



Understanding the Impact of Consumer Awareness of Utility Regulatory Framework on Energy Efficiency Program Participation

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Understanding the Impact of Consumer Awareness of Utility Regulatory Framework on Energy
Efficiency Program Participation

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A Thesis in the Field of Sustainability and Environmental Management
for the Degree of Master of Liberal Arts in Extension Studies

Harvard University

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Abstract

It is not often that we come across an advertisement that asks us to spend less. As consumers, we are accustomed to being pressured into using, buying, and spending more. So, when a utility advertises a program to reduce electricity consumption, a reasonable reaction is “where’s the catch?” The underlying assumption is that utilities achieve higher profits when they sell more electricity. However, this is not the case in a growing number of states. State regulators have been changing incentive structures to remove disincentives for utilities to develop, promote, and execute energy efficiency programs.

This research explores the relationship between customer awareness of the utility regulatory framework and their likelihood to participate in such energy efficiency programs. The key research question is: Is a lack of awareness of the utility regulation framework a significant barrier to participation in utility-driven energy efficiency programs? The key hypothesis tested is: Residential customers who are aware of utility regulatory framework are more likely to participate in utility-driven energy efficiency programs than similar customers who are not aware.

To test this hypothesis, existing survey data were used. These survey responses were collected by a large investor-owned utility with operations in New York, Massachusetts, and Rhode Island. The survey data included a battery of questions related to respondent awareness of utility regulation framework as well as a series of questions about customer satisfaction, their attitudes towards the utility and energy efficiency communications, and general demographics. Based on this survey data, respondents

were categorized as either aware or not aware of the regulatory framework. These data were combined with energy efficiency program participation data for those same customers, allowing calculation of the percentage of energy efficiency program participation among customers who are aware of the utility regulatory framework as well as those who are not aware. Tabular analysis was the primary methodology.

Utility customers who were aware of the regulatory framework had 29% lower levels of distrust, 11% higher levels of trust, 38% higher recollection rate for energy efficiency advertising, and, ultimately, a participation rate 22% higher than customers who were not aware. Higher participation was observed in each of the three states included in the analysis.

This thesis also reviewed the utility regulatory frameworks in the three aforementioned states and identified differences that may influence the differing levels of program participation observed in the data analysis. Based on this analysis, a list of recommendations is presented to optimize energy efficiency marketing and the regulatory framework that would encourage higher energy efficiency program participation rates.

The findings from this research will be useful to regulators interested in modifying the regulatory framework in their jurisdictions, regulators and utilities that are seeking to improve energy efficiency program participation rates, organizations that advise utility regulation policy, and companies who provide products and services associated with the execution of energy efficiency programs. Clearly, electricity not consumed is electricity that does not pollute, and managing electricity demand to avoid building new production capacity can save significant money.

Dedication

This work is dedicated to my parents, Nediljko and Katarina. Their lessons of hard work, education, integrity, family, and perseverance are my inspiration every day. They faced and overcame unimaginable challenges to provide a better life for their family and I will forever be grateful. Never give up.

Acknowledgments

This work would not be possible without the data and support of National Grid and my manager Theodore Everitt, the guidance and insight from my thesis director, Dr. Matthew Gardner, and my research advisor, Dr. Mark Leighton, and the sacrifice and patience from my brother Jure and partner Jesse.

Table of Contents

Dedication	v
Acknowledgments.....	vi
List of Tables	ix
List of Figures.....	x
I. Introduction	1
Importance of Energy Efficiency Programs	2
Research Significance and Objectives	4
Background.....	5
Overview of Energy Efficiency Programs.....	5
Utility Regulation.....	8
Decoupling.....	9
EE Programs and Regulation in New York, Rhode Island and Massachusetts	11
National Grid	14
Energy Efficiency Program Marketing.....	15
Barriers to Participation in Energy Efficiency Programs	17
Research Questions, Hypotheses and Specific Aims.....	18
Specific Aims.....	19
II. Methods.....	21
Survey Methodology.....	21

	Questionnaire	22
	Assessing Customer Awareness of the Regulatory Environment.....	23
	Energy Efficiency Program Participation Data.....	24
	Analyzing Datasets	26
III.	Results.....	27
	Impact of Regulatory Awareness on Customer Perceptions.....	28
	Communications Recollection	30
	EE Familiarity.....	31
	Communications Effectiveness.....	31
	Demographics of Regulatory Awareness.....	32
	Regulatory Awareness and EE Program Participation	35
	Accounting for EE Marketing Activities	38
	Accounting for Demographic Differences.....	41
IV.	Discussion.....	44
	Jurisdictional Findings.....	45
	Findings Relevant to EE Marketing.....	46
	Recommendations for Utilities and Other EE Program Administrators.....	48
	Recommendations for Regulators.....	49
	Questions for Further Research	49
	Conclusions.....	51
	References.....	52

List of Tables

Table 1. State EE rankings.....	12
Table 2. Regulatory framework questions from National Grid Brand, Image, and Relationship study.	24
Table 3. Scoring used to calculate regulatory awareness for each survey respondent.	24

List of Figures

Figure 1. IEA Global Energy Outlook emissions scenario with temperature increase limited to 2 degrees.....	2
Figure 2. Estimated savings from both maintaining and increasing energy efficiency policies through 2030.....	4
Figure 3. Electric energy efficiency by state, 2016.	6
Figure 4. Energy Efficiency program categories.	7
Figure 5. Map of US states with decoupling policies.	10
Figure 6. Map of National Grid US service areas.....	15
Figure 7. Model of path from regulatory awareness to EE program participation.	18
Figure 8. Distribution of survey respondents by regulatory awareness score.	27
Figure 9. Regulatory awareness by region.....	28
Figure 10. Distrust and trust by regulatory awareness.....	29
Figure 11. EE communications recollection by regulatory awareness.	30
Figure 12. EE familiarity by regulatory awareness.	31
Figure 13. Effectiveness of EE communications by regulatory awareness.	32
Figure 14. Regulatory awareness by age group.	33
Figure 15. Regulatory awareness by education level.....	34
Figure 16. Regulatory awareness by income level.	34
Figure 17. Regulatory awareness by home ownership.	35
Figure 18. Regulatory awareness by prior EE program participation by jurisdiction.	36

Figure 19. Post-survey EE program participation by regulatory awareness.....	37
Figure 20. Post-survey EE participation by regulatory awareness by jurisdiction.	38
Figure 21. Post-survey EE participation rates by regulatory awareness (EE familiarity weighting)	40
Figure 22. Post-survey EE participation rates by regulatory awareness (demographics weighting)	42
Figure 23. Path from regulatory awareness to EE participation with observed outcomes.....	44

Chapter I

Introduction

Decreasing electricity demand can potentially avoid significant societal costs associated with building new generation capacity. It can also decrease significant greenhouse gas emissions associated with the avoided electricity generation. Customer participation in utility-driven energy efficiency programs has been an important source of demand reduction. Most customers believe that utilities generate higher profits when more energy is consumed (National Grid, 2017) and thus may be disinclined to participate in utility-sponsored energy efficiency programs because they perceive these programs to be disingenuous and false advertising.

For residential whole home retrofit programs, annual participation rates of 1-3% are reported; the utility that provided the data for this analysis (National Grid) has an annual participation rate of approximately 2% (York, Neubauer, Nowak, & Molina, 2015). If the utility can increase participation by 20%, this will bring the overall participation percentage to 2.4%. This is almost halfway between current performance and best-in-class, and a significant shift. While these percentages are small, the resulting energy savings can be significant on an individual home level, as well as on the aggregate level (York, Neubauer, Nowak, & Molina, 2015). The combination of savings potential as well as the significance of investment, makes program execution efficiency an important field to explore. Getting higher annual participation rates can result in quicker reductions in demand and less aggregate costs.

Importance of Energy Efficiency Programs

CO2 emissions need to decrease from the current 33 GT down to 16 GT by 2040 (Figure 1) (American Council for an Energy Efficient Economy, 2016) to limit the rise in the average global temperature to 2 degrees Celsius. There is clearly no magic bullet that will enable such a fundamental shift, but there are a number of levers available. The switch to renewables will drive a significant portion, as will carbon capture and storage along with fuel switching. However, the IEA also estimates that by 2040 the single most significant source of CO2 emissions reduction (7 GT) will be energy efficiency across all sectors (Figure 1).

