

Final Report

**Process Evaluation
of the My Home Energy Report (MyHER)
Program in Kentucky**

**Prepared for
Duke Energy**

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TABLE OF CONTENTS

EXECUTIVE SUMMARY 1

KEY FINDINGS AND RECOMMENDATIONS 1

 Key Findings: Management Interviews 1

 Key Findings: Customer Surveys 3

 Recommendations 5

INTRODUCTION AND PURPOSE OF STUDY 7

 SUMMARY OVERVIEW 7

 Summary of the Evaluation 7

DESCRIPTION AND PURPOSE OF PROGRAM..... 7

 PROGRAM ENROLLMENT, ELIGIBILITY, AND PARTICIPATION 8

 Opt-Out Enrollment 8

 Eligibility 8

 Participation 9

METHODOLOGY 10

 OVERVIEW OF THE EVALUATION APPROACH 10

 Study Methodology 10

 Data Collection Methods, Sample Sizes, and Sampling Methodology 11

 Number of Completes and Sample Disposition for Each Data Collection Effort 11

 Expected and Achieved Precision 11

 Description of Measures and Selection of Methods by Measure(s) or Market(s) 11

MANAGEMENT INTERVIEW FINDINGS 12

 PROGRAM DESCRIPTION 12

 Program Theory and Design 12

 Program Goals and Objectives 13

 Market Barriers 14

 OPERATIONAL ROLES 14

 PROGRAM DEVELOPMENT 15

 MYHER REPORT 16

 Overview 16

 Data Handling 17

 Home Characteristics 18

 Data Clustering 19

 Calculating Average and Efficient Homes 20

 Report Design and Data Presentation 20

 Use of Rate Factors to Demonstrate Monthly Energy Costs in Dollars 22

 Report Messaging 24

 Explaining the Graphics 24

 Presenting Energy Saving Ideas 25

 Duke Energy Messages 27

 Messaging Challenges 27

 Data Quality Assurance 28

 PRINTING AND DELIVERY 29

 Report Frequency 29

Print Quality.....	30
Report Delivery.....	30
Enterprise Server.....	31
CALL CENTER CUSTOMER SUPPORT	31
Call Volume.....	31
Call Handling.....	32
Training.....	34
Quality Control	34
Service Level Agreements.....	35
EMAIL CUSTOMER SUPPORT	35
Quality Control	36
Service Level Agreements.....	36
CUSTOMER PAPER MAIL	36
WEBSITE.....	36
SOCIAL MEDIA.....	37
WORKING RELATIONSHIPS.....	37
The Program Vendor.....	37
The Call Center Vendor.....	39
Customer Prototype Lab.....	39
PROGRAM CHANGES INTERVIEWEES WOULD LIKE TO SEE	39
Messaging.....	39
Data Transfer	40
Website.....	40
CONCLUSIONS.....	40
RECOMMENDATIONS FOR PROGRAM IMPROVEMENTS.....	41
Clustering.....	41
Data Presentation	42
Tips and Messages	43
Data Quality.....	44
Overall.....	44
RESULTS FROM MYHER CUSTOMER SURVEYS.....	46
Introduction.....	46
Customers Who Read the MyHER and Why.....	46
Customer Perceptions of Their Efforts Regarding Energy Efficiency	48
Customer Perceptions Compared to Recent MyHER Scores	51
What Energy Efficiency Means to Customers.....	52
Interest in Energy Efficiency and MyHER.....	57
Frequency of Receiving MyHER.....	58
Accuracy of Home Information.....	59
Energy Efficiency Scores.....	60
Tips and Messages	66
The Difference between Tips and Messages	67
Recalled Tips and Messages	67
Comparison: Messages versus Tips.....	68
Influence of MyHER Tips and Messages on Actions Taken.....	74
Tip and Message Relevance.....	75

Tip and Message Savings.....	77
Effect of Actions Taken on Comfort	80
Customers Receiving Duplicate Reports	82
Other Energy Efficiency Actions Taken.....	83
Satisfaction with MyHER.....	86
Comparison Units: Dollars vs. Kilowatt Hours vs. Pounds of Pollution.....	88
Sharing MyHER and Using Social Media	90
Customers Contacting Duke Energy.....	92
Customer-Suggested Changes to MyHER.....	96
Participation and Interest in Other Duke Energy Programs.....	99
Additional Services from Duke Energy	100
Electric Vehicles and Solar Power.....	104
CONCLUSIONS AND RECOMMENDATIONS FOR PROGRAM CHANGES	104
APPENDIX A: PROGRAM MANAGER INTERVIEW INSTRUMENT.....	106
APPENDIX B: VENDOR INTERVIEW INSTRUMENT.....	113
APPENDIX C: MYHER CUSTOMER SURVEY INSTRUMENT.....	116
APPENDIX D: EXAMPLE MYHER REPORT.....	150
APPENDIX E: SUMMARY OF ENERGY SAVING ACTION TIPS AND MESSAGES	152
APPENDIX F: WELCOME LETTER AND FREQUENTLY ASKED QUESTIONS	160
APPENDIX G: WHAT IT MEANS TO BE ENERGY EFFICIENT	162
APPENDIX H: WHAT SURVEYED CUSTOMERS DO TO BE MORE ENERGY EFFICIENT.....	171
APPENDIX I: SURVEYED MYHER CUSTOMER DEMOGRAPHICS	178
APPENDIX J: SUMMARY OF TIPS AND MESSAGES	187
APPENDIX K: LIST OF SELF-REPORTED ENERGY EFFICIENCY ACTIONS	190
APPENDIX L: IMPROVING ASPECTS OF THE PROGRAM.....	214

Executive Summary

Key Findings and Recommendations

The key findings and recommendations identified through this evaluation are presented below.

Key Findings: Management Interviews

- The My Home Energy Report program provides Duke Energy residential customers with a meaningful look at their homes' energy use compared to other homes similar to theirs.
 - See section titled "Program Description" on page 12.
- Participation numbers are on target and customer opt-outs represent a fraction of one percent of participating customers; this is an indication of the popularity of the reports.
 - See section titled "Participation" on page 9.
- Among the few customers who do opt out, the three most common reasons for opting out are that customers consider the reports to be an inappropriate use of Duke Energy's resources (40%), customers believe they are doing enough to save energy (16%), and no reason given (10%).
 - See section titled "Call Handling" beginning on page 32.
- The reports are carefully designed for at-a-glance reading. Data is clearly presented and easily understood. Messages are crisp and actionable.
 - See section titled "Report Messaging" on page 24.
- Call volume for the program is low. As of June 30, 2013, for all states served by the program, inbound calls totaled only 10,124 calls on base of greater than one million customers. In Kentucky, the total call volume during that time was 375 calls on a base of approximately 44,000 customers. This equates to less than one percent of customers for all calls.
 - See section titled "Call Volume" on page 31.
- The primary reason why customers contact Duke Energy about the program is to correct household characteristics, which is understandable given some of the data's third party origin. The most frequently corrected data points are heat fuel type, square footage, and home age in that order.
 - See section titled "Call Handling" beginning on page 32.
- The program vendor's platform has added appreciable functionality for the customization of messaging and the display of data, which is foundational to the program's ability to drive behavior change. But these technical feats are not without their challenges. The program vendor's platform is not yet as stable as the team would like which is primarily due to the functionality added throughout the year. Report production has been hampered by data quality concerns, most of which have been caught and fixed prior to mailing.

