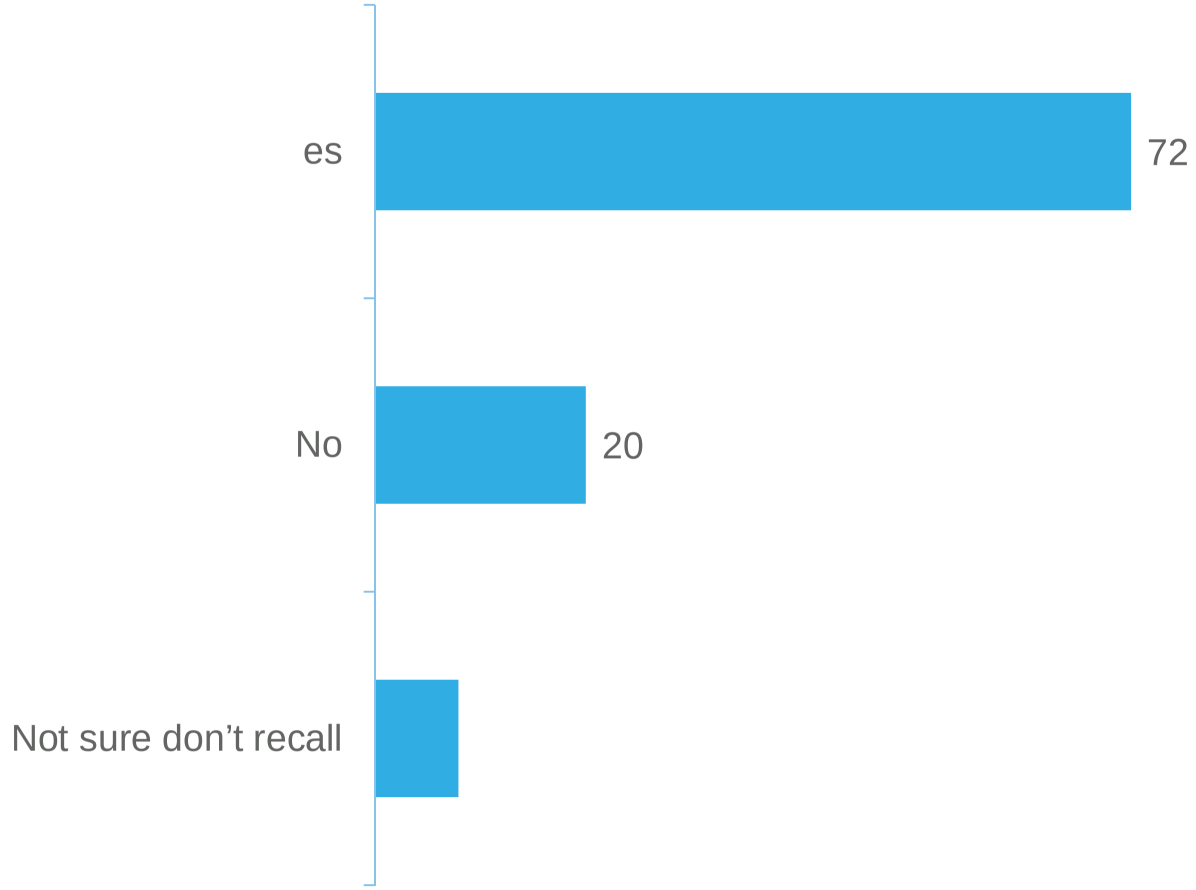


Customers with a company-controlled 4 hour or hour cycle thermostat (47 top two) were more likely to consider the tips or suggestions useful than those with a customer-controlled thermostat (3 top two) or in-home display (43 top two) or non-participants (30 top two).

n 470

ore than seven out of 10 actually followed the tips or suggestions to reduce their energy usage.

15 – id you follow any of the tips or suggestions offered to help you reduce your energy usage

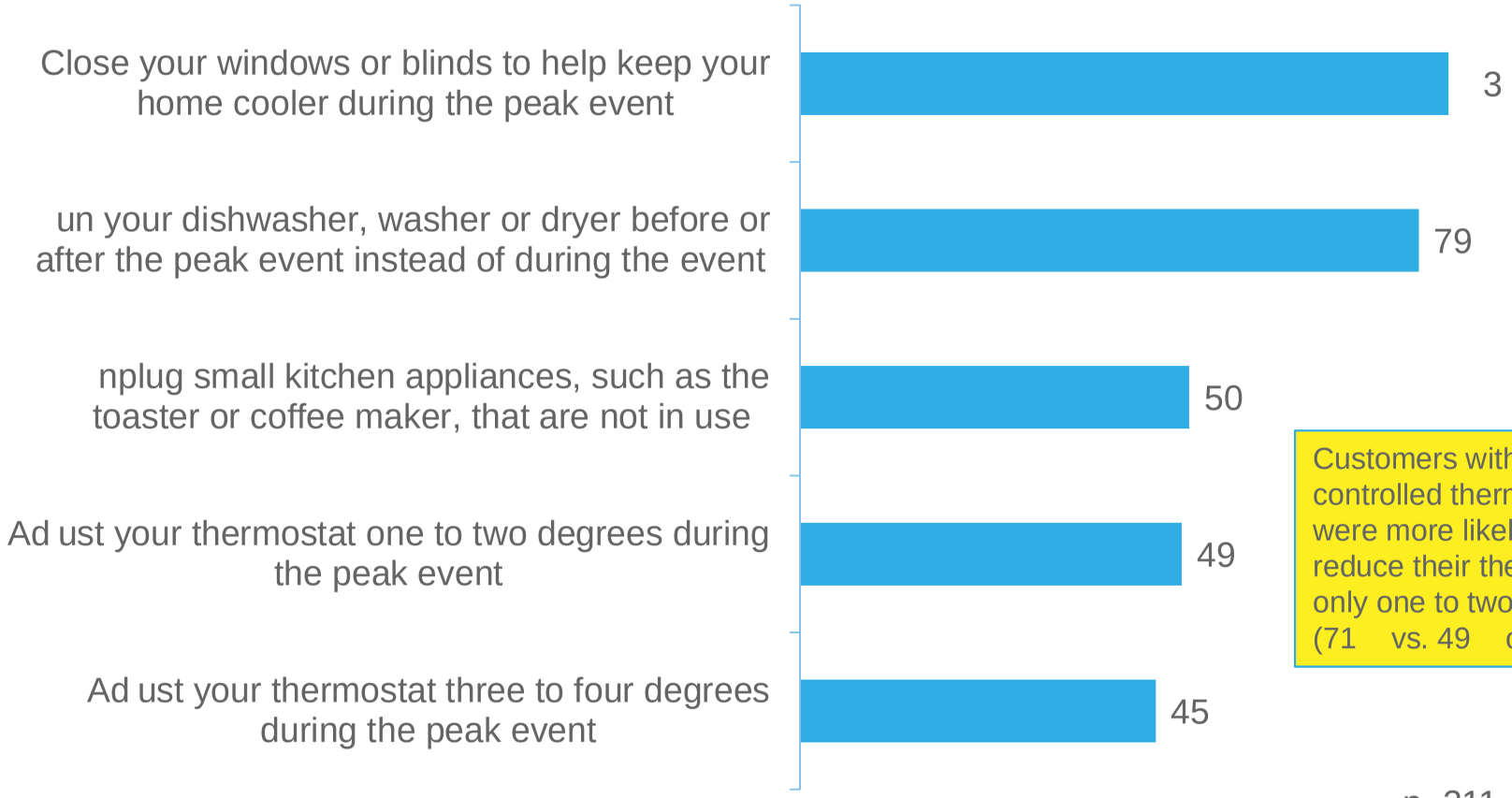


Customers with a ioneer thermostat or ower ab display were almost twice as likely to follow the tips or suggestions than non-participants (72 vs. 39).

n 203

About eight out of 10 actually closed windows or blinds and shifted their use of ma or appliances.