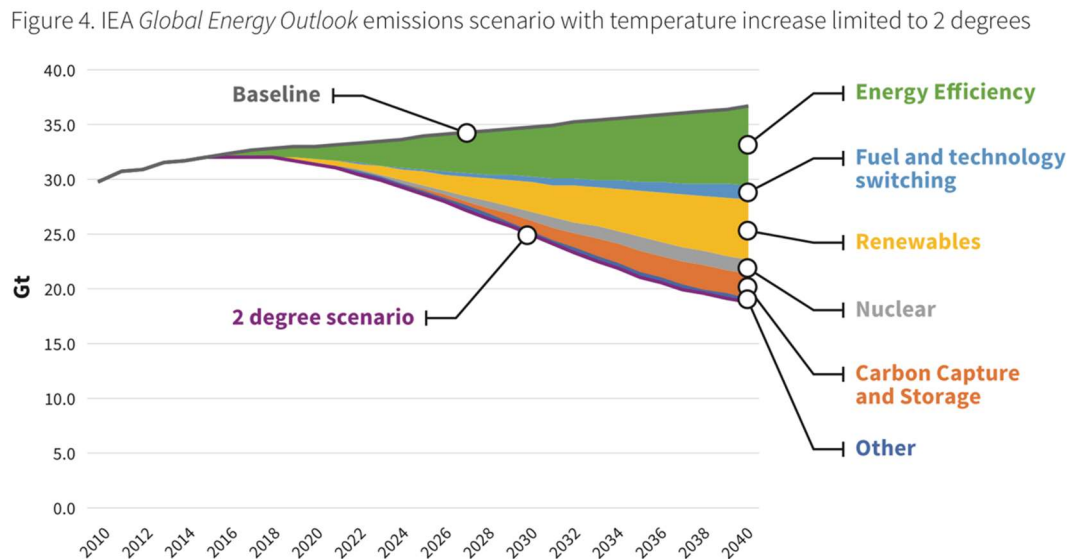


Figure 1. IEA *Global Energy Outlook* emissions scenario with temperature increase limited to 2 degrees.

Graph and title from American Council for an Energy Efficient Economy (2016) based on data from the International Energy Agency (2019).

Electricity generation is one of the largest global contributors to CO₂ emissions, and it contributed 27% to US total emissions in 2018 (United States Environmental Protection Agency, 2020). This represents a significant opportunity and challenge as governments seek to address climate change and limit global warming to 2 degrees Celsius.

Within the US, much work has already been done to introduce and develop energy efficiency programs for both commercial and residential electricity usage. Energy efficiency policies have already saved a significant amount of electricity usage in the US, allowing electricity consumption to remain flat despite economic growth in the past decade (Figure 2) (American Council for an Energy Efficient Economy, 2016). However, to limit global warming to less than 2 degrees, stronger energy efficiency programs will be needed to further decrease the amount of electricity used in the US. To date, only 27 states have Energy Efficiency Resource Standards (EERS) (American Council for an Energy Efficient Economy, 2019) – an obligation for utilities and other retail electricity distributors to satisfy some of their energy demand through energy efficiency. While not all energy efficiency is economically attractive, it is estimated that “pursuing economically attractive, but as yet untapped energy efficiency could yield more than 20 percent savings in total electricity demand nationwide by 2025” (United States Environmental Protection Agency, 2015, p. 5). More states will need to adopt EERSs, and higher customer participation in energy efficiency programs will be important to enable this.

Figure 11. Estimated savings from both maintaining and increasing energy efficiency policies through 2030

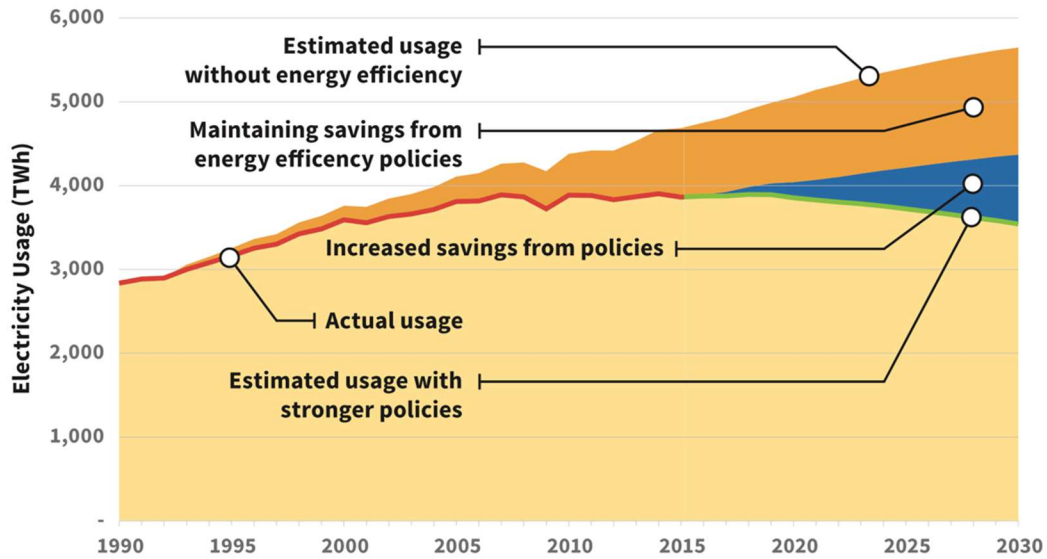


Figure 2. Estimated savings from both maintaining and increasing energy efficiency policies through 2030.

Graph and title from American Council for an Energy Efficient Economy (2016).

Research Significance and Objectives

Driving increased participation in energy efficiency programs is an important method of limiting greenhouse gas emissions related to electricity consumption. This research explored customer perceptions of their utility – specifically their awareness of the regulatory framework and the economic motivations driving their utility’s actions – and whether a higher level of customer awareness is associated with greater energy efficiency program participation.

The objectives of this research were to:

- Assess the impact of regulatory framework awareness on energy efficiency program participation

- Identify customer groups that are less likely to participate in energy efficiency programs
- Advise energy efficiency program communications strategies

Background

Decreased emissions from electricity generation in advanced economies combined with relatively mild weather resulted in global CO₂ emissions remaining flat at 33 gigatons (GT) in 2019 – even with the global economy growing 2.9% (IEA, 2019a). Given the ongoing pandemic, it is too early to tell if the 2019 numbers represent a true peak in CO₂ emissions or just a plateau in a continued upward trend, but the need to reverse the trend is essential to limit global warming to less than two degrees Celsius.

Overview of Energy Efficiency Programs

In 2015, utility spending on energy efficiency (EE) programs in the US was \$5.8 billion and is projected to grow significantly to \$8.6 billion by 2025 (Goldman et al., 2018). For high-performing utilities, the percentage of energy savings generated from EE programs can represent more than 3% of annual retail sales and the spending associated with these programs can account for 10% of their revenues (Relf, Baatz, & Nowak, 2017). New England and a handful of other states are leaders in the US and achieve high levels of annual incremental savings. The average for all states with EERS is an annual savings of 1% - more than double the percentage of savings achieved in states that do not have stringent standards (Figure 3) (US Energy Information Agency, 2018).

Electric energy efficiency savings by state, 2016

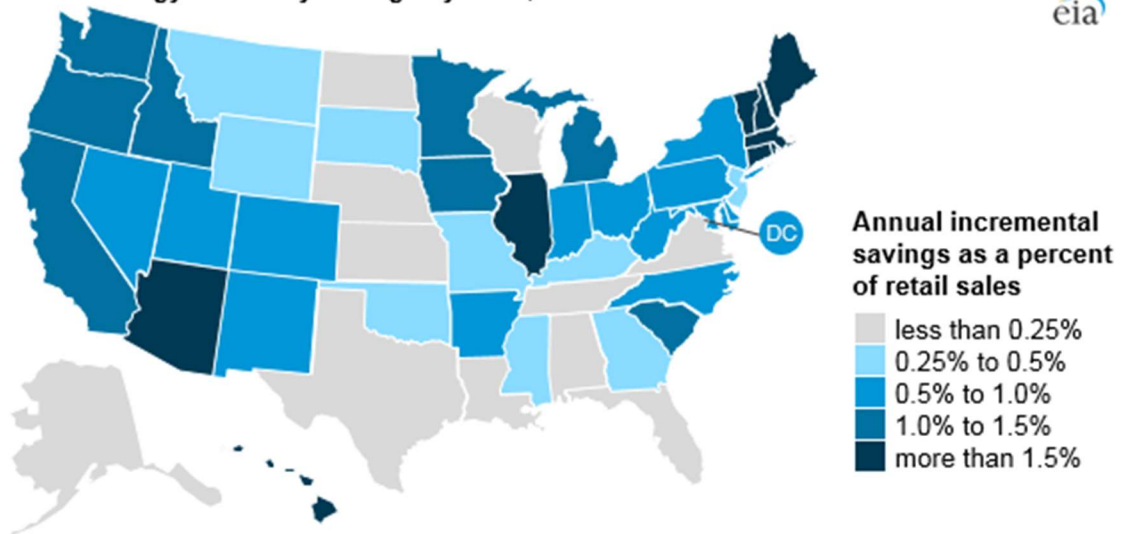


Figure 3. Electric energy efficiency by state, 2016.

US Energy Information Agency (2018).

There is a tremendous variety of EE programs offered by utilities in the US. These programs are individually designed by the utilities that manage them in tandem with the regulatory agencies that oversee them. Hoffman et al. (2013) identified more than 1,900 different programs managed by 108 program administrators across 31 states. These programs can be grouped by sector, and then by simplified categories (Figure 4) (Hoffman et al., 2013).