- See section titled "Data Quality Assurance" on page 28.
- One lapse in data quality that was not caught in advance of mailing arose from issues regarding heat fuel types and resulted in data presentation and clustering errors affecting 119,147 reports sent to customers in all Duke Energy service territories in April 2013. However, according to Duke Energy records only 5 Kentucky customers showed incorrectly coded heat fuel records.
 - See section titled "Data Quality Assurance" on page 28.
- Report delivery has been on time, except for one lapse due to data quality mentioned above, in which case reports were mailed between 1-12 days late.
 - See sections titled "Report Delivery" on page 30.
- Print quality has also been an issue, but a series of diligent steps toward resolution appear to be successful.
 - See sections titled "Report Delivery" on page 30 and "Print Quality" on page 30.
- Call center operations and email support from the Customer Prototype Lab are operating smoothly and those teams interface effectively with the program management team.
 - See sections titled "The Call Center Vendor" and "Customer Prototype Lab" on page 39.
- The working relationship between Duke Energy and the program vendor is operationally functional and productive..
 - See section titled "The Program Vendor" on page 37.
- Overall the program represents a roundly successful contribution to Duke Energy's efficiency portfolio and a model for a well-designed and effectively run behavior change program for residential customers.
 - See section titled "Conclusions" on page 40.

Key Findings: Customer Surveys

- There were 310 customers successfully contacted for the survey. Of these, 253 (81.6%) recalled receiving the Home Energy Report.
 - See section titled "Introduction" on page 46.
- 96.4% (244 out of 253, including 4 incomplete interviews) of the surveyed MyHER customers who recall MyHER are reading the report. If the full number of contacted customers are included in this calculation (N=310, as noted above), and the assumption is that those who don't recall MyHER throw the report away, this brings the percent of customers reading the MyHER down to 78.7% of the targeted customers..
 - See section titled "Customers Who Read the MyHER and Why" on page 46.
- Before being asked about what messages or tips customers recalled from the MyHER, most respondents defined energy efficiency in general terms, such as energy efficiency means "trying to use less energy" (54.2% or 135 out of 249) and "saving money on bills" (32.9% or 82 out of 249). Some respondents included specific examples of energy efficient activities in their definitions, such as "heating and cooling decisions" (10.0% or 25 out of 249) and "turn off lights when not in use" (8.0% or 20 out of 249).
 - See section titled "What Energy Efficiency Means to Customers" on page 52.
- On average, the 249 MyHER customers who completed the survey scored their interest in energy efficiency (8.58 on a 10-point scale) higher than their interest in reading the next MyHER (8.14). This finding is statistically significant with 95% confidence, though much of the difference comes from customers who do not read MyHER (5.75 rating for reading the next report, 7.44 rating for interest in energy efficiency). Interest in energy efficiency is also significantly higher than interest in reading the next report for customers who feel they do "more than others" and "less than others" (but not for those who feel they do "about the same as others").
 - See section titled "Interest in Energy Efficiency and MyHER" on page 57.
- Overall, 69.5% (173 out of 249) of Kentucky customers surveyed are satisfied with how frequently they receive the MyHER, although 24.9% (62 out of 249) say they would prefer to receive reports by email instead of on paper.
 - See section titled "Frequency of Receiving MyHER" on page 58.
- Only about one MyHER surveyed recipient in twenty (4.4% or 11 out of 249) reports that there are errors on their report. The most common inaccuracies have to do with the size of the home (5 of 11), the age of the home (3 of 11), and home heating (2 of 11).
 - See section titled "Accuracy of Home Information" on page 59.
- There is a strong, but not absolute, relationship between customers' perception of their "usual" MyHER scores and their perception of their energy efficiency efforts. Most customers who say they "do more than others" for energy efficiency also say that their reports usually show they use less than the average home (54.0% or 67 out of 124), while most customers who say they do "less than others" also say that their reports usually

show that they use more than the average home (63.6% or 7 out of 11). However there is not a significant relationship between Kentucky customers' perception of what their reports usually show and the score on their most recent report.

- See section titled "Energy Efficiency Scores" on page 60.
- Overall, more than half of MyHER customers surveyed are using the report to track their home's energy usage (60.6% or 151 out of 249) and are trying to improve their comparison scores (51.0% or 127 out of 249). Customers who are using the report to track usage (9.19) and trying to improve their scores (9.25) give significantly higher satisfaction ratings for the program compared to those who do not track usage (8.40) and those who are not trying to improve their scores (8.51).
 - See section titled "Energy Efficiency Scores" on page 60.
- A little over half of MyHER recipients surveyed (51.8% or 129 out of 249) were able to recall at least one tip or message from past reports. However, only 74.1% (189 out of 255) of these recalled tips and messages matched those included in the recipients' Home Energy Reports. Counting only the correctly recalled tips and messages, 43.4% (108 out of 249) of customers correctly recalled an average of 1.75 tips or messages apiece. More tips were recalled than messages, and the average length of recall was 99 days for tips and 142 days for messages. Most of the tips recalled were about lighting (CFLs), insulation, and weatherization. The most-recalled messages were "Vampires" and "Back To School".
 - See section titled "Recalled Tips and Messages" on page 67.
- Nearly two-thirds of Kentucky customers surveyed (63.1% or 157 out of 249) say the tips and messages are relevant and applicable for their household. Among customers who said the tips and messages were not relevant or applicable, the most common reasons given are that they were already following the recommendations in the tips and messages before receiving them on MyHER reports, and that the customers' homes are too new and already-efficient for most of the tips to be applicable.
 - See section titled "Tip and Message Relevance" on page 75.
- MyHER customers generally give the program high ratings for satisfaction, both overall (8.90 on a 10-point scale) and for specific aspects of the report and program (ranging from 6.72 to 9.08). Satisfaction with the program is significantly higher for customers who read the reports than those who throw them away, both overall (9.00 vs. 5.00) and for every specific aspect of the program. For specific aspects of the program, the highest satisfaction ratings are: "the reports are easy to read and understand" (9.08 overall); "I find the graphics helpful in understanding how my energy usage changes over the seasons" (8.74); and "I find the graphics useful in understanding how my energy usage compares to others like me" (8.56). The lowest-rated aspect is, "The energy saving tips in the report provided new ideas that I was not previously considering" at 6.72 overall.
 - See section titled "Satisfaction with MyHER" on page 86.
- Customers were asked to rate three comparison units that could be used on MyHER reports: Dollars was rated the most useful (overall 8.42 on a 10-point scale), followed by

kilowatt hours (5.53) and pounds of pollution (4.83). When asked if there were any other comparisons that could be made, customers responded with concerns about the comparisons themselves (including number of residents, building materials, heating fuel, etc.) rather than providing any suggestions for other units of comparison that could be used.

- See section titled “Comparison Units: Dollars vs. Kilowatt Hours vs. Pounds of Pollution” on page 88.

Recommendations

For a full explanation of recommendations see section titled “Recommendations for Program Improvements” beginning on page 41.