1 – hich of the following activities, tips or suggestions have you used in your home to reduce your energy consumption specifically during peak events 1 of 2

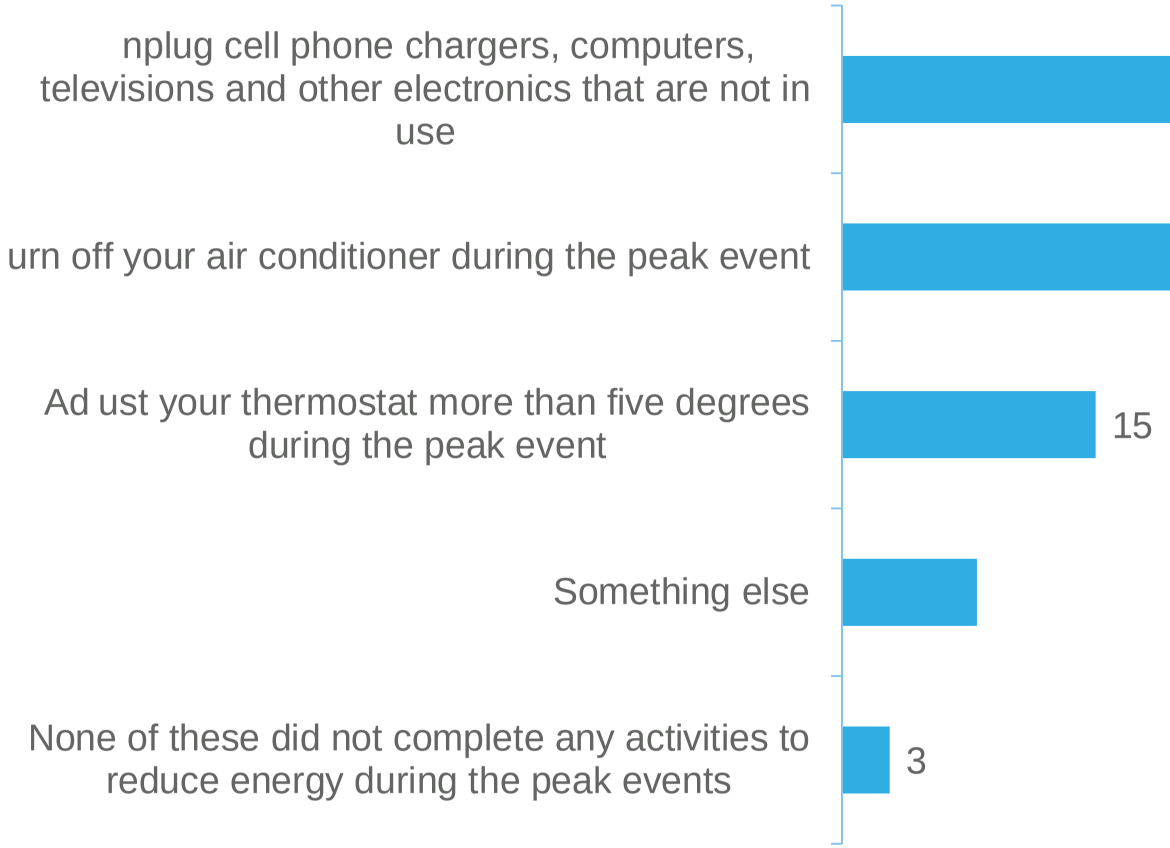


Customers with a self-controlled thermostat were more likely to reduce their thermostat only one to two degrees (71 vs. 49 overall).

n 211

ne-third of customers actually turned off their air during peak events to reduce their energy consumption.

1 – hich of the following activities, tips or suggestions have you used in your home to reduce your energy consumption specifically during peak events 2 of 2

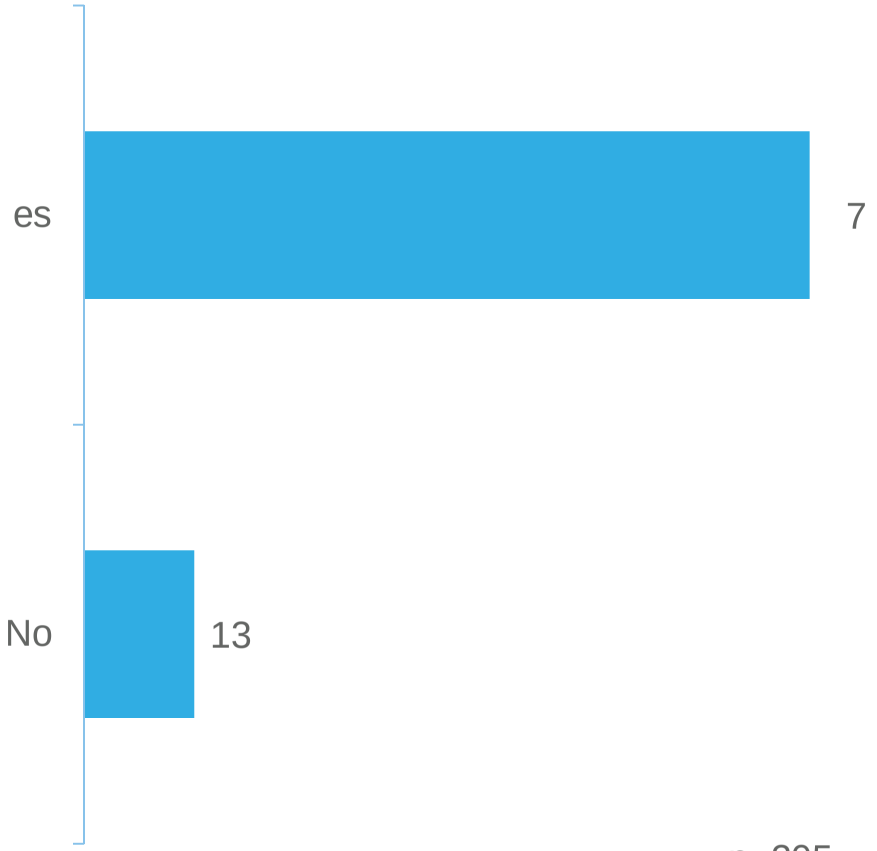


- Customers with an in-home display were more likely to unplug electronics (1 vs. 39 overall) and kitchen appliances.
- verall, customers with a self-controlled thermostat or in-home display had a slightly higher average number of activities than customers with company-controlled thermostat (4.2 vs. 3.).

n 211

he ma ority of participants have integrated energy-saving behaviors as a regular behavior.