On the residential side, these programs are broadly categorized into two groups: consumer product rebates and whole home EE programs. Consumer product rebate programs are fairly simple. The utility will provide point-of-sale rebates for energy efficient consumer products. These rebates are often applied to products such as light bulbs, washing machines, dryers, dishwashers, programmable thermostats, and similar

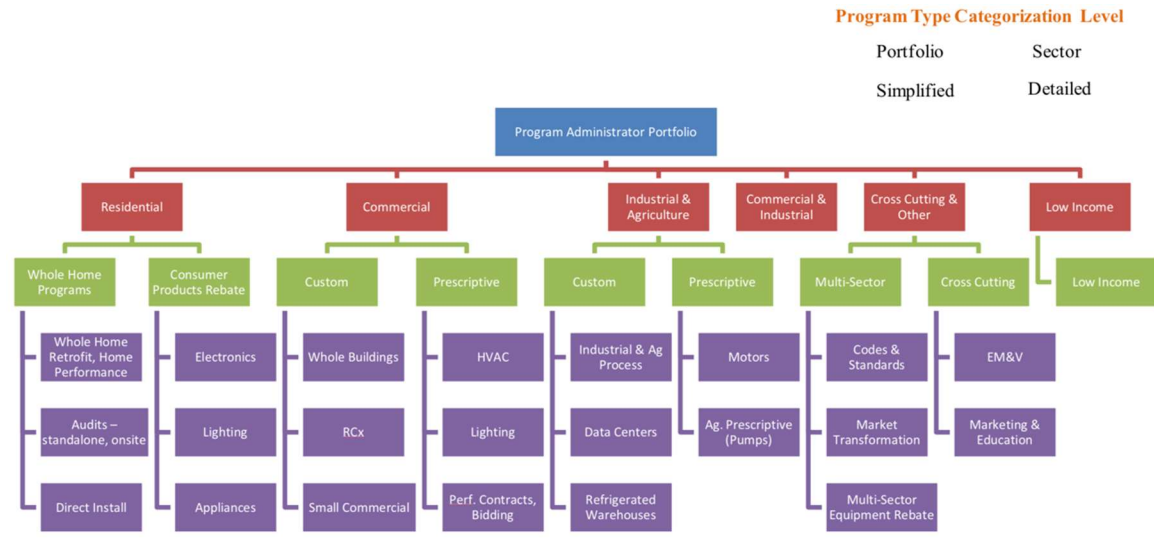


Figure 4. Energy Efficiency program categories.

Hoffman et al. (2013).

items directly at the point of purchase. The rebate for smaller products (such as light bulbs) is often already included in the listed price for the product so the customer does not need to be aware of the utility-managed EE program behind it. Sometimes program participation requires the customer to complete a rebate form and receive the rebate after the purchase. Customer participation in these programs is simple and generally requires little effort from the customer.

Whole home programs require more involvement from customers. These programs typically involve an energy auditor coming to a customer’s home to assess their home’s energy efficiency and provide recommendations for increased energy efficiency. These can also include the direct installation of low-cost items such as energy efficient lighting, water-saving showerheads and faucet aerators. They can also involve weatherization of the home – installing additional insulation along windows or in other areas – and providing recommendations for further energy efficiency. These

recommendations will often include two major components: behavioral recommendations (such as adjusting thermostat settings) and home improvement recommendations. Installing additional insulation on the walls or roof of a home is a common home improvement recommendation, but recommendations can also include upgrading heating/cooling systems or windows which often involve significant investments.

There is also a newer category of EE programs that are designed to save energy by changing customer behaviors. “Behavioral-based energy efficiency programs are those that utilize strategies intended to influence consumer energy use behaviors to achieve energy and/ or peak demand savings” (Dougherty & Van de Grift, 2016, p. 899). Unlike traditional conservation marketing, these programs provide feedback to individual customers on their household energy usage, often combined with customized suggestions on how to lower energy usage. For many customers this means periodically receiving a report that indicates how their energy usage compares with similar homes in their neighborhood. These reports are called Home Energy Reports (HER).

Utility Regulation

“Regulation constitutes an agreement between the utility and the government: the utility accepts an obligation to serve in return for the government’s promise to approve and allow rates that will compensate the utility fully for the costs it incurs to meet that obligation” (Lazar, 2016, p. 6).

Traditionally, the regulatory frameworks that enabled this also created a system whereby utility profits increased along with any marginal increase in commodity sold through their networks. Given the need to reduce electricity usage, there is a clear need to remove this linkage.

Each state also has different approach to utility regulation and EE program administration. Based on the different services offered in different territories as well as the different energy efficiency standards in different jurisdictions, there are differing levels of EE program availability and participation.

Decoupling

In the US, most utility regulation occurs at the state level. Some states have also adopted greenhouse gas emissions reduction targets. Achieving these targets often requires a reduction in the amount of electricity consumed. Utilities, with their direct relationship with consumers, are a natural vehicle for EE programs that can help achieve these goals through demand reduction. However, utilities also face a conflict of interest in traditional regulatory frameworks. Regulators have a long history of refining regulatory frameworks to help address misalignments of interest between shareholder-owned utilities and the communities they serve. Decoupling mechanisms also seek to better align utility and community needs:

A decoupling mechanism is simply a system to regularly adjust rates to ensure a utility's actual revenues match its authorized revenues to recover its fixed costs. Regulators of investor-owned utilities and governing boards of publicly owned utilities can use regular, small adjustments in rates (typically less than ± 3 percent) to ensure that utilities recover their authorized fixed costs—no more and no less. The small rate adjustments break the link between—or decouple—a utility's revenues and sales by either restoring to the utility or giving back to customers the money that was under- or over- collected as a result of fluctuations in retail sales (Natural Resources Defense Council, 2012, p. 2).

As of March 2019, there are decoupling mechanisms active in 24 states and Washington DC (Figure 5) (Center for Climate and Energy Solutions, 2016). Decoupling

mechanisms initially started in the West and Northeast coastal states but have been gradually expanding as more states adopt greenhouse gas emission reduction goals.

Decoupling has been successful in driving improved levels of energy efficiency in the states where it has been introduced (Nissen & Williams, 2016) and it has had “a very strong effect on gains in the annual rate of energy efficiency” (Anders, 2011, p. iii).

Reported increases in annual MWh savings generated from EE programs have ranged from 28% to 438% with a median 82% (Nissen and Williams, 2016).

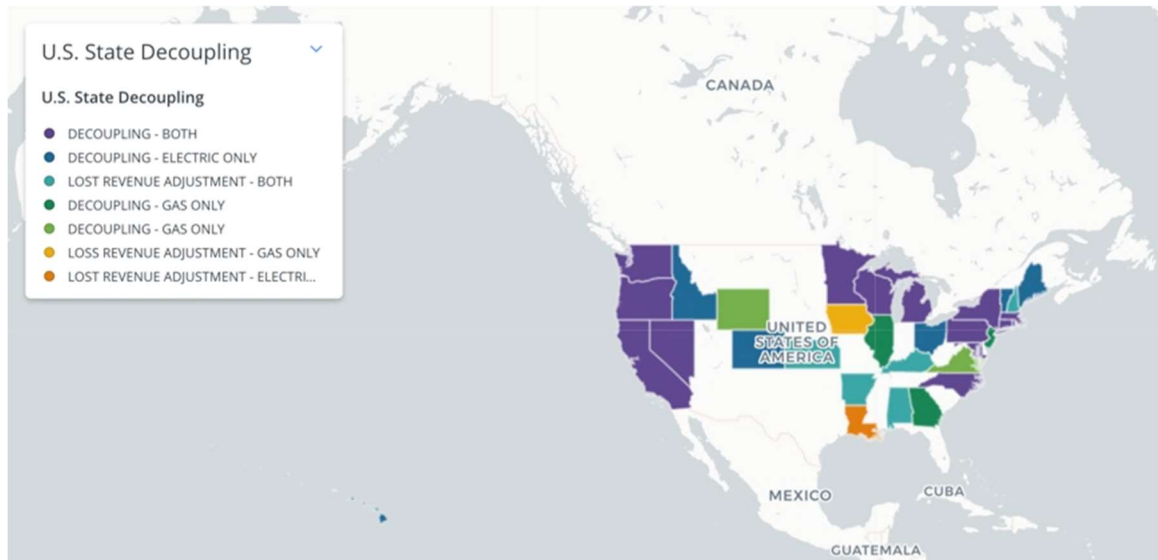


Figure 5. Map of US states with decoupling policies.

Center for Climate and Energy Solutions (2019).

In the US, California has had decoupling mechanisms in place the longest, going back to the early 1980s (National Association of Regulatory Utility Commissioners, 2007), but national adoption of this mechanism has been slow. New York implemented its decoupling policy in 2007 (State of New York Public Service Commission, 2007) and

both Massachusetts (Commonwealth of Massachusetts Department of Public Utilities, 2007) and Rhode Island (State of Rhode Island and Providence Plantations Public Utilities Commission, 2012) implemented it in 2012 after lengthy analysis.