- Efforts to reword potentially ambiguous statements on the reports may help mitigate customer misinterpretations, particularly those involving tone or sarcasm.
- While there is insufficient room for all FAQs on the reports, returning an explanation of average and efficient to the report would provide clarity about the report comparisons and preempt the need for customer clarification phone calls.
- Investigate ways to engage advanced customers on a deeper level in order to derive additional savings.
- Take steps to ensure that energy saving suggestions remain fresh and interesting.
- Resume dynamic assignment of tips and messages as soon as feasible to maximize behavior change potential.
- Consider investigating the impact of customers’ knowledge of changing cluster sizes on energy savings by removing cluster size information from the monthly reports for a test group of customers to be compared to a control group who receive cluster size information on their reports. This investigation would provide additional validity to the notion that customer knowledge of cluster size influences their usage.
- Alternatively, add an answer to the MyHER FAQs to explain why cluster sizes change over time and why a customer may find themselves compared to different size clusters on different reports.
- Consider conducting a longitudinal analysis of existing data (plus or minus one year) to determine whether the energy savings observed from homes in small clusters is similar to energy savings from homes in larger clusters.
- Consider pre- and post-testing to help determine the influence of changing data presentation from dollars to kWh. If not, at least establish specific parameters to capture any comments about the change as communicated by participants via the call center vendor, CPL, mail, social media or other forms of correspondence.
- Ensure implementation of newly developed quality control measures in advance of all customer mailings, and monitor closely.

- Ensure and maintain a clear understanding between all parties regarding: standards for data quality assurance, thresholds for print quality, and minimum criteria required prior to making and implementing change requests to improve the product or to accommodate customer feedback.
- While the spirit of continuous improvement and increased customer responsiveness are central to the Duke Energy ethos, pause to consider if it is appropriate to make changes based upon a small number of errors or customer comments. The answer may well and appropriately be yes, but the threshold for change—and the impacts of doing so—should be clearly understood by all parties.
- Consider setting up test groups that receive the same MyHER with the same tips in order to conduct a more thorough and meaningful analysis of which tips are recalled and acted upon.
- Add specially coded CFL coupons to the MyHER mailing if it can be shown that the participants can use additional CFLs that they are not likely to purchase on their own.
- Perceived accuracy of the home energy use comparisons may be increased if household sizes are indicated as comparison criteria. This potential advantage should be weighed against the data collection and programming required to add such a factor to the clustering methodology.
- Consider replacing even more of the general efficiency messages on the second page of the report with more specific marketing messages for other Duke Energy programs.
- Since customer perceptions of inaccurate data on Home Energy Reports can be a barrier to reading (and taking action based on) the reports, consider establishing a web-based data update form where customers can go to correct or update their household information. A link to the web update form would be displayed prominently in the home comparison information section on the mailed reports. This short web update form can be designed to capture household data in the format needed for input into the program vendor's clustering algorithm, as well as Duke Energy's customer records. This link could result in improved customer perception of the accuracy of household comparisons, as well as more accurate comparisons. However, a telephone option for updating information should remain in place, since not everyone is comfortable using the web to communicate with Duke Energy. The benefits of increased accuracy, and customers' perception of accuracy, need to be considered in light of the additional costs of gathering this data and the total savings achieved by the program.

Introduction and Purpose of Study

Summary Overview

This document presents the process evaluation report for Duke Energy's My Home Energy Report (MyHER) Program as it was administered in Kentucky. The evaluation was conducted by TecMarket Works and Matthew Joyce.

Summary of the Evaluation

This document presents the process evaluation report for Duke Energy's My Home Energy Report (MyHER) Program as it was administered in Kentucky. The evaluation was conducted by TecMarket Works and Matthew Joyce, subcontractor to TecMarket Works. The interview and survey instruments were developed by TecMarket Works and Matthew Joyce. The customer survey was administered and analyzed by TecMarket Works. Matthew Joyce conducted in-depth interviews with program management.

Evaluation Objectives

This process evaluation is intended to provide insights to help Duke Energy, and other interested parties, evaluate the program as it is currently administered. The report reviews program history, evaluates current processes, and considers customer surveys and participant feedback in order to diagnose issues and present recommendations for changes intended to increase energy savings, improve operational efficiencies, and enhance customer satisfaction.

Researchable Issues

In addition to the objectives noted above, there were a number of researchable issues for this evaluation. These include:

1. To solicit feedback from program participants about their experience with the MyHER mailings, such as their recollection of the messages and tips, their home energy scores, and their satisfaction with the reports;
2. To gain an understanding of customer demographic categories responding positively to the MyHER program.

Description and Purpose of Program

The My Home Energy Report (MyHER) Program is an energy efficiency program currently operating in Kentucky. The purpose of the program is to provide Duke Energy residential customers with customized home energy reports that compare their home's electric energy usage with similar homes in order to encourage behavior driven energy savings through the principles of social norming. Eight reports are sent each year.

The program targets more than 44,000 residential customers residing in individually metered single-family residences in Duke Energy's Kentucky service territory. Rather than requiring people to sign up for the efficiency program, customers are automatically enrolled into the program to begin receiving personalized reports comparing their monthly and annual energy usage with a group of homes of similar size, age, type of heating fuel and geography.

Duke Energy works with a third party program vendor that uses proprietary methods, to analyze the customer's energy use and compare it to a peer group. The customer's monthly and annual energy usage is then graphed in comparison to the usage of an average home and an efficient home within the peer group. The reports present specifically targeted tips to save energy and offers to participate in Duke Energy's other energy programs. These targeted suggestions are based specifically on the customer's energy consumption patterns and home characteristics.

Program Enrollment, Eligibility, and Participation

Opt-Out Enrollment

Unlike other energy efficiency programs offered by Duke Energy, this program is designed to use opt-out enrollment, so that eligible customers automatically receive a welcome letter and begin receiving reports without the need to formally sign up. With a growing number of utilities offering comparable behavior change reports, opt-out enrollment is considered an industry norm for programs of this type.

Opt-out enrollment offers advantages to customers and to Duke Energy. First, it enables a greater number of customers to benefit from a better understanding of their homes' energy use and the most effective ways that they can save energy. Second, it diminishes program costs by reducing the need for program marketing, since opt-in enrollment necessarily requires making customers aware of the benefits of the program prior to signing them up. Third, as the reports directly state: "When customers reduce their energy needs, it reduces the costs to provide energy and the need to build more power plants, which lowers bills for you, your community, and Duke Energy."

The opt-out enrollment method is considered appropriate because the reports contain useful information specific to each customer. For this reason, the reports are deemed to be informational communications about customer accounts rather than solicitations. Customers always retain the ability to opt-out at any time with a phone call or email using the contact details listed on every report. However, as of May 31, 2013, the Kentucky opt-out rate is extremely low at less than 0.01%, or 63 people on a base of approximately 44,000 participants.

Eligibility

To be eligible for the program, customers must live in a single family home with a single electric meter. They must be on a rate plan that bills for the full amount of energy used during a month. Customers must also have 13 months of consecutive billing data at the present address. Full program eligibility requirements are as follows:

- Active customer on a residential rate plan in Kentucky
- 13 months of consecutive usage history
- Individual electric meter
- Single family home
- Non-apartment
- Non-business
- No fixed payment plan
- No equal payment plan
- No budget bill plan

- No percent of income plan
- Home address equals a billing address or post office box in same state as the service address
- Has not opted out of the program
- Not part of the control group (opt-in is possible)

Duke Energy customers are considered to be MyHER program participants when they have:

- Met the program's eligibility requirements
- Received at least one MyHER Report
- Not opted out of the program

Participation

The MyHER program sends a paper report by mail to approximately 44,000 participating households in Kentucky. Participation numbers vary due to opt-outs and changes in customer eligibility status. Customer participation is validated monthly by Duke Energy using detailed reports from the program vendor. The table below shows official program participation numbers by month between program inception and May 31, 2013.