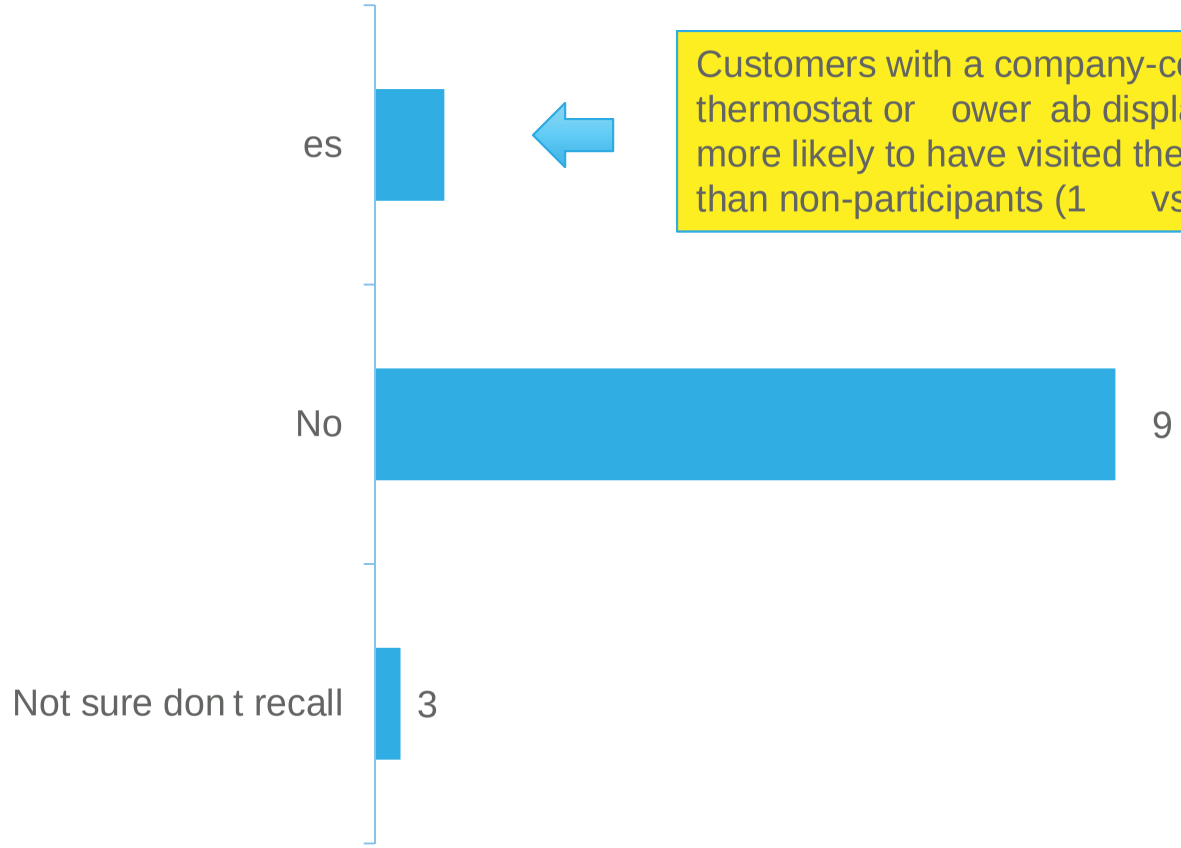
1 b – ave you adopted any of these activities, tips or suggestions as a regular behavior (not ust during peak events)



n 205

nly of customers visited the website.

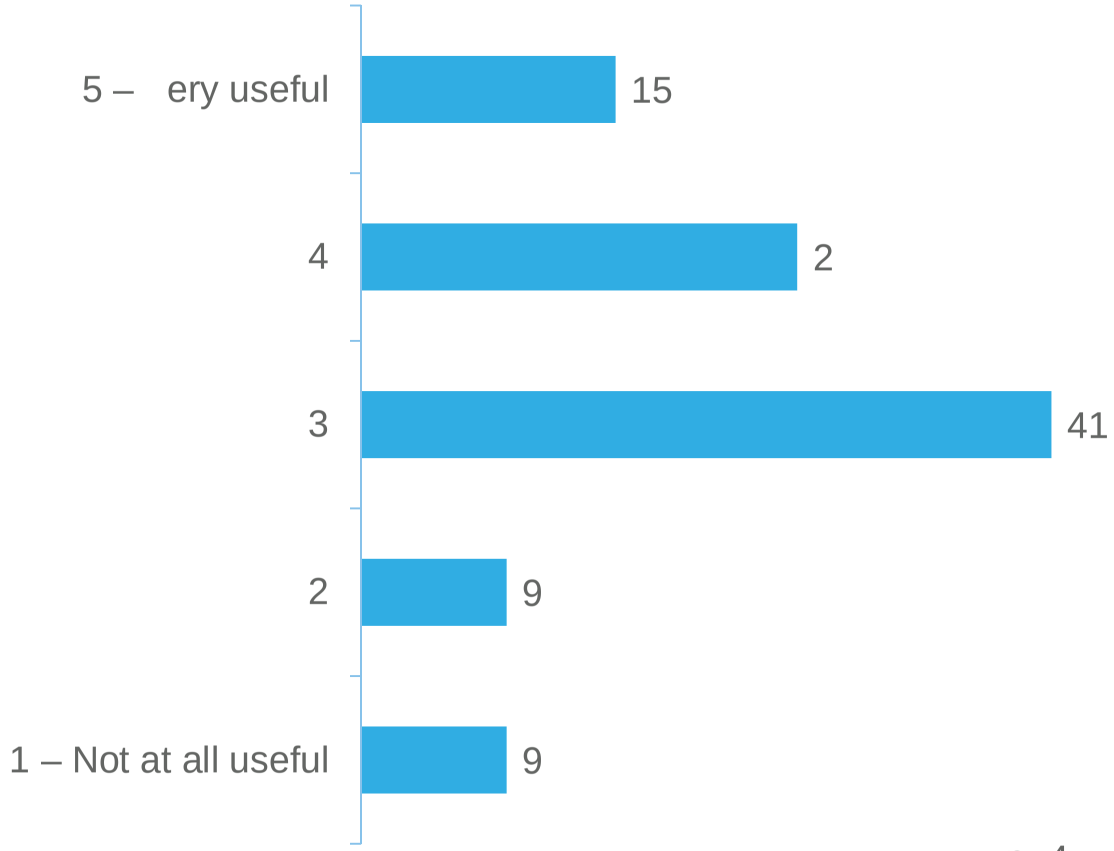
17 – A website was created to provide more information to customers about the program. ave you ever visited ule he oost hio.com



n 554

atings of the website were generally positive to neutral; only 1 considered the website not useful.