Energy efficiency program administration has historically been unique for each state, with many states still at the very beginning of this process. As more states adopt EERS, they will need to make decisions which model to adopt for program administration. Neme, Gottstein and Hamilton (2011, p. 46-47) outlined key factors to consider when choosing a program administrator for residential EE home programs:

- Mission alignment
- Multi-fuel perspective
- Conflict of interest
- Consumer trust
- Ability to create partnerships
- Nimbleness

The American Council for an Energy Efficient Economy conducts an annual assessment of each state. The ratings are based on five policy areas (Berg et al., 2020, p. ix):

Utility and public benefits programs and policies
Transportation policies
Building energy efficiency policies
State government-led initiatives around energy efficiency
Appliance and equipment standards

EE Programs and Regulation in New York, Rhode Island and Massachusetts

These three states are the focus of this research, but have developed different models for EE program administration and are also generally considered leaders among states in this arena. Rhode Island is the simplest. There is one utility, and they are tasked with developing and administrating programs to achieve EE goals. New York has a

hybrid model with a state agency (NYSERDA) offering programs alongside the numerous utilities operating in that state. In Massachusetts, utilities design and administer programs, but programs are aligned across the commonwealth and marketed under a unified, non-utility brand.

All three of these states rank in the top five nationally for both overall, as well as specifically for utility and public benefits programs and policies (Table 1). This ranking provides some context when assessing the different regulatory environments that influence differing customer awareness and attitudes that will be discussed later in this paper.

Table 1. State EE rankings.

		Total Score	Utility and public benefits programs & policies	State government initiatives around EE	Appliance efficiency standards	Building EE policies	Transportation policies
Rank	State	(50 pts)	(20 pts)	(6pts)	(3 pts)	(9 pts)	(12 pts)
1	California	43	16	6	3	7.5	10.5
2	Massachusetts	42.5	19.5	6	0	7	10
4	Rhode Island	39.5	19.5	6	0	6	8
5	New York	36.5	13.5	5.5	0.5	6.5	10.5

Table adapted from American Council for an Energy Efficient Economy rankings (Berg et al., 2020).

New York is somewhat unique among states because it has multiple state agencies that regulate electric utilities:

- The New York Public Service Commission (PSC) regulates utilities across most of the state – but not the entire state. Among other responsibilities, they set utility rates and authorize EE programs for most investor-owned utilities in the state –

including National Grid. They also authorize EE programs administered by another agency, the New York State Energy Research and Development Authority (NYSERDA).

- The New York Power Authority (NYPA) provides service to “more than 1,000 customers altogether: local and state government entities, municipal and rural cooperative electric systems, and industry, large and small businesses and non-profit organizations” (NYPA, 2021). They also administer EE programs; however, their programs are not marketed towards residential customers.
- The Long Island Power Authority (LIPA) owns and is responsible for the operation of the electricity distribution network in Long Island. They also authorize EE programs that are administered through an investor-owned utility contractor that operates the electric network on their behalf – PSEG Long Island (PSEGLI). National Grid operated the Long Island electric network on behalf of LIPA prior to PSEGLI - up until 2014. Although they no longer operate the electricity network, they continue to operate the gas distribution network in this region.

In summary, a residential electric customer in New York state can participate in an EE program administered by NYSERDA or their local utility (such as ConEd or National Grid). If a customer has different utilities for gas service and electric service, they could potentially have three different sources of information on program availability within their community. An example of this would be a customer on Long Island who could participate in an EE program offered by NYSERDA, National Grid (as their gas utility), PSEG (as their electric utility contractor), or LIPA (as the state agency that acts

as their official electric utility). The increased number of participants offering EE programs can be a source of confusion.

The Public Utilities Commission (PUC) authorizes EE programs in the state of Rhode Island. National Grid is responsible for 99% of the total electricity sales in the state and they administer nearly all the EE programs executed in this state (American Council for an Energy Efficient Economy, 2021a).

Massachusetts has the Department of Public Utilities (DPU), the state agency responsible for regulating utilities. They authorize EE programs that are administered by individual utilities. However, unlike other states, “all investor-owned gas and electric utilities and energy efficiency program administrators have partnered together to sponsor the Mass Save® program [...] to provide a wide range of services, incentives, trainings, and information promoting energy efficiency.” (American Council for an Energy Efficient Economy, 2021, Utilities section, Customer Energy Efficiency Programs heading, para. 2).

National Grid

National Grid, the subject of this research, has operations in these same three states: Massachusetts, New York, and Rhode Island (Figure 6). National Grid consists of a series of legacy utility companies that offer gas and/or electric services across their service territories. In some areas National Grid is both the electric and gas utility, in some areas it only offers electricity, and in other areas it offers only gas. This is a function of the franchises owned by the legacy utilities acquired by National Grid over time. In New York, the service territories in New York City and Long Island are gas only. The areas in Upstate New York (generally the areas including and surrounding Albany, Syracuse, and

Buffalo) are part of the Niagara Mohawk legacy company and offer a combination of electric and gas services. In Massachusetts, National Grid is a combination utility offering gas and electric service, while in Rhode Island, National Grid offers both gas and electric service and covers nearly 100% of the energy delivery market.

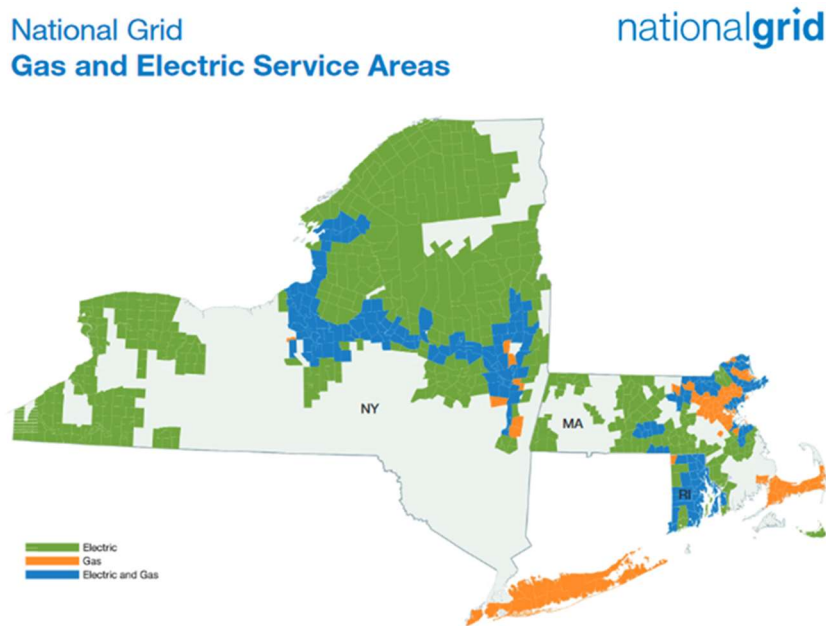


Figure 6. Map of National Grid US service areas.

National Grid (2014).

Energy Efficiency Program Marketing

Electricity is generally universal, reliable, and cheap. These are positive outcomes of the regulatory environment that oversees electricity generators and distributors. However, it also means that most people don't have to think very much about their electricity – where it comes from, how it gets to them, what are the environmental and social impacts of generation and distribution. Lesic et al. (2018)

concluded that consumer understanding of their energy use is weak; consumers tend to over-estimate energy consumption of appliances that use less energy and underestimate for appliances that use more energy. A common strategy to decrease energy use is to curtail usage (e.g., turn off the lights), but little thought is given to how well a home is insulated or how efficient existing high-energy consuming appliances are (Lesic et al., 2018) A general lack of interest combined with a low level of understanding makes EE program marketing challenging. Education must be a key component of any consumer EE program.

It is generally left up to the individual EE program administrators to define how they want to communicate program benefits and encourage enrollment in their programs. Marketing EE programs has a set of challenges that is relatively unique. Cole, McDonald, Wen and Kramer (2018) measured the perceived benefits of home energy efficiency and found that the top three benefits identified are: 1) reduction in energy costs, 2) a good return on investment, and 3) increased comfort of the home. They found some variability in the ranking of benefits according to US region, but the environmental benefits were only identified in the top-three among residents of the West.

While it appears that there is a limited opportunity to use environmental messaging to drive home EE program participation, some have found that it can even be a deterrent. Communicating environmental benefits of energy efficiency has resulted in lower adoption of EE measures among politically conservative individuals (Gromet, Kunreutheraf, & Larrick, 2013). Consequently, much of the EE marketing that can be seen today avoids or minimizes mention of environmental benefit and focuses more on lower utility bills as the key potential benefit that participants will experience. This

message, while avoiding the potentially politicized messaging about the environment, has a credibility issue. It runs directly contrary to how most residential customers view their electric utility.

On the other end of the spectrum, households with pro-environmental behavior are more likely to participate in EE programs (Gamtessa & Guliani, 2019), but even when marketing environmentally friendly products to individuals who express an elevated level of receptiveness to environmental messaging, credibility of the advertisement remains an important driver of purchase intention (Tucker, Rifon, Lee, & Reece, 2012). When looking across the spectrum of all customers in the US, we see that less than a third of customers (29%) trusted their electric utility to inform them about actions to optimize electricity consumption and only 34% were aware of EE programs offered by their utility (Accenture, 2010). Utility communications about energy efficiency run into a credibility gap on both ends of the spectrum.