Table 1. Program Participation by Month

Month	# of Participants*
Sep 2012	41,760
Oct 2012	42,477
Nov 2012*	43,076
Dec 2012*	43,076
Jan 2013	44,112
Feb 2013	44,563
Mar 2013*	44,466
Apr 2013*	44,466
May 2013	44,372

**In months when no new reports are sent, participation numbers are considered the same as in the preceding month since customers are considered to remain in the treatment group until the next treatment report is mailed.*

Methodology

Overview of the Evaluation Approach

This process evaluation has two components: management interviews and participant surveys.

Study Methodology

In-depth interviews were conducted with program management and the participant surveys were conducted with 249 customers in Kentucky.

Management Interviews

In-depth interviews were conducted with the Duke Energy product manager, the Duke Energy database analyst, one of the Duke Energy managers responsible for new program development, and the Duke Energy manager of the Customer Prototype Lab (CPL), which provided call center and email support during the OH and SC pilots of this program, and which continues to provide email assistance for the full commercial version of the program. In addition to these Duke Energy employees, TecMarket Works interviewed four representatives from the third party program vendor that creates and mails the reports —the production manager, two client project managers, and a project engineer. We also spoke with the lead call center representative from the third party vendor that provides call center services for the program. The interviews covered program design, execution, operations, interactions between organizations, data transfer methods, and personal experiences in order to identify any implementation issues and discuss opportunities for improvement.

Customer Surveys

TecMarket Works developed a customer survey, administered over the phone, for the MyHER Program participants, which was conducted from April 3 to May 6, 2013.

Surveys were completed with a random sample of 249 MyHER customers; in addition, four customers qualified for the survey, but were not able to complete the interview. When the customer was successfully contacted, the surveyor asked if the customer was familiar with the MyHER mailings. If not, the surveyor provided a short description of the MyHER mailings they have been receiving: *This program provided information on how much electricity you used in the previous month and in the previous 12 months compared to your neighbors and provided tips on how you could lower your electricity use and costs in becoming more energy efficient.*

If the customer still did not recall the MyHER, they were thanked for their time and the call was terminated. If they did recall the MyHER, the survey continued regardless of whether they read the MyHER. There were 253 customers out of 310 contacted (81.6%) who recalled receiving the MyHER report, though only 249 recipients completed the entire survey (four incomplete survey responses are not included in this report except for awareness of the program and whether they read MyHER).

MyHER customers were surveyed by TecMarket Works. The survey can be found in Appendix C: MyHER Customer Survey Instrument.

Data Collection Methods, Sample Sizes, and Sampling Methodology

Management Interviews

Management interviews, as well as follow-up phone calls and emails, were conducted with staff members from Duke Energy, the program vendor, and the call center vendor. The interview instrument can be found in Appendix A: Program Manager Interview Instrument and Appendix B: Vendor Interview Instrument.

Customer Surveys

The complete survey was conducted with a random sample of 249 MyHER customers. The survey protocol can be found in Appendix C: MyHER Customer Survey Instrument. We attempted to contact program participants by telephone no more than four times at different times of the day and different days before dropping them from the randomly sampled contact list. Call times were from 10:00 a.m. to 8:00 p.m. Eastern, Monday through Saturday.

Number of Completes and Sample Disposition for Each Data Collection Effort

Management Interviews

Between February and July of 2013, TecMarket Works interviewed four Duke Energy employees and five representatives from two vendors for this evaluation. This represents a completion rate of 100%.

Customer Surveys

A sample list of customer records was randomly pulled by TecMarket Works from a list of 41,760 participants with contact information provided by Duke Energy. Surveys were conducted and completed by telephone with 249 participants. The survey instrument can be found in Appendix C: MyHER Customer Survey Instrument.

Table 2. Summary of Data Collection Efforts

Data Collection Effort	Size of Population in Sample for Surveys	# of Successful Contacts	Sample Rate
Management Interviews	8	8	100%
Customer Surveys	41,760	249	0.6%

Expected and Achieved Precision

Customer Surveys

The survey sample methodology had an expected precision of 90% +/- 5.2% and an achieved precision of 90% +/- 5.2%.

Description of Measures and Selection of Methods by Measure(s) or Market(s)

This behavioral program does not include any energy efficient measures. The MyHER program consists of regular mailings to a targeted list of customers as described above.

Management Interview Findings

Program Description

The My Home Energy Report program is an energy efficiency program that sends periodic personalized reports to residential customers who meet eligibility criteria. The reports are designed to increase energy savings behaviors by showing customers how their electric energy usage compares to an average neighbor and an efficient neighbor living in residences in the same geographic area with similar square footage, heating type, and home age.

Energy usage is displayed in a monthly bar chart comparison and in a 13-month line chart comparison. If customers perform better than average, the average household is dropped from the monthly comparison, so that customers strive to match the lower energy usage of their more efficient neighbors. Average home values are always shown on the 13-month line chart, since customer energy usage may be above average for some months and below during others. An example report is shown in Appendix D: Example MyHER Report.

Reports are created eight times per year and are distributed in paper format via U.S. mail. The reports present energy efficiency suggestions that are customized according to that customer's specific household characteristics. The suggestions are designed to further spur the customer to action by providing an estimate of the dollar savings that may be achieved by making the effort. The reports also contain customized marketing messages that encourage customer participation in other Duke Energy efficiency programs for which that specific customer is eligible.

Program Theory and Design

The program's design for generating behavior driven energy savings is based on the theory of "social norms." Social science research demonstrates that people tend to conform to social norms even when they deny such influence^{1,2}. By sending letters that compare one utility customer's energy use with that of similar customers, several utility companies have used this normative effect to generate between 1.5 to 2.5% savings.³ Longitudinal studies about the persistence of these energy savings are underway.

The MyHER program design is based in part on this research and on studied observations of market participants. It is also based upon information garnered from Duke Energy's Personalized Energy Report[®] (PER) and Home Energy House Call (HEHC) programs. However, the current design is most appropriately ascribed as the outgrowth of two years of pilot efforts in Ohio and South Carolina.

¹ Jessica M. Nolan, P. Wesley Schultz, Robert B. Cialdini, Noah J. Goldstein, Vladas Griskevicius, Normative Social Influence is Underdetected, *Pers Soc Psychol Bull* July 2008 vol. 34 no. 7 913-923, DOI: 10.1177/0146167208316691

² P. Wesley Schultz, Jessica M. Nolan, Robert B. Cialdini, Noah J. Goldstein and Vladas Griskevicius, The Constructive, Destructive, and Reconstructive Power of Social Norms, *Psychological Science* May 2007 vol. 18 no. 5 429-434 DOI: 10.1111/j.1467-9280.2007.01917

³ Hunt Alcott, Social Norms and Energy Conservation, *Journal of Public Economics*, Volume 95, Issues 9-10, October 2011, Pages 1082-1095, DOI: <http://dx.doi.org/10.1016/j.jpubeco.2011.03.003>

Program Goals and Objectives

Because this program is designed with an opt-out enrollment mechanism it does not have new customer acquisition goals (see Opt-Out Enrollment). Instead, the program's primary numeric goals focus directly on energy savings. The program has an energy savings target of an average 219 kWh per participant per year. Progress toward this goal is to be determined by an impact evaluation.