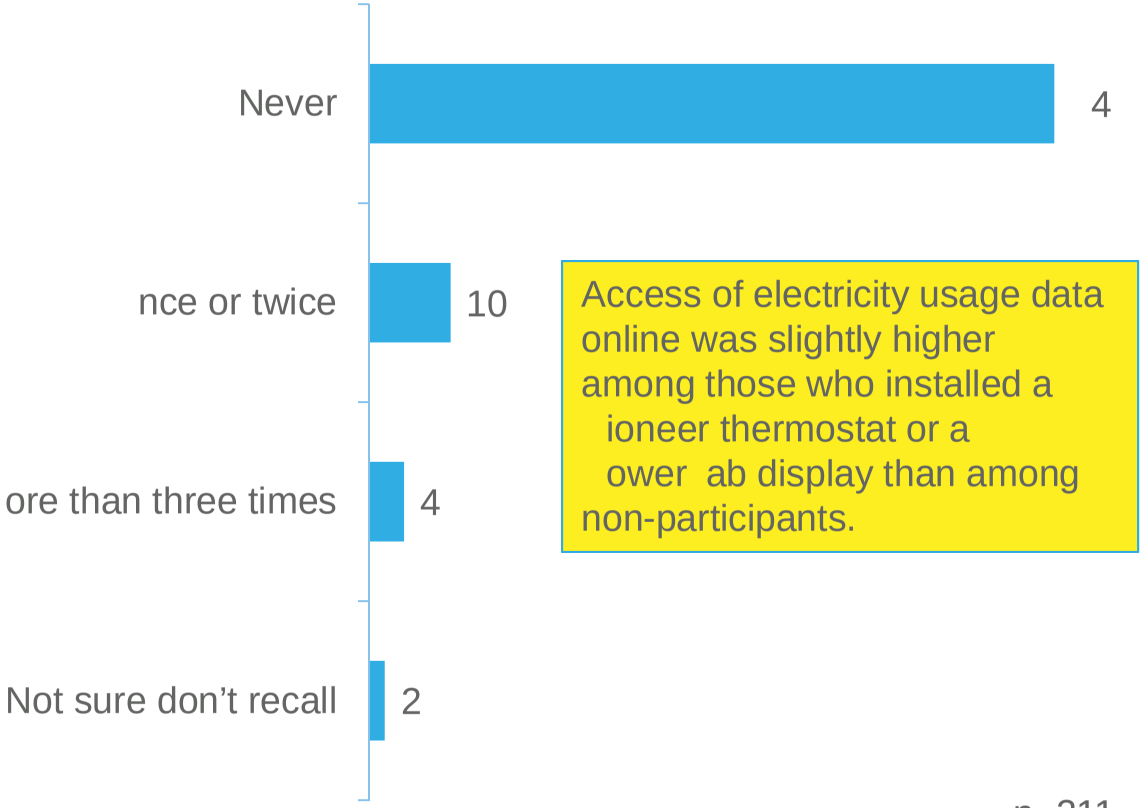
1 – n a scale of 1 to 5, with 1 being “Not at all useful” and 5 being “ ery useful,” how would you rate the usefulness of the website



n 4

nly 1 of customers said that they actually accessed their energy usage information online.

19 – he program also provided real-time electricity usage data on the Internet to allow you to better manage your energy usage and control your costs. ow often did you access your energy usage information online



Access of electricity usage data online was slightly higher among those who installed a ioneer thermostat or a ower ab display than among non-participants.

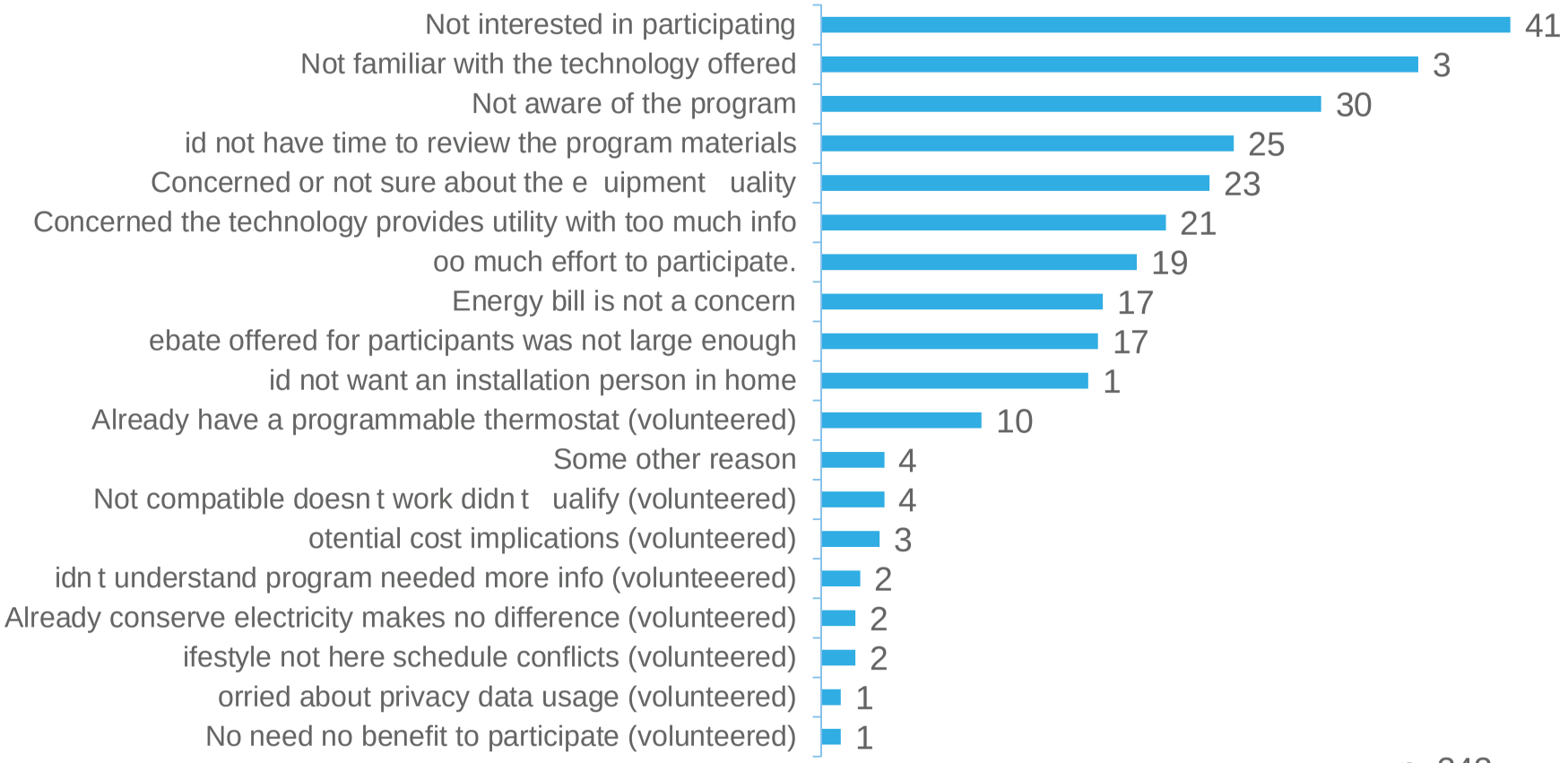
n 211

Ninety percent of customers who received a smart meter chose to install no additional technologies.