Barriers to Participation in Energy Efficiency Programs

There are numerous barriers that keep customers from participating in EE programs (Lazar, 2016; Goldman et al., 2018):

- Customers don't know EE savings are possible
- Customers don't know how to implement EE savings
- Customers can't get financing for EE
- Contractors and builders don't know or aren't interested
- Specialized EE materials and equipment are not always available locally
- Misalignment of utility incentives (i.e. lack of decoupling)

To increase EE program participation, there is a clear need to communicate more about these programs and to communicate better. Utilities have the advantage of owning the relationship with customers, but a lack of credibility with their conservation messaging limits them.

Research Questions, Hypotheses and Specific Aims

This research focused on quantifying and understanding the relationships between customer perceptions and actions related to their utilities and energy consumption patterns. Conceptually, the model underpinning this analysis is that increased regulatory awareness will decrease customers' distrust of their utility, which will allow them to view EE program advertisement and conservation messaging more credibly and positively. The increased effectiveness of these messages builds stronger EE program familiarity over time and will also be associated with higher EE program participation rates (Figure 7).

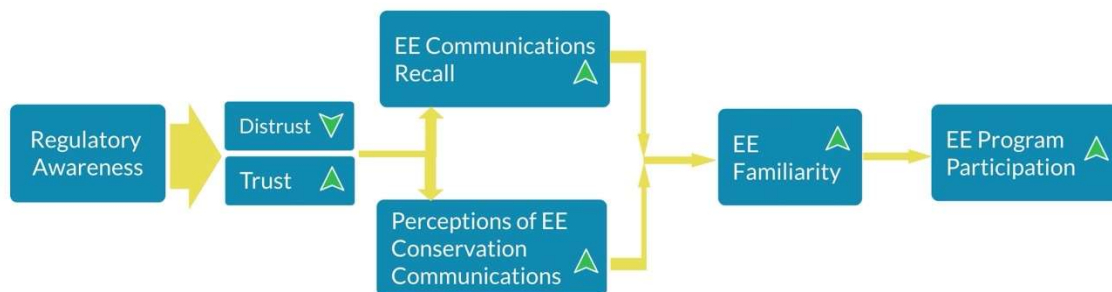


Figure 7. Model of path from regulatory awareness to EE program participation.

Regulatory Awareness influences customer trust and enables better penetration of EE communications and consequently improves EE familiarity and is associated with higher EE program participation.

This paper's key research question is: Is a lack of awareness of the utility regulation framework a significant barrier to participation in utility-driven EE programs?

Some secondary questions are:

- Among the three regulatory jurisdictions analyzed – New York, Massachusetts, and Rhode Island – where is regulatory awareness more of a barrier?
- Are there regulatory practice differences that can explain differing regulatory awareness rates?
- Can regulatory practices be leveraged from higher performing jurisdictions?
- Are there different levels of regulatory awareness among demographic groups, and how do these levels impact EE program participation?

To help address these questions, I tested the following hypotheses:

- Residential customers who are aware of utility regulatory framework are more likely to notice and remember EE advertising.
- Residential customers who are aware of utility regulatory framework will view utility EE conservation communications more positively.
- Residential customers who are aware of utility regulatory framework are 20% more likely to participate in utility-driven EE programs than similar customers who are not aware.

Specific Aims

The sequence of research tasks I executed was the following:

1. Calculate overall percentage of customers who are aware of the regulatory framework for each of the three states

2. Identify survey respondents who have participated in EE programs
3. Identify EE program participation rates for those who are aware and those who are not aware
4. Compare EE communication recollection rates between those who are aware and those who are not aware
5. Compare customer attitudes towards EE conservation messaging rates between those who are aware and those who are not aware
6. Check for statistical significance
7. Conduct analysis of regulatory awareness by demographic criteria (education, income, home ownership), and jurisdiction (New York, Massachusetts, Rhode Island).

Chapter II

Methods

To achieve the outlined aims, most of the research focused on analyzing existing primary research data. The Brand, Image and Relationship Tracker is a survey that has been conducted by a third-party agency on behalf of National Grid since 2012. It is an ongoing survey conducted among customers to track their opinions and attitudes towards the utility brand and measure the effectiveness of its communications campaigns. The survey data have been provided by National Grid for the purposes of this analysis.

Survey data were combined with EE program participation data for that same utility and for those same survey respondents. The combination of these two data sources allows the calculation of the percentage of EE program participation among customers who are aware of utility regulation as well as that same statistic for customers who are not aware.

Survey Methodology

The Brand, Image, and Relationship tracker is a National Grid study that the company uses to understand customer perceptions of its brand, the effectiveness of its communications and general customer sentiment towards the company. Interviewing is done by a third-party agency on behalf of National Grid and respondents are informed that National Grid is the sponsor. Interviewing is conducted continuously for this study with an average of more than 750 interviews conducted monthly. The resulting sample is

representative of the overall customer base per jurisdiction when survey demographic data are compared with census data. For the purposes of this analysis, the focus was on data collected during a 24-month period from April 2015-March 2017. Including two full years of survey data helps minimize the effect of seasonality or current events biasing survey respondents. Interviewing was predominantly done online through a web questionnaire sent via email invitation, although some interviewing was done over the phone during the initial three months (April – June 2015).

All survey respondents were screened to ensure they are 18 or older and are familiar with their utility (National Grid). Quotas are set by region to ensure that there is adequate sample to review survey results by region, but these quotas are not designed to make the individual regions representative within the overall survey sample.

Questionnaire

The survey included questions about customer perceptions of National Grid, their satisfaction with interactions they have had with the company, their perceptions of brand attributes and communications, recollection of specific communications, demographics, as well as a series of true/false questions that relate to customer understanding of the regulatory environment the company operates in. The questionnaire also specifically includes a question asking about awareness of energy efficiency programs (“How familiar are you with energy savings or rebate programs from National Grid that help you with ways to use less gas or electricity?”) that is used to measure effectiveness of EE marketing efforts. To identify customer recollection of EE communications, the following question was used: “Have you seen, heard, or read any advertising from National Grid that talks about how energy upgrades can make your home better?” This

question was offered along with “Yes/No/Not sure” answer options and was included in the questionnaire in April-October 2015. For the purposes of this analysis the question “How would you rate National Grid on... Usefulness of suggestions on ways you can reduce your energy usage and lower your monthly bill” was used to measure customer attitude towards EE communications. This question was asked on a 10-point scale with labels on one (“Unacceptable”), five (“Average”) and ten (“Outstanding”) and was included from November 2015 through March 2017. The demographic questions included in the questionnaire were: Education, Income, Age, and Homeownership.

Assessing Customer Awareness of the Regulatory Environment

In order to group the survey respondents by regulatory awareness, each respondent was scored based on the accuracy of their survey responses related to regulatory awareness. The questions were presented as statements and respondents were asked to confirm if the statement is True or False, or if they do not know (Table 2). For each correct response, the respondent received a point, for each incorrect response, the respondent lost a point, and for each “not sure” response the respondent got zero points. Given that there are eight statements, the maximal score was eight points, while the minimal was minus eight points (Table 3).

For the purposes of this analysis, respondents with a score of 3 or higher were considered as having regulatory awareness. This represents the top quartile of the survey respondents.

Table 2. Regulatory framework questions from National Grid Brand, Image, and Relationship study.

True/False Statements from Brand Image and Relationship Questionnaire
Supply charges are regulated by government agencies
The actual cost of purchasing energy is passed through to customers without any upcharges
Customers can choose the company that supplies their energy
National Grid can adjust energy supply fees to increase the company's profits
Delivery charges are regulated by government agencies
The actual cost of delivering energy is passed through without any upcharges
Customers can choose the company that delivers their energy
National Grid can adjust energy delivery fees to increase the company's profits.

(National Grid, 2017).

Table 3. Scoring used to calculate regulatory awareness for each survey respondent.

For each of the following statements, please indicate whether you think the statement is true or false by checking the appropriate box.	TRUE	FALSE	Not Sure
National Grid bills include separate charges for the energy supplied and the energy delivered to your home.	1	-1	0
Supply charges are regulated by government agencies.	1	-1	0
The actual cost of purchasing energy is passed through to customers without any upcharges.	1	-1	0
Customers can choose the company that supplies their energy.	1	-1	0
National Grid can adjust energy supply fees to increase the company's profits.	-1	1	0
Delivery charges are regulated by government agencies.	1	-1	0
Customers can choose the company that delivers their energy.	-1	1	0
National Grid can adjust energy delivery fees to increase the company's profits.	-1	1	0

Scoring conducted on survey data. (National Grid, 2017).