In the absence of energy savings numbers to be derived from an analysis of the results of the impact evaluation, Duke Energy and its partnering third party vendors have been focusing the preponderance of their managerial efforts on the program's other strategic objectives for which feedback is more readily available. Those strategic objectives include:

- Educating customers about their energy use and encouraging them to take energy saving actions,
- Generating interest in other energy efficiency offerings,
- Deepening customer engagement,
- Responding to customer comments and suggestions in order to improve the reports and the program, and
- Increasing customer satisfaction.

When asked to comment on the place of this behavior modification program in Duke Energy's energy efficiency portfolio, one interviewee from Duke Energy used an analogy of a car to explain the role of the home energy report:

"People constantly receive cues about their cars' gas consumption. The speedometer, odometer, gas gauge, and the price of gas are readily available to help people judge how much they're using and how much it is costing them in near real-time. That's not the case with your home's electric consumption. You just get a bill at end of month after you've used the energy. And, the bill isn't very informative for those customers who only look at the amount they owe and the due date. The home energy report helps to change that by showing customers how they're doing over time compared to others. It's a bit like comparing miles per gallon, but the reports also tell people how they can be more efficient and how much each action is likely to save them. In short, the reports provide a customer feedback loop and help people learn how to improve."

As important as this is, Duke Energy sees the home energy reports as serving other functions as well. The home energy reports are seen as a means of helping to strengthen customer satisfaction. Perhaps even more strategically, the educational aspects of the report and the periodic frequency of their delivery also serve as a starting point to begin engaging residential customers in the active management of their energy consumption as larger commercial customers have done for years. As another interviewee said, "We want to become their energy partner and not just a utility they write a check to." In other words, the home energy reports may

be a one-way communication, but they are an invitation to the customer to begin a meaningful two-way conversation.

Market Barriers

Based on its previous pilot efforts, Duke Energy identified three potential market barriers to success: 1) customers not opening the reports; 2) not understanding the information presented; and 3) not taking action. The program design incorporates elements to address each of these. First, because the reports are delivered by paper mail, there is a risk that customers will assume the envelopes contain junk mail and not open them. To overcome this, the reports are sent in envelopes clearly displaying the Duke Energy logo and company address to denote the sender and nature of the communication. Second, customers may not have sufficient time available to read the report, nor may they have a comprehensive understanding of how energy is used in their homes. To overcome this, the reports are designed for at-a-glance reading with easy-to-understand graphics and simply worded explanations (see Report Design and Data Presentation). Third, customers may lack the financial resources and motivation to change their energy use over time. To overcome this, the reports present predominantly low cost / low effort energy saving recommendations. They also encourage adoption by showing the customer how much money that particular measure could save. The report delivery schedule of eight months per year provides ongoing contact and encourages continuous engagement. No additional market barriers were identified during the interview process.

Operational Roles

Operational roles for the MyHER program are shared between Duke Energy, two primary vendors, and several subcontractors. These roles are described briefly below and more fully in the following portions of this management review.

Duke Energy provides monthly billing and other customer data necessary to customize the energy reports, such as account information, records of participation in other efficiency programs, and data regarding customers' homes collected through direct customer communication or via the Personalized Energy Report and Home Energy House Call programs.

The Duke Energy product manager provides full operational oversight with responsibility for overall strategy, product planning, market expansion, determining messaging, selecting the criteria for customers to receive messaging, regulatory filing, financial reporting, vendor management, and quality assurance.

The Duke Energy database analyst is primarily responsible for ensuring the program's data integrity. She provides systematic quality assurance, full program data support, and regular oversight on data interactions between Duke Energy and the program vendor.

The Duke Energy Customer Prototype Lab provides email support for customer inquiries.

The call center vendor handles all phone-related functions. They are staffed Monday to Saturday.

The program vendor handles report production and distribution from start to finish. The program vendor receives data from Duke Energy and transforms the information into individualized home

energy reports by creating data clusters to compare customer usage to similar homes, suggesting energy saving actions, and presenting targeted Duke Energy communications. The program vendor is also responsible for printing, comingling, and mailing the reports, although these functions are handled through subcontractors.

Program Development

The initial steps for planning and launching the My Home Energy Report program began during 2008, when Duke Energy recognized it was possible to influence behavior in order to produce energy savings. Duke Energy had already done much work on its efficiency programs designed to achieve energy savings via structural and equipment improvements, and the utility's senior managers were seeking a different approach to augment their portfolio. Work began in earnest as they researched academic studies and real world tests by market actors. During 2009, regulatory approvals came through and Duke Energy prepared to deploy two pilot efforts using in-house resources and a third party printer to produce the reports.

The first pilot launched in Ohio on February 22, 2010. It was designed to test data presentation and the frequency of report delivery. A comparable pilot effort was launched in South Carolina on May 28, 2010. The initial treatment groups consisted of 10,000 residential customers in Ohio and 8,258 residential customers in South Carolina. For each pilot effort, these overall treatment groups were divided into two groups. One group received quarterly reports and the other received monthly reports. These two groups were each then subdivided into receiving two different types of reports, with one subgroup receiving a report showing usage data with line graphs, while the other subgroup received their information in bar chart format. Process and impact evaluations were conducted by TecMarket Works to determine the results of these efforts in 2011. The findings from these evaluations and the many learnings from the pilots were incorporated into the improved design and deployment of a fully commercialized version of the program.

The first commercial version of the program launched in Ohio on September 10, 2011, with a target of 240,000 participants and a multi-staged startup process that added approximately 25,000 additional customers per week until the target was reached. The same internal Duke Energy departments that handled operations for the pilot efforts managed the delivery of the first full commercial version of the program.

While Duke Energy was preparing for this full commercialized roll out, the utility was simultaneously using an RFP process to select a third party contractor specializing in data analysis with a platform robust enough to produce and mail the home energy reports on a scale sufficient to reach its distribution targets in all approved service territories. The program vendor worked with Duke Energy during the latter half of 2011 to design, develop, and deploy systems for generating the home energy reports according to contract specifications. Full commercialized systems transition from Duke Energy to the program vendor occurred during March of 2012.

At the time of transition, a letter was sent to all participating pilot customers in Ohio to tell them of the upcoming changeover. The letter focused on the improvements to the report that the transition made possible. The text of the letter read:

“You’ve asked for more, so we’re adding on! There may be a slight ‘construction delay,’ but when your new My Home Energy Report arrives, it will have two pages of valuable information about your energy usage and even more energy saving tips. Oh, don’t worry. You and your home will still be front and center. How Am I Doing charts will continue to show how your energy use compares to similar homes – each month and over time. But now we’ll have more room to answer your questions, like ‘What can I do to reduce energy use?’ and ‘How much could this tip save me?’ Stay tuned! We think you’re going to like your new report!”

After a few months to fine tuning efforts, on May 25, 2012, a commercialized version of the program launched in South Carolina with a target of 215,000 customers. Pilot customers in South Carolina received a letter similar to the one sent to Ohio customers.

Then, on June 12, 2012, Duke Energy made its next handoff, transitioning call center operations from the Customer Prototype Lab to the call center vendor. With this segue complete, the respective program actors assumed their currently assigned roles.