Shelton Grp

isinterest, unfamiliarity with the technology and lack of awareness were the top reasons cited

9a – hich of the following reasons describe why you chose not to have an advanced thermostat or in-home energy display installed in your home



n 343

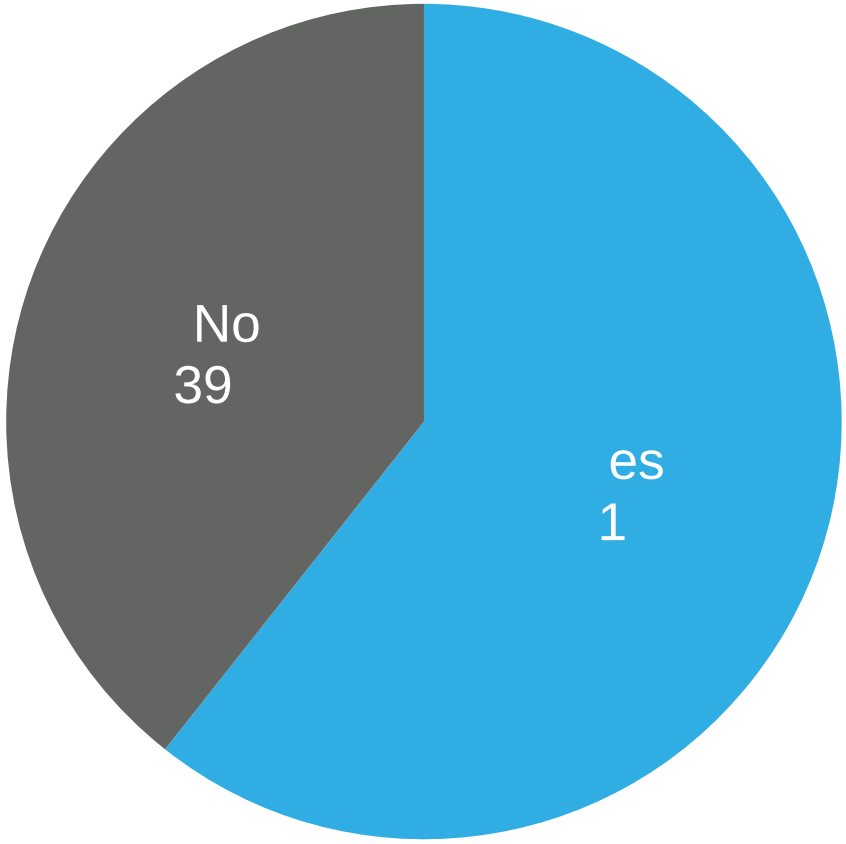
but the primary reasons limiting participation were lack of awareness and disinterest.

9b – hich of these would you say is the primary reason why you chose not to have an advanced thermostat or in-home energy display installed in your home

n 343

Six out of 10 non-participants, however, would have been positively influenced by a larger rebate offer.

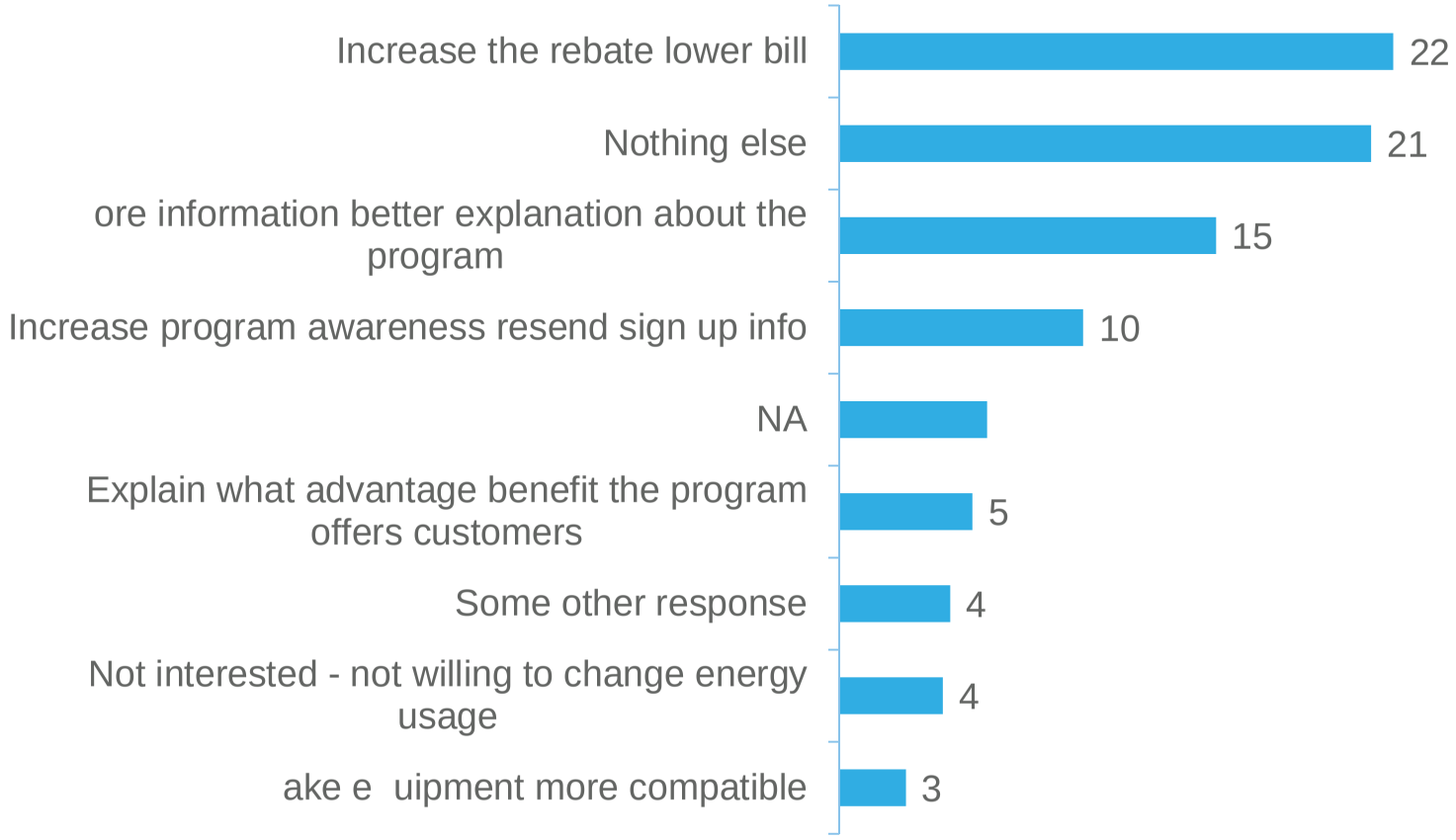
10 – ould a larger rebate for reducing your energy usage during peak time periods make you more interested in this program



n 343

Fifteen percent would have been more interested in participating if they had a better program explanation more information.