Energy Efficiency Program Participation Data

Program participation data were provided to me for the utility customers who participated in the survey and participated in an EE program any time between January 2012 through April 2020. This included program participation data from dates prior to the survey, as well as dates after the survey. Of the 18,169 customers who participated in the survey from April 2015 through March 2017, there was program participation data available for 4,263 customers representing almost one quarter of the survey respondents.

Of these, 2,436 had participated in an EE program prior to responding to the survey, and 1,822 participated in an EE program after responding to the survey.

The energy efficiency programs included in this list were:

- Home energy audits: an energy specialist inspects a home to identify opportunities for increased energy efficiency. These are conducted at no-cost and can include direct installation of energy efficient lighting and faucet aerators. The audit will also detail other opportunities for energy savings through weatherization, insulation, or heating/cooling system modifications.
- Energy Star Products: rebates offered for energy efficient equipment and appliances
- Residential gas heating and water heating: Incentives offered to homeowners to help offset the costs of installing more energy efficient gas heating and water heating equipment
- Residential weatherization: services provided to homeowners to insulate home
- Ecommerce: direct sales of specialized energy efficiency products directly from the utility with rebate already included in sales price (predominantly smart thermostats and related)
- HVAC: Central AC – Incentives offered to homeowners to help offset the costs of installing more energy efficient central air conditioning
- Low-income services : weatherization, insulation, and heating services offered at no-cost to qualifying low-income households
- Refrigerator recycling: buyback program for functional, yet inefficient older refrigerators and freezers

Behavioral EE program participation is very different from any of the aforementioned programs. Customers participate by curtailing their energy usage after they receive a HER. Given that this level of data was not available, these types of programs were not included in this analysis.

Analyzing Datasets

Each record in both datasets included a unique account number. Using these, EE participation data were added to the survey dataset. To ensure sample independence, during the merging process duplicate records in each dataset were removed, giving preference to the earliest record. So, if a survey participant responded more than once in the 24-month period, only the first interview was included in the analysis. Similarly, if a customer participated in multiple EE programs, the earliest program participation date was used for the analysis.

Two methods were used to assess the linkage between regulatory awareness and EE program participation:

- The survey confirmed that customers who had already participated in an EE program prior to the survey have higher levels of regulatory awareness
- Those who expressed higher levels of regulatory understanding in the survey were more likely to subsequently participate in an EE program.

Unless otherwise noted, no weighting was applied to the survey data. If data analysis required weighting survey data, it is disclosed in the results section.

Significance testing was done for each pair of scores using t-tests to identify statistical significance at the 95% confidence level.

Chapter III

Results

Generally, the level of regulatory awareness was low when all data were combined for the three states. Nearly half (45%) of the survey respondents received a zero or a negative score (Figure 8). A score of three or higher represents top quartile of Regulatory Awareness and was used as the threshold for delineating between respondents who have regulatory awareness (only 25%) and those who do not.

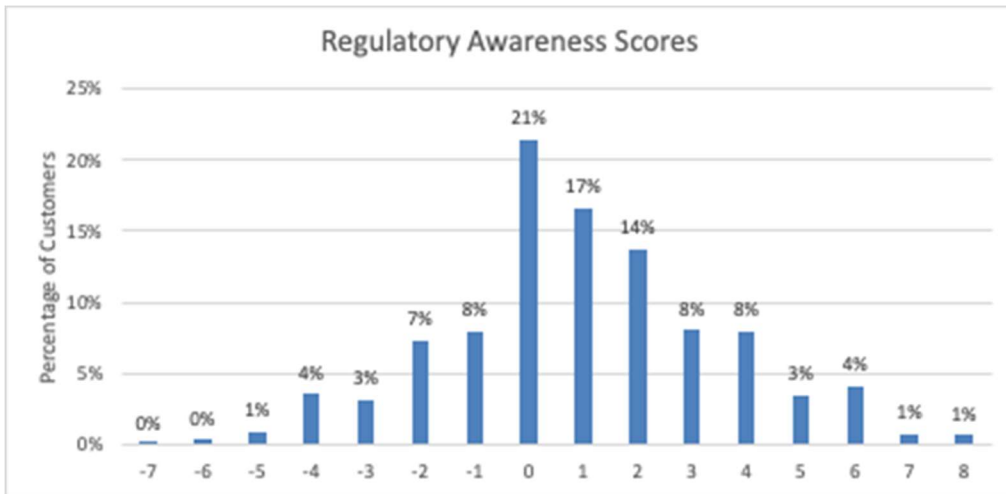


Figure 8. Distribution of survey respondents by regulatory awareness score.

Regulatory awareness scores calculated from survey responses (National Grid, 2017)

The level of customer awareness of the regulatory environment differed by Jurisdiction. Regulatory awareness was highest in Upstate New York (29.1%) and Rhode

Island (28.0%) and lowest in New York City (20.2%) and Long Island (22.0%), while Massachusetts (24.3%) was close to the overall average (Figure 9).

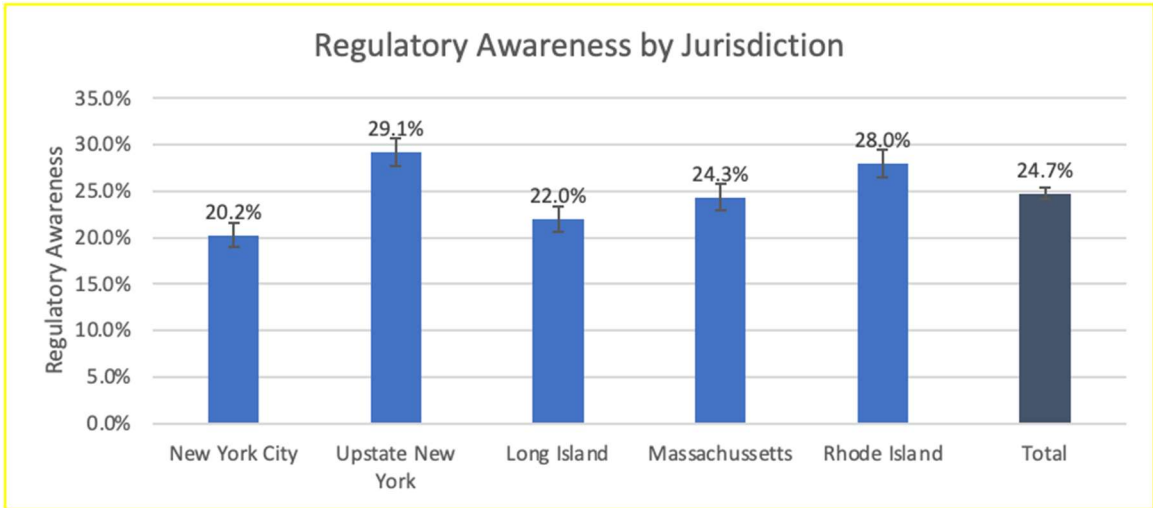


Figure 9. Regulatory awareness by region.

Error bars represent 95% confidence level. Regulatory awareness scores calculated from survey data for each jurisdiction (National Grid, 2017).

Impact of Regulatory Awareness on Customer Perceptions

Customers who had higher levels of regulatory awareness had lower levels of distrust and somewhat higher levels of trust (Figure 10). The question in the survey was “How much do you trust National Grid to provide you the advice you need to make good energy decisions?” This question was offered on a ten-point scale with one labeled “Do Not Trust Advice at All” and ten labeled “Trust Advice Completely”. For the purposes of this analysis, distrust was measured by a rating of four or lower, while trust was measured with a rating of 6 or higher.

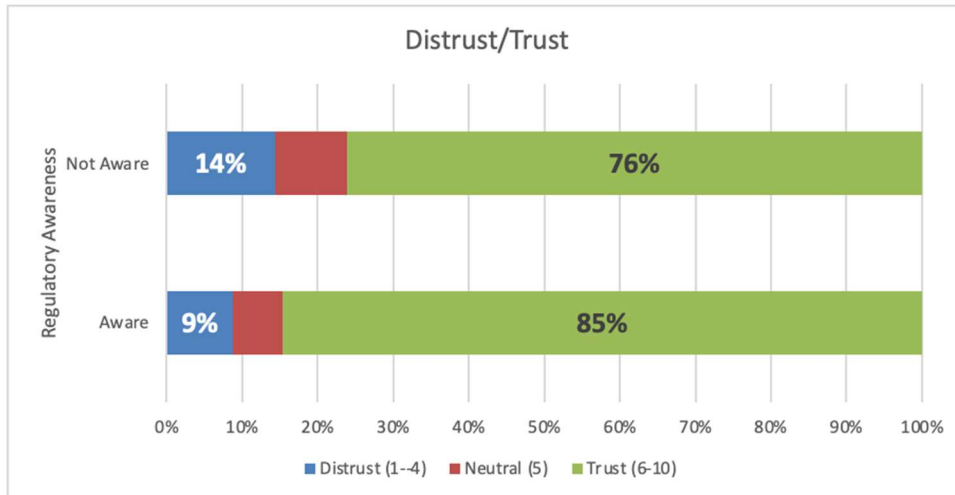


Figure 10. Distrust and trust by regulatory awareness.