A commercialized roll out to 46,000 residential customers in Kentucky occurred on August 22, 2012. North Carolina followed on October 17, 2012, with the largest target yet, 500,000 residential customers. In contrast to these commercial launches, Indiana began with a pilot effort in May of 2012.

Operations in all service territories are mentioned here because the same systems and methodologies are used to create and distribute reports in all states. Thus, overall report volumes, operational challenges, and any decisions made concerning the program in one state are likely to impact operations in the others.

MyHER Report

Overview

The program vendor receives a secure transfer of customer data on a nightly basis from Duke Energy, which includes updated energy usage, billing records, account and rate changes, eligibility criteria, and household demographics. This customer data is then passed through two distinct stages — integration and production — in order to create the MyHER reports. The integration stage runs daily and is designed to sort, catalog, parse, and combine the data according to a complex set of software rules that prepare the data for report production.

Report production occurs eight times per year, with each report corresponding to a calendar month. For each report cycle, the data is divided into four weekly batches. Each batch is processed independently, as customers are clustered with others having similar billing dates and similar household characteristics. Each batch then consists of hundreds of clusters containing tens to thousands of houses in each.

Once the dynamically assigned clusters are established, the kWh energy use of individual households in each cluster are used to determine how much electricity the “average” home and the “efficient” home use. Each individual household’s kWh usage is then compared to the average and efficient homes in their cluster to show relative performance each month for the previous 13 months. Kilowatt hours are converted to dollar figures using a statewide rate factor that makes it possible to display meaningful comparisons of homes that may be on different rate plans.

To further encourage energy savings behaviors, the front page of the report presents two specific tips that suggest seasonal and household-appropriate ways to save energy, such as weatherization or using task lighting. The tips, which are developed by the program vendor, also show how much money enacting that tip is likely to save that particular customer based on household characteristics. The rear page of the report presents two additional messages developed by Duke Energy. The program vendor uses yet another set of software rules to ensure that the Duke Energy messages displayed on the report promote specific energy efficiency programs for which the customer is eligible or a more general energy saving suggestion in the event that no specific program promotion is available.

Once these tips and messages have been dynamically assigned, PDF versions of the individual customer home energy reports are produced. The program vendor maintains quality assurance measures throughout the production process to catch potential errors. However, Duke Energy also performs a number of second-level quality control checks, including reviewing a sample set of 10,000 PDFs out each weekly batch of reports. As of June 2013, prior to printing and mailing, Duke Energy also reviews a complete file containing all up-to-date customer data.

Once this second level of quality assurance has been successfully completed, the full batch of PDFs is sent to a subcontractor for printing and mailing. The PDFs are also uploaded into a program vendor -hosted web portal called the Enterprise system, so that the reports can be viewed by representatives from the call center vendor and the Customer Prototype Lab. The following sections discuss this process in more detail.

Data Handling

Throughout the creation and development of the data integration and report production processes, the program vendor worked with Duke Energy to identify common issues that might arise with the data used to generate a customer’s report. For instance, if a customer is missing the current month’s billing data, then a software rule flags the customer ID and labels it as ineligible for a report since there is no new data available to create the monthly comparison. A similar rule applies to customers who are missing their thirteenth month of previous billing data since that anchors the beginning of the year-to-date comparison. Likewise, the program vendor needed to write a software rule that stops the report process if the customer is missing two bills within the 13 month period, excluding the first and thirteenth months, since too many missing data points cause the graphs to render poorly. Missing billing data is reconciled with Duke Energy on a nightly basis to mitigate such issues, but the rules must be in place in order to control the small percentage of situations to which they apply at the time the batch is processed.

Because the data integration process is so complex, it has required almost continuous process improvements to fine tune the most appropriate ways to handle unanticipated data idiosyncrasies. On numerous occasions, additional software rules needed to be written to deal with the unforeseen circumstances. Billing data issues continue to provide a good example. In some cases customers may receive two bills in a single month. Under the originally envisioned scenario, the second bill would be added to the first bill. However, in another scenario, the first bill should be considered cancelled, while the second bill shows the corrected amount. Without a software rule in place to address this real world business practice, the customer's MyHER report would present inaccurate information. These types of fixes are made whenever issues are discovered.

Home Characteristics

The comparative nature of the MyHER reports relies upon the program vendor's ability to automate the creation of data clusters of similar homes. The program vendor's data integration process ensures that each customer ID is paired with several identifying household characteristics:

- Age of home
- Size (square footage)
- Heating fuel type
- Location (multiple vectors based on latitude and longitude)
- State (ensures neighborhoods do not cross state lines during clustering)
- Bill dates (ensures billing periods are of similar duration to produce accurate comparisons for consumption)

These characteristics are compiled from a variety of data sources with a specific order of precedence based upon their availability and deemed degree of accuracy. Those data sources are:

1. Customer specified information, such as corrected numbers for home square footage, age, and heat fuel type, as captured via telephone conversations with the call center vendor or email exchanges with the Customer Prototype Lab;
2. Household characteristics recorded during a visit by a professional auditor as part of Duke Energy's Home Energy House Call (HEHC) program;
3. Duke Energy algorithms applied to confirm customer provided data, such as heating fuel type, since customers may erroneously think they have gas or electric heat, while an analysis of their annual electric load shape reveals otherwise;
4. Household characteristics provided directly by customers when they completed a data collection survey as part of Duke Energy's Personalized Energy Report (PER) program; and
5. Household characteristics acquired by the program vendor via publically available Experian third party data.

Once these characteristics have been appended to the customer ID, the characteristics are used to help identify other similar households that will be clustered together later in the process to generate the home energy use comparisons.

All parties agree that this aspect of the report generation process is well-conceived, but data quality issues have hampered implementation to varying degrees (See Data Quality Assurance starting on page 28 for more information on this.).

Data Clustering

One key difference between the original clustering methodology used during the early program development and the current deployment is that Duke Energy's original methodology relied on static clusters of homes that were generated one time based upon similar home characteristics. This static clustering offered the advantage of facilitating comparisons with a consistent set of homes each month. However, the static clustering method did not easily accommodate the fact that new comparable homes became eligible each report cycle, while other homes needed to be dropped from the comparison pool based upon eligibility changes or upon customer requested corrections to their home characteristics. The program vendor's clustering methodology accommodates these data changes by employing a K-means data clustering methodology that creates new and accurate cluster assignments for each report cycle. While sacrificing a static comparison to the exact same houses each month, the K-means clustering methodology offers the advantage of ensuring a more accurate, consistent, and unbiased comparison of homes with similar attributes each report cycle, which Duke Energy deemed fundamental given the changing nature of the data.

Despite its differing dynamic nature, the program vendor's methodology yields clusters closely similar to those generated by Duke Energy's original static method. The dynamic clustering methodology works by creating a coordinate, or vector, for each piece of household information — bill date, home size, home age, fuel type, longitude, latitude, proximity of location, etc. — to receive a weight. Heuristic algorithms then run until convergence is reached and clusters of similarly weighted homes are generated. The reports refer to these clusters as "neighborhoods," but the homes are grouped based upon their similarly weighted attributes rather than being grouped as customers might commonly think of a neighborhood, such as homes sharing sidewalks, streets, and proximity to local landmarks.