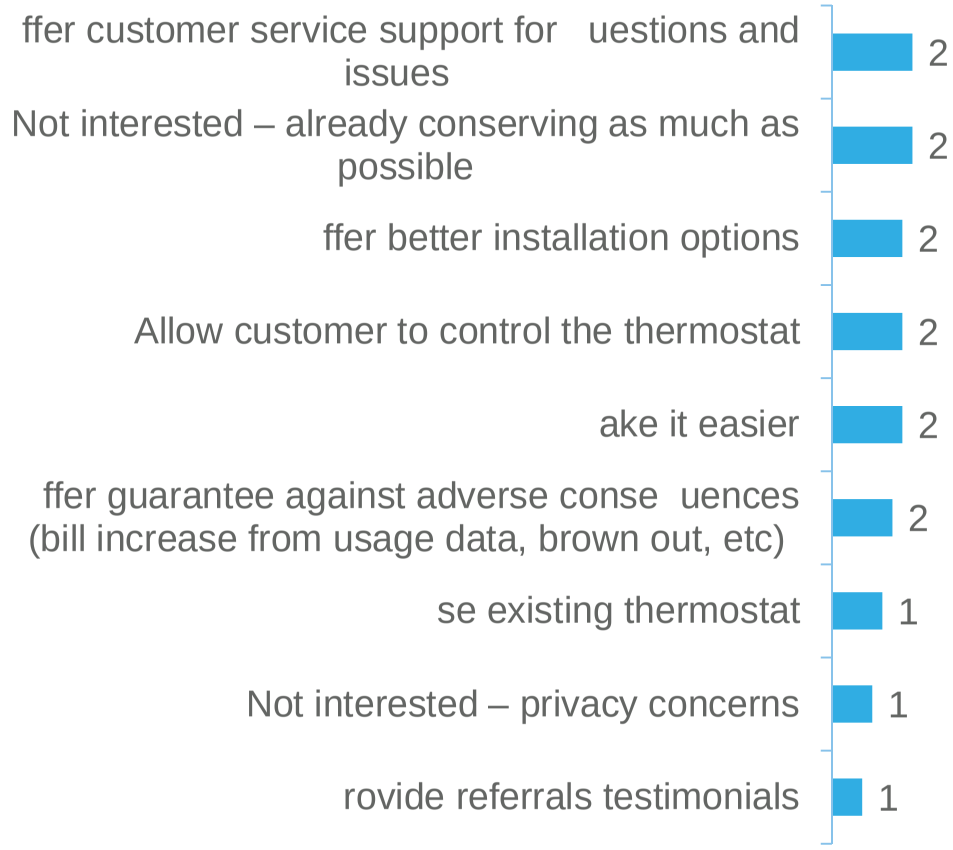
11 – hy or why not hat else could he Illuminating Company do to increase your interest in participating (N E: erbatim responses have been coded and categorized). 1 of 2



n 343

Customers offered a variety of suggestions to increase interest in the program.

11 – hy or why not hat else could he Illuminating Company do to increase your interest in participating (N E: erbatim responses have been coded and categorized). 2 of 2



n 343

Conclusions and Recommendations

Shelton Grp

rogram participation has generated changes in regular behavior for most participants.

- Satisfaction with the program is generally good, and most participants found the program easy to participate in and opt out of. he ma ority were also satisfied with both the uantity and duration of the events. Based on their experiences, many would be interested in participating in the program if it were offered again.
- any also believe that participation in the program has increased their understanding of summer peak time power usage and their overall awareness of their energy usage. he ma ority plan to be more actively involved in reducing their energy consumption, and have already integrated energy-saving activities as part of their regular behavior.

EC EN A I N:

- Continue to reinforce this behavior and mindset with regular communications – tips, suggestions and reminders.

Building an even stronger program moving forward:

- he overall program impact was positive. Customers who installed the ioneer thermostat or ower ab display had a significantly more favorable perception of the company than those who did not install any of these technologies.
- otential savings were the key driver for many participating, but that was also the feature that received the most complaints (not enough savings rebate was minimal for the amount of effort exerted).
- As you would expect, those with company-controlled thermostats had larger temperature ad ustments than those with customer-controlled thermostats. owever, those with customer-controlled thermostats and in-home displays had a slightly higher number of activities completed to reduce their energy consumption than those with a company-controlled thermostat.

Building an even stronger program moving forward:

EC EN A I NS:

- here is an opportunity to build even stronger engagement levels moving forward through improved communications and evaluation of the rebate level.
- Consider using a “touch base” call or email after the first alert to confirm that the e uipment is functioning as expected and to determine if customers have any uestions and or need any support on using the devices effectively.
- Consider evaluating the rebate levels, particularly for those who are performing below par. A number of customers felt that the rebate was not ade uate relative to the amount of effort exerted.
- Add communication touch-points with low-participants – offering additional tips suggestions to help them achieve the energy reductions desired.

eaching a broader mix of customers with the hase 2 roll out:

- emographically, program participants were somewhat older than the average homeowner in the region. In fact, almost half of those surveyed were 5 or older.
- his matches Shelton's target profile for load control, but not in-home displays, which tends to be much younger.

EC EN A I N:

- igher participation rates among seniors could indicate a higher level of interest for them in this type of program, but it could also be a result of the higher response rates to the initial recruitment through direct mail. Email addresses were only available for approximately 20-30 of the test population for each tech. And email blasts to encourage participation didn't go out till later, well into program launch.
- As the program rolls to the 39,000 households in hase 2, we recommend using both traditional print and digital direct marketing to reach a broader mix of potential program participants.

Increased communications will be key to developing stronger participation levels in the future.

- Ninety percent of customers who had a smart meter installed did not elect to install any additional technologies, and 30 of non-participants said they weren't even aware of the program.
- Six out of 10 non-participants, however, would have been positively influenced by a larger rebate offer. In addition, 15 would have been more interested in participating if they had a better program explanation more information.

EC EN A I NS:

- Increased use of other communication vehicles is needed – incorporate a mix of mail, telephone, internet, and door hangers to help increase the effective reach and participation levels.
- As the program rolls into hase 2, consider increasing visibility of the communications through a geo-targeted media campaign using cable , radio, outdoor transit and non-traditional placements like grocery carts and public restroom signage.

hat's the "right" technology

- Company-controlled thermostats performed better on overall usefulness of reducing energy consumption, and their reported thermostat changes were greater. owever, these were the most challenging technologies, in regard to ease of adoption.
- e also observed a slightly higher number of energy-saving behaviors among customers with customer-controlled thermostats and in-home energy displays.