Regulatory awareness, Distrust, and Trust calculated from survey data (National Grid, 2017).

While both measures come from the same question, it is important to look at them separately. Within this context, it is important to recognize that regulatory awareness is not so much a driver of trust, as its absence can be a barrier to trust. Among respondents who had regulatory awareness, the distrust rate was 8.8%, while among respondents who did not have regulatory awareness this is 14.3% - a difference of 40%. This difference is statistically significant ($t= 10.38, p= 0.05, n_{\text{Aware}}=4,249, n_{\text{Not Aware}}=12,837$). Among respondents who had regulatory awareness, the trust rate was 84.7%, while among respondents who did not have regulatory awareness had a significantly lower trust rate of 76.1%, ($t= 12.73, p= 0.05, n_{\text{Aware}}=4,249, n_{\text{Not Aware}}=12,837$).

The same pattern was seen in each of the jurisdictions included in this analysis. Distrust decreased among all jurisdictions. The smallest decrease was seen in Long Island (33%) and largest decrease in Rhode Island (49%). All of the jurisdictional level differences were statistically significant ($p<0.05$). Trust increased in each jurisdiction.

The largest increase was also in Rhode Island (17%) while the smallest increase was in New York City (7%) (all $p < 0.05$).

Communications Recollection

Customers were asked “Have you seen, heard, or read any advertising from National Grid that talks about how energy upgrades can make your home better?” Customers who had higher levels of regulatory awareness had a 48% recollection rate, while other customers had a recollection rate of 35% (Figure 11). This difference represents 38% higher recollection of utility EE communications attributable to regulatory awareness. The difference in recollection levels was significant ($t = 8.89$, $p = 0.05$, $n_{\text{Aware}} = 1,417$, $n_{\text{Not Aware}} = 4,680$) and was consistent across all the jurisdictions included in the analysis.

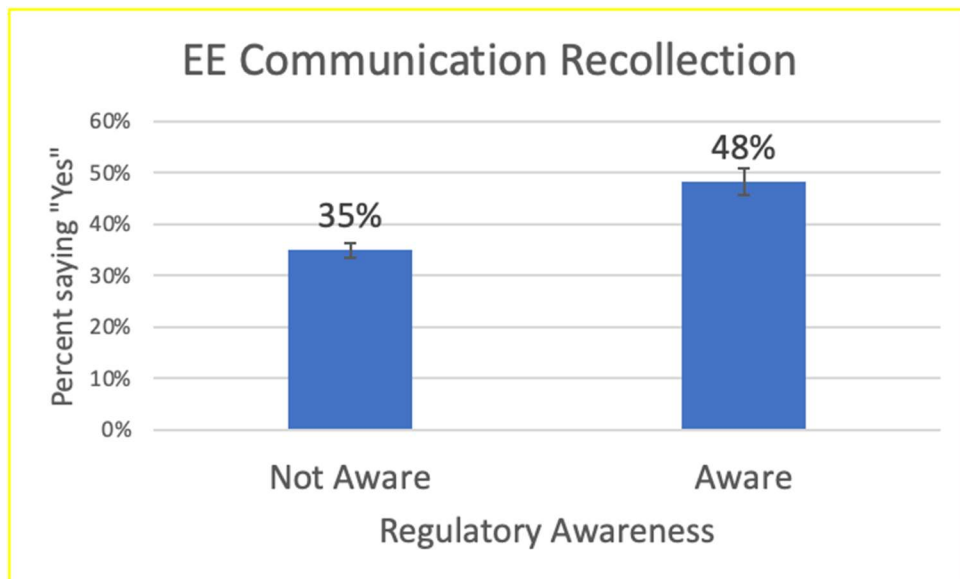


Figure 11. EE communications recollection by regulatory awareness.

Error bars represent 95% confidence level. Regulatory awareness and communications recollection calculated from survey data (National Grid, 2017).

EE Familiarity

Customers were asked “How familiar are you with energy savings or rebate programs from National Grid that help you with ways to use less gas or electricity?”

Customers who had higher levels of regulatory awareness had an EE Familiarity rate of 52%, compared with other customers who had 38% (Figure 12). This represented a difference of 32% higher levels of EE Familiarity attributable to regulatory awareness.

The difference was statistically significant ($t= 14.4$, $p= 0.05$, $n_{\text{Aware}}=3,757$, $n_{\text{Not Aware}}=11,989$).

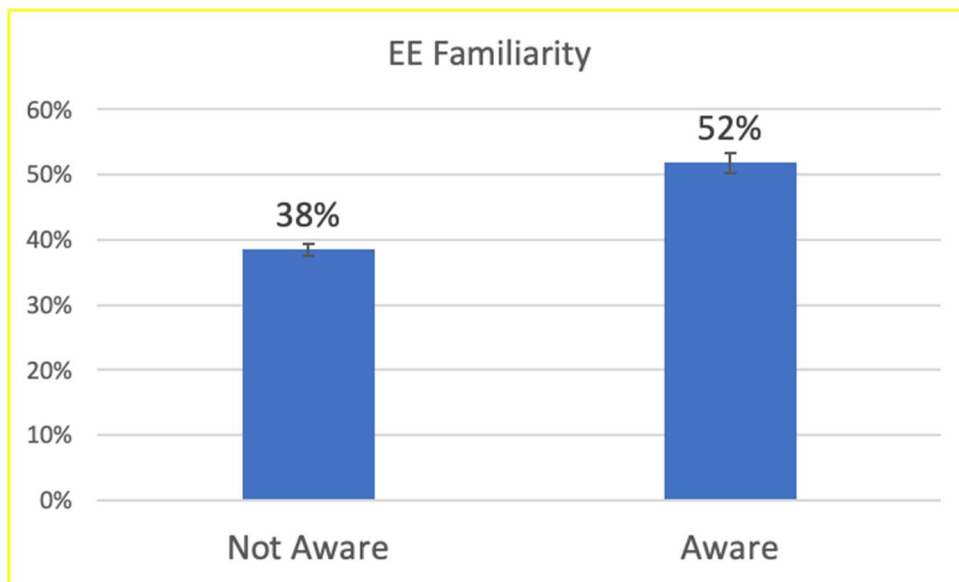


Figure 12. EE familiarity by regulatory awareness.

Error bars represent 95% confidence level. Regulatory awareness and EE familiarity calculated from survey data (National Grid, 2017).

Communications Effectiveness

Customers were asked to rate “usefulness of suggestions on ways you can reduce your energy usage and lower your monthly bills.” Among customers who had regulatory

awareness, 64% provided a positive rating. While other customers provided a 52% positive rating (Figure 13). This difference represented a 23% higher positivity rate attributable to regulatory awareness. This difference was statistically significant ($t=11.63$, $p=0.05$, $n_{\text{Aware}}=2,844$, $n_{\text{Not Aware}}=7,952$). A similar pattern was seen across all jurisdictions and meets the threshold for statistical significance in each one.

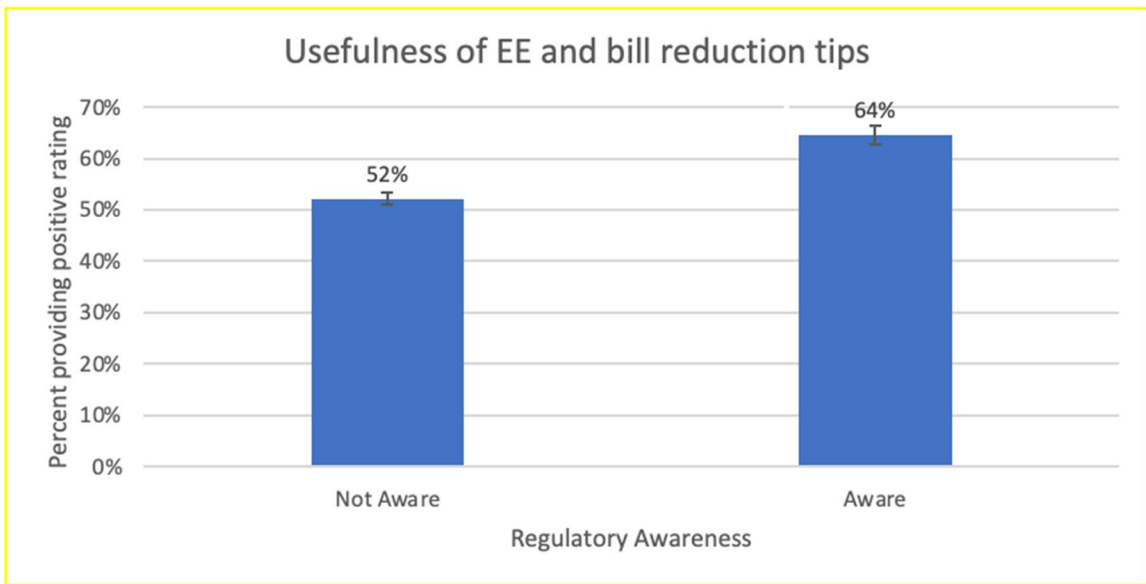


Figure 13. Effectiveness of EE communications by regulatory awareness.