The number and size of the data clusters changes each month because they are dynamically generated based upon the vector weightings of the data. A sample of the program vendor data for March of 2013 revealed that Kentucky has an average of 418 neighborhood clusters per month. Across the entire Duke Energy service territory, the program vendor's system is generating an average of 3,275 clusters. The analysis also showed that the numbers of homes within a cluster ranges from a low of 10 homes to a peak cluster size of 8,924 homes, which happened to be in North Carolina. In Kentucky the average cluster contains 126 homes, while its maximum is 1,186 homes. Theoretically there is no maximum to the number of clusters or to the number of homes. However, the numbers noted above represent typical cluster sizes.

In essence, the program vendor's clustering methodology recognizes clusters that are too large do not provide an accurate comparison, while clusters that are too small may have their average and efficient home comparisons swayed by the undue weighting of individual homes. It is for this reason that if a cluster contains less than 10 similar homes then the customer does not receive a report. Duke Energy and the program vendor are currently considering the trade-offs

between raising that minimum to provide greater statistical significance versus the reduced energy impacts resulting from sending reports to fewer homes.

Calculating Average and Efficient Homes

The key to the social norming process employed by the MyHER reports is the way that the reports compare a customer's energy usage with others. The reports make two different comparisons.

The first comparison is to the "average" home. Average is calculated by determining the arithmetic mean for the cluster. This is calculated by summing all kWh usage in the cluster and then dividing by the number of homes in the cluster. So, for a hypothetical cluster of three homes with 1000 kWh, 1200 kWh, and 1400 kWh, the sum would be 3600 kWh. When divided by three, this equals an average of 1200 kWh.

Because social norms tend to influence behavior toward the group average, Duke Energy also adds a second comparison designed to further influence customers toward additional energy savings. For this reason, the reports also compare customer energy usage to an "efficient" home. The efficient home represents the 25th percentile (first quartile) of energy usage such that homes at this mark use less energy than 75% of homes in the cluster.

Report Design and Data Presentation

The focal points of the MyHER reports are the monthly energy use comparison on the front page of the report and the annual energy use comparison on the back page of the report. The monthly comparison commands at-a-glance visual attention. The headline: "How am I doing?" immediately establishes context, while three bold bars compare the reader's home energy use to that of the average home and efficient home. Bar lengths provide a graphic display of information, while dollar amounts specify the exact values.

The second page of report also sports a prominent graph; this one is a line graph displaying monthly energy use for 13 months to facilitate year-to-year comparisons of energy usage. Average and efficient homes are also shown, so that customers can see how their annual performance compares to their peers. In this way, the line graph encourages both internal and external competition as customers strive to better both their own performance and that of others.

The program vendor provided a significant enhancement to fostering this sense of competition when it created a way to alter the display of the monthly bar chart. When the reports were produced by Duke Energy, the amounts displayed for the average home, your home, and the efficient home would change each month as the data changed. But pilot testing and industry research revealed that when customers were shown that their energy usage was lower than average, their performance tended to revert toward average rather than continuing to improve toward the efficient home. Duke Energy and the program vendor resolved this issue when the program vendor developed a way to drop the column displaying average home performance and center the remaining two columns (see Appendix D: Example MyHER Report for an example). This change necessarily causes readers to focus on the difference between their homes and efficient homes, thereby continuing to spur a sense of competition toward achieving even greater energy savings. However, even when customers use less energy than average for a given month,

the average home performance continues to be displayed on the annual usage line graph since the customer may be above average and below average at different times of the year.

Similar attention to detail has gone into the explanations that accompany the monthly comparison chart (Figure 1). To the right of the monthly bar chart a legend explains whose electricity usage is being compared to the customer. The legend then lists the number of households in the data cluster, as well as providing the heat source, range of square footage, and age range of the houses in the cluster. This information is presented so that customers understand how closely similar the homes they are being compared with are. This is intentionally stated to increase credibility and build customer trust in the accuracy and reliability of the comparisons.

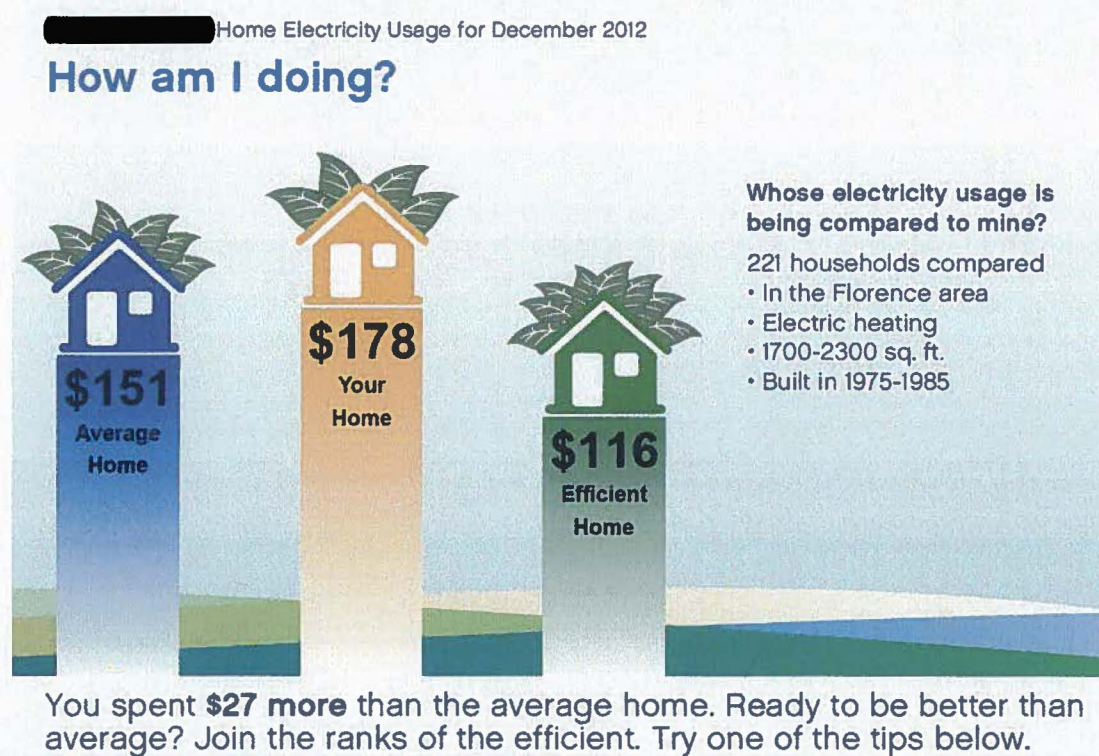


Figure 1. Monthly Energy Use Comparison

This verisimilitude became a point of disagreement between Duke Energy and the program vendor during the development phase. The program vendor felt strongly that the number of homes, square footage, and age range shown on the reports should be changed each month to automatically and accurately reflect the exact homes in that month's dynamically generated comparison cluster. Duke Energy disagreed, citing calls and emails from customers who were confused as to why those numbers were changing each month. Because customers were focusing on those "wrong" changes instead of focusing on their changing energy use, the two parties eventually agreed to display a fixed range of comparison for the square footage and home age. Those were set at +/- 300 square feet and +/- five years from those attributes of the customer's home. This change ensured that customers would see a consistent and reliable benchmark for the comparisons, even though the actual numbers may vary slightly according to the data points in that month's dynamically generated cluster.