EC EN A I N:

- FirstEnergy should evaluate the consumption reduction analysis currently underway to confirm our hypothesis that there were greater drops in consumption for those with FE-controlled thermostats during peak-demand events. If so, that should likely weigh heavily in the technology decision – particularly for peak load control purposes.

hat's the "right" technology

- owever, we assume that customer engagement with their energy is an e ually important goal for this program, and respondents with customer-controlled thermostats and the in-home displays showed higher levels of engagement, and potentially, more long-lasting behavior change. For that reason, we think that these technologies should also be a part of FE's long-term roll-out plan.

Questions/Discussion

Shelton Grp

Thank you!

im irtz
5.934.1772
twirtz sheltongrp.com

ee Ann ead
70 .331. 027
lhead sheltongrp.com

Shelton Grp

Smart Grid Modernization Initiative

FirstEnergy®

Smart Grid odernization Initiative ro ect and rogram
Phase II Proposal
Consumer Behavior Study

hase ne Customers Continued

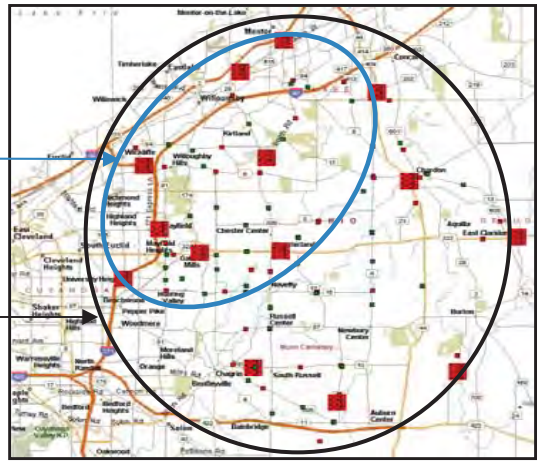
- **Retain Phase One Pilot Participant customers in study to continue collecting data for three years**
  - Continue to use of .40 k h for two more summers calling 15 events each summers
  - Approximately 52 customers with in-home technology
  - etain addition 450 customers that are in the control group
  - Continue to regularly communicate energy saving tips, suggestions, and reminders in order to reinforce customer behavior.

hase wo Customers

- **Additional meters deployed to remaining customers in project footprint – i.e. all customers served by the smart grid circuits**
  - Currently approximately 39,400 customers available (3 ,000 residential, 3,400 commercial)
  - Giving customers choice to opt out of meter reduces the available pool

Phase 1: Random customers in this footprint

Phase 2: Fill in initial footprint - Deployment to remaining residential customers in project area – excluding those who opt out of meter. Some commercial meters deployed.



hase 2 esign esidential

- **Continue to allow customers to opt-out of meter (approx. 5.5% in phase 1)**

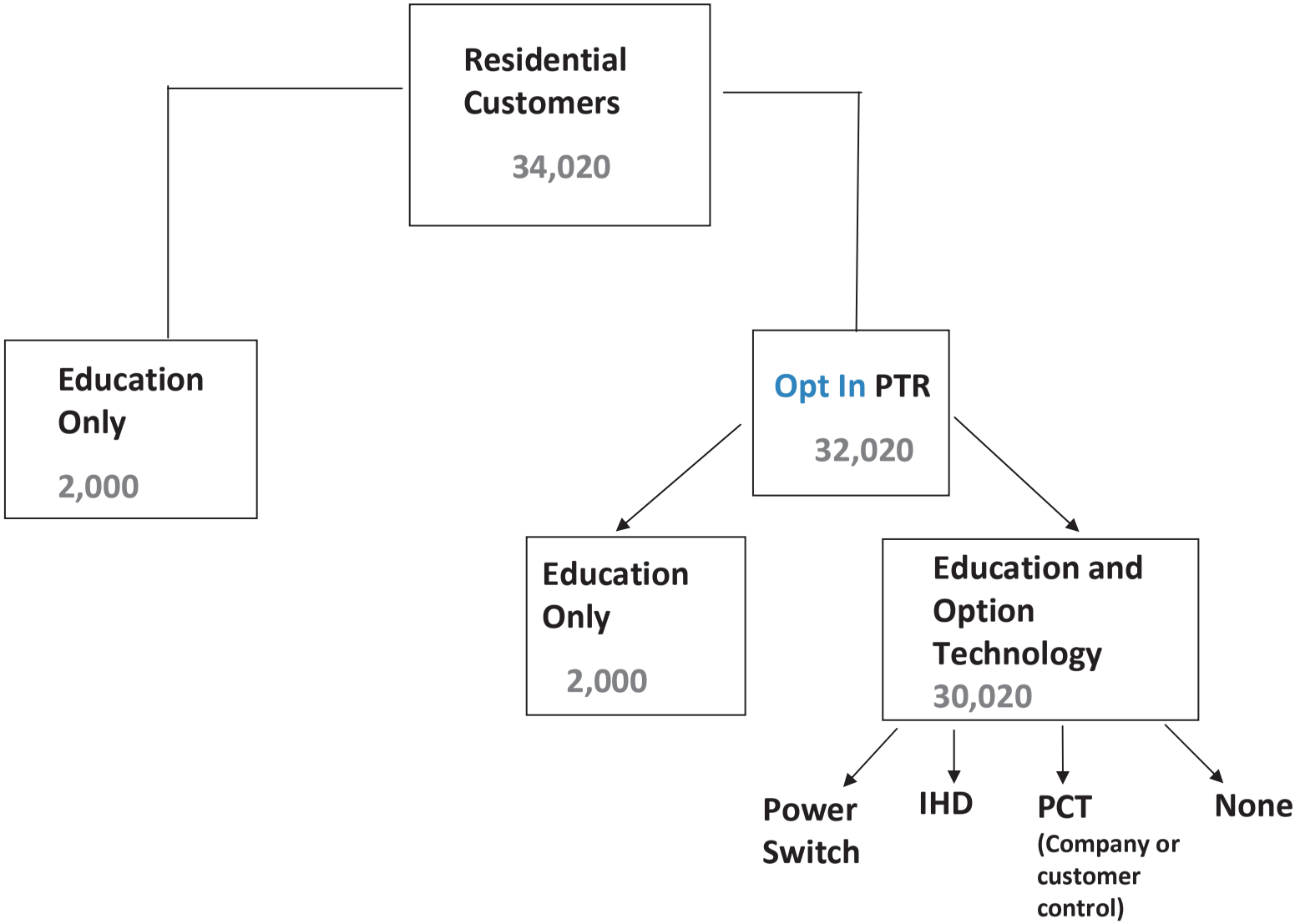
Residential	
Potential Customers	36,000
Opt-outs	5.50%
Meter Installs	34,020

- **Lead with the Peak Time Rebate – offer technologies to help the customer attain their reduction goal but customer can choose PTR only**

Residential Customers	Hours	Education Only	Power Switch	PCT Customer	PCT Company Controlled	In-home Display
PTR $.40	2-6 PM	x	x	x	x	x
PTR $.40	1-7 PM	x				
No PTR	2-6 PM	x				
No PTR	1-7 PM	x				

Additional Treatments could be filled if enrollment allows

hase 2 esign esidential



hase 2 esign esidential

- **Use baseline calculation used by BGE – 14 prior days excluding event, weekend & holidays (highest 3 but must be +/- 10% of THI index)**
- **Add smoothing strategy to reduce snap back**
  - 3 degree initial setback
  - ast hour gradually return to pre-event setpoint
- **Keep the current duration periods for events**
- **Maintain current rebate level based on results of EPRI analysis**

ther Changes for hase 2

- **Improvements to Rule the Roost website – Focus on Education**
  - ink to Aclara web presentment
  - estimonials
  - Game mechanics
- **Add some additional marketing approaches**
  - se of doorhangers
  - Business eply postcards
  - nline sign-up
- **Educate CRES on meter footprint and work with them on billing options for time differentiated pricing**

New earnings - esidential

- **Feedback from Shelton survey indicated that some customers did not realize there was a rebate associated with this program – Phase II will lead with the rebate and make the technology secondary to test whether it increases participation levels**
- **Feedback from Shelton survey coupled with our internal gap analysis indicated some customers were not satisfied with the size of the rebates received. New baseline will test whether this addresses customer concerns**
- **Event notification only and PTR only cells did not exist in our Phase 1 design. Addition of these treatments groups will help to isolate the effects of the PTR from the technology. Also we will learn the extent to which customers reduce usage based on public service notifications.**

New earnings - esidential

- **Examine how choice of technology affects overall enrollment levels**
- **Identify ways to reduce the snap back after events are ended**
- **Explore CRES interest in time differentiated pricing**

hase 2 esign Commercial Customers

- **3,400 commercial customers (Form 2S and 16S meters only)**
- **Offer PTR only with Energy Education**
- **Randomly draw control group of 250 customers**

Commercial Customers	Hours	Education Only
PTR $.40	2-6 PM	x
PTR $.40	1-7 PM	x

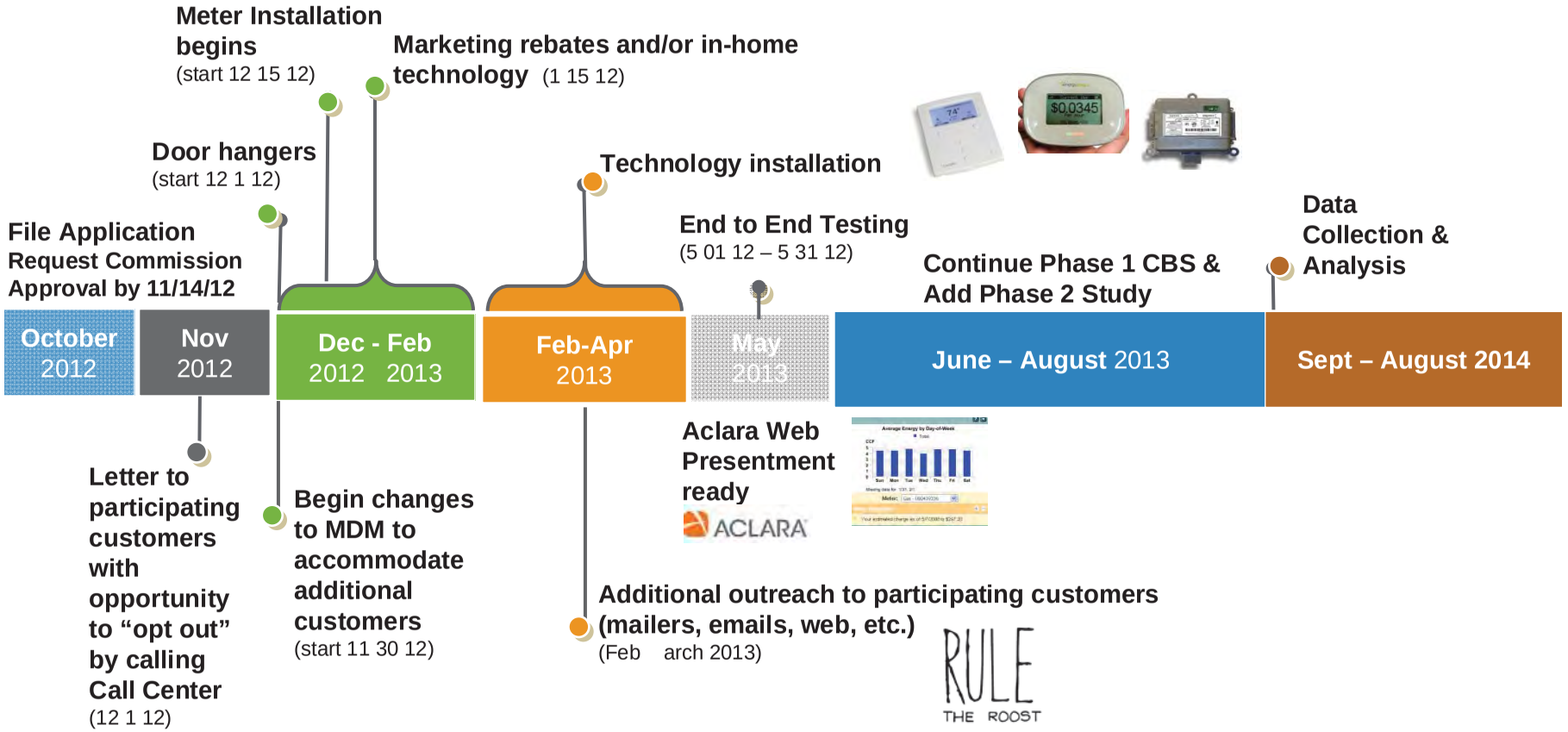
- **Baseline Calculation will be the same as revised residential**
- **Potential for any non-shopping commercial customers to take advantage of existing tariffs for TOU, CPP and RTP**
- **Educate CRES on smart meter footprint and work with them on billing options for time differentiated pricing**

New earnings - Commercial

- **Installation and Operation of Commercial AMI meters**
- **What is the contribution of these customers to load reduction**
- **Are Commercial customers/CRES interested in peak time rebates and/or other time differentiated prices – what is the participation rate**

hase 2 imeline

- **Compressed time period – install 35,000+ meters & in-home technology before June 2013**
  - ***Prior to November 1***
    - evelop additional marketing materials
    - evelop education only treatment
    - Evaluate potential changes to baseline calculation



Summary: Motion electronically filed by Ms. Tamera J Singleton on behalf of Ohio Edison Company and The Cleveland Electric Illuminating Company and The Toledo Edison Company