Other elements of the report have been the subject of careful consideration as well. According to those we interviewed, each element and detail of the reports has been carefully considered to elicit a trusting and positive response from Duke Energy customers. The typeface, colors, gradient fades, and differing layouts between the first and second page were all specifically chosen. For instance, the color yellow was selected to show the homeowner's energy usage since it is the easiest color to see, while green was picked for the "efficient" home to reinforce the "green is environmentally friendly" message. Likewise the houses atop the monthly bar chart columns were selected for their simple iconic representation of a home, and the green leaves were designed to simultaneously imply financial savings and environmental friendliness.

The current two page format was expanded in March of 2012, when the program vendor began producing the reports in order to provide more space for additional information. Prior to that time, the reports consisted of a single page of new information with monthly and annual graphs showing on the same page along with the energy saving tips. The rear of the report consistently listed frequently asked questions. To create extra space for the graphs and messages, the FAQs were shifted to a welcome letter (see Appendix F: Welcome Letter and Frequently Asked Questions) that arrives by mail along with the first report. The program website replicates these FAQs so customers can refer to them long after the welcome letter has been disposed of.

Two questions: "What is this report?" and "Why would Duke Energy try to help me save energy?" were retained on the front page of each report since they were considered important to establish and ensure context for the reader. The reports also contain other consistent elements including email and telephone contact details, a link to the program website, and a Quick Response (QR) code inviting those with mobile phone scanners to watch an online video about the home energy reports.

Participant surveys, conducted as a part of this evaluation, had not yet been completed when we spoke with the product manager, call center representative, and the Customer Prototype Lab (CPL) manager, but all three people indicated that customers are responding positively to report design, according to unsolicited customer feedback obtained via the call center and email. (This finding was later corroborated by satisfaction ratings from the participant surveys as discussed in the Satisfaction with MyHER section below.) A link to a new online customer opinion survey was added to the reports in March of 2013. It was anticipated to provide ongoing feedback, but no survey results had yet been prepared at the time of this evaluation.

Use of Rate Factors to Demonstrate Monthly Energy Costs in Dollars

While home energy use comparisons are calculated using kWh, the data is graphed on the reports in terms of dollars. Dollar amounts are calculated using a multiplier known as a rate factor, which is a composite figure created to represent the blended value of all the charges a customer would be presented with on the bill. This single number is multiplied by the kWh used by each customer to determine the dollar amount to display on the reports.

The rate factor for Kentucky is \$0.088. The rate factor is calculated by the Duke Energy rates department after allowing for the various tariffs that eligible customers may be on, as well as riders, taxes, and other fees. This single number is considered to be the most appropriate way to

create a statewide “apples-to-apples” dollar value comparison between sets of customers who may be on different rate schedules.

Duke Energy made the decision to present the information this way for two primary reasons: 1) dollar amounts were considered to be more easily understood by customers than kWh with which they are less familiar; and 2) customers were considered to be more likely to take actions to save energy when shown dollar figures on the monthly and annual graphs, as well as in the energy tips on the front page.

However, that decision was reconsidered during the spring of 2013 when Duke Energy decided to change the way the reports’ monthly and 13-month energy usage graphs present information. Starting in August of 2013, the graphs’ axes will be relabeled from displaying dollar amounts calculated with rate factors to displaying kWh based on actual energy usage. Otherwise the graphics will remain visually similar.

One reason for the change is that while Duke Energy makes it clear in its FAQs that dollar values shown are not bill amounts, some customers inevitably compare the dollar amounts shown on the home energy reports with the dollar amounts shown on their bills. When the numbers don’t match, confusion can ensue. By changing the data labels from dollar amounts to kWh, Duke Energy intended to bring the MyHER reports into closer alignment with customer bills. Based upon feedback from customer focus groups, Duke Energy anticipates this will help to increase the perceived accuracy of the MyHER reports, and thus positively influence their effectiveness.

As the Duke Energy product manager explained, because the MyHER program deliberately compares the energy usage of customers on different rates, the rate-factor-generated dollar amounts shown on the reports were never intended to align with billing amounts. However, if not exactly the same, the amounts shown are as closely similar as possible. But small differences grow larger as energy usage increases, and times of higher usage are when customers are more likely to make comparisons, reasoned the product manager; hence, part of the impetus for change.

The switch from dollars to kWh is anticipated to have other benefits as well. The Duke Energy product manager cites an additional advantage being that kWh figures are the true metric of customer usage. kWh is also the metric for measuring the impact of the energy savings for the MyHER program. Thus, a commonality of metrics and language may be achieved by reporting the values in kWh. Moreover, reporting usage in kWh will also serve to begin educating customers about the importance of kWh for their homes in a manner akin to miles per gallon for their cars. In the same way that fuel economy influences their driving behavior and vehicle purchases, a stronger understanding of home energy economy has the potential to lead to greater and more persistent savings.

To achieve this upside without diminishing the behavioral motivation achieved by presenting the energy comparisons in terms of dollars, the rate factors will still be used to calculate the energy spend amount discussed in the captions for the monthly and 13-month graphics. For instance, while the graphics might show a difference of 300 kWh between the Your Home usage and the Average Home amount, the caption would explain that the customer was spending X dollars

more than the average home. In this way, Duke Energy planned to retain the behavior influence of presenting dollar comparisons without making graphic comparisons using rate factor conversions. An explanation of kWh will be included beside the graphic.

Report Messaging

Duke Energy devotes considerable time and effort to ensuring that the language in the home energy reports remains consistent with the company brand — the copywriting is crisp, the wording friendly, and the tone encouraging. This messaging discipline is maintained through a combination of creative freedom on the part of the writers and keen editorial oversight during the internal review process. While every word on the reports has been carefully considered, three areas of the report contain dynamic messaging sections that serve to turn an otherwise static report into an individually targeted mailing to encourage the adoption of specific energy saving measures appropriate to that particular home.

Explaining the Graphics

One of the hallmarks of the MyHER program is the program vendor's ability to customize the messages that a customer sees according to their home's monthly usage, their cluster's values for average and efficient home, and the specific characteristics of their home. This customization applies to captions below the graphics, to home-specific energy savings tips on the front page, and to tailored messages from Duke Energy on the second page.

The first area with customized messaging is the caption below the monthly energy use graphic on the front page. That wording is automatically generated based on software rules designed around the numeric differences between the monthly cluster's unique values for the average home, your home, and the efficient home. So, if a customer uses more energy than the average home, the message might say, "You spent \$36 more than the average home. Ready to be better than average? Join the ranks of the efficient. Try one of the tips below." However, if the customer uses less energy than the efficient home, then the message might say, "Way to go! You are among the most efficient homes in your area. You can always save more. Try one of the tips below."

A similar customization methodology applies to the 13-month comparison on the second page. Using the same customer examples as just described, these messages might say, "Your usage for this month has <increased> compared to a year ago. You spent <\$ value> <more> than the <efficient homes> in your area in the last 12 months." Or it might say, "Your usage for this month has <decreased> compared to a year ago. You are <among the most efficient homes in your area for the year. Great job.>" The brackets < > are inserted here to illustrate conditional text delivered according to preset conditions in the program vendor's software coding.

In all cases, the messages are intended to be encouraging and are written to prompt customers to take the next step. However, even the best intentioned messages are open to customer interpretation. The call center manager informed us that a tiny number of customers have complained about "the sarcastic tone." When asked what this complaint referred to, one customer whose energy usage was below average, but above efficient, interpreted the automatically generated sentence, "Nice work. You used X dollars more than the efficient home." to be sarcasm. The call center representative explained otherwise and the customer ended