Error bars represent 95% confidence level. Regulatory awareness and communications effectiveness calculated from survey data (National Grid, 2017).

Demographics of Regulatory Awareness

Regulatory awareness also tends to increase with age, education, income, and homeownership.

Approximately 15% of respondents under the age of 35 had regulatory awareness, while that percentage was double for those 65 and older (Figure 14). This pattern was consistent across all jurisdictions.

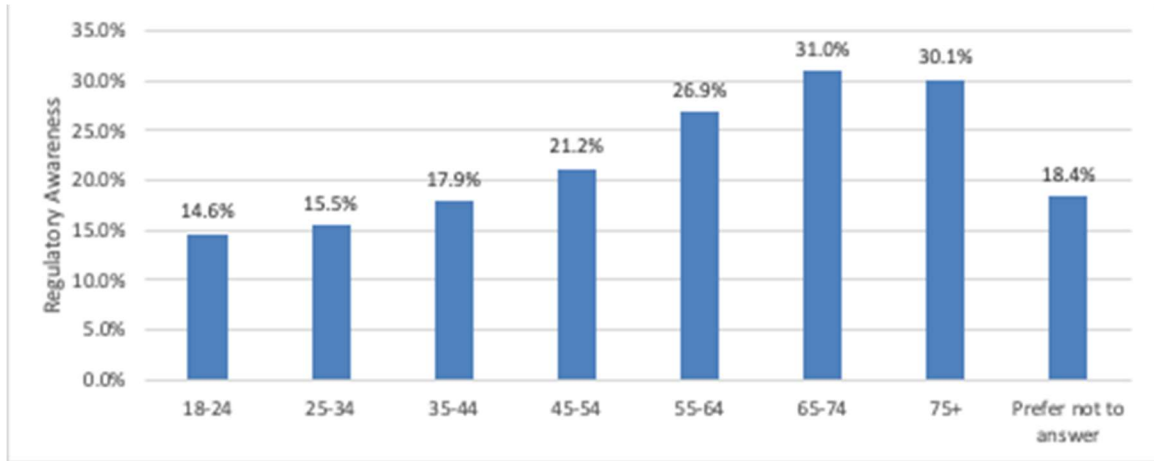


Figure 14. Regulatory awareness by age group.

Regulatory awareness calculated from survey data (National Grid, 2017).

Approximately 20% of respondents with a High School degree or less had regulatory awareness. Among respondents with vocational or college education this was approximately 25%, while among those with postgraduate study or a professional degree the percentage approached 29% (Figure 15). This pattern was consistent across all jurisdictions.

Education and income tend to be correlated, so a similar pattern is seen when we look at income levels. Approximately 30% of those making \$100,000 per year had regulatory awareness. That number was approximately 20% for those making less than \$50,000 and in between for those making \$50,000-\$99,999 (Figure 16). This pattern was consistent across all jurisdictions.

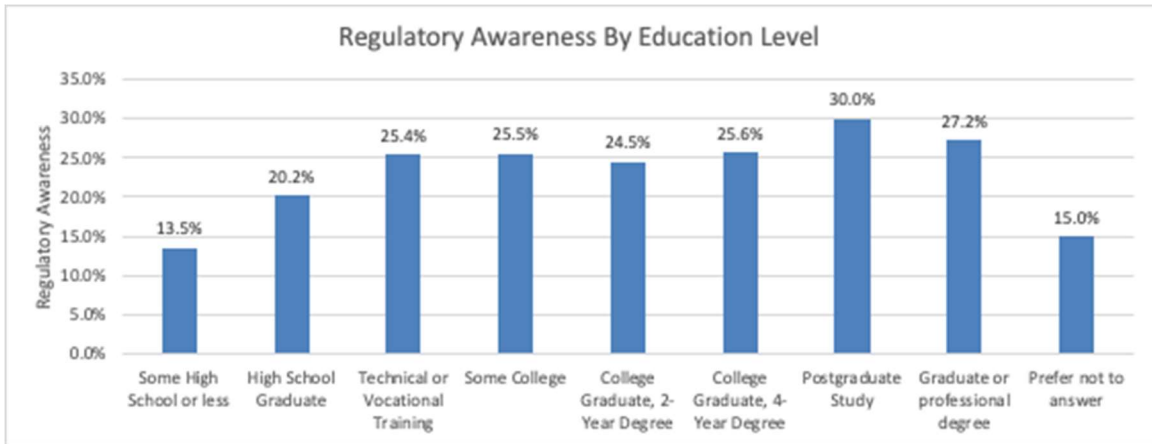


Figure 15. Regulatory awareness by education level.

Regulatory awareness calculated from survey data (National Grid, 2017).

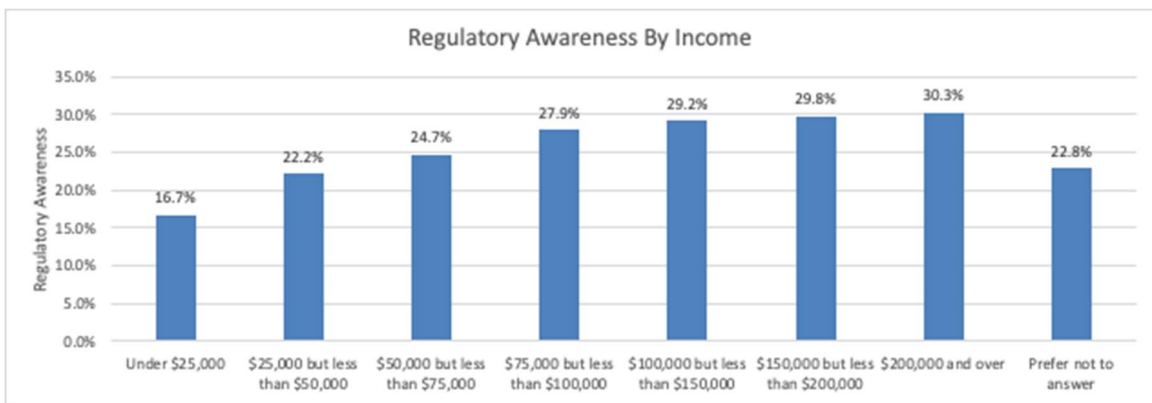


Figure 16. Regulatory awareness by income level.

Regulatory awareness calculated from survey data (National Grid, 2017)

Across all jurisdictions, homeowners were more likely to have regulatory awareness. When looking at the overall dataset, 27.1% of homeowners had regulatory awareness compared to 18.2% of renters (Figure 17). This difference in regulatory awareness was statistically significant ($t= 11.92$, $p= 0.05$, $n_{\text{Rent}}=3,430$, $n_{\text{Own}}=13,531$).

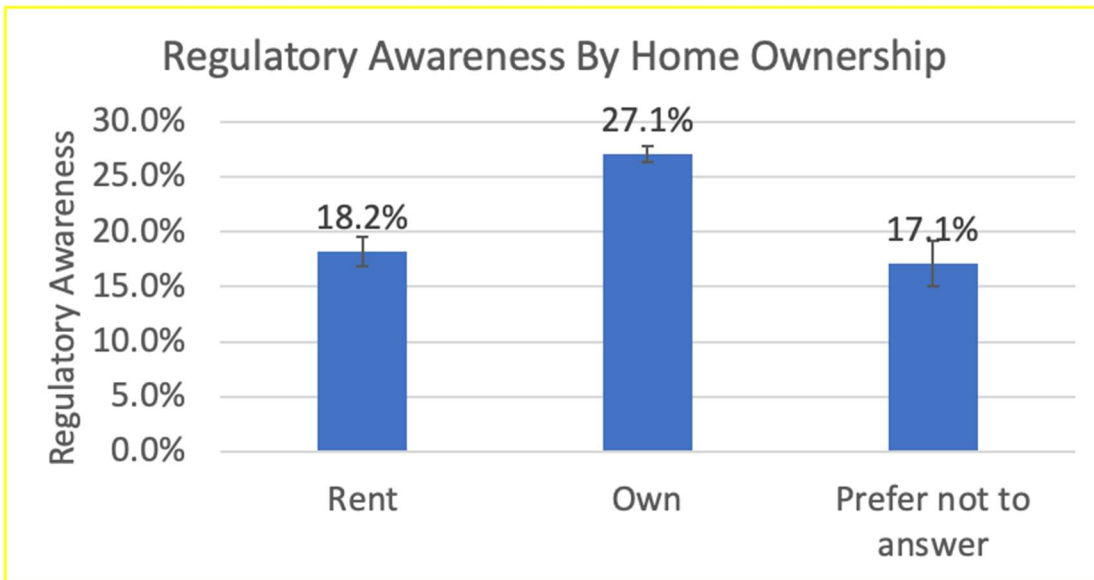


Figure 17. Regulatory awareness by home ownership.

Error bars represent 95% confidence level Regulatory awareness calculated from survey data (National Grid, 2017).

Regulatory Awareness and EE Program Participation

Aside from looking at the attitudinal data about customer perceptions of EE communications, another way to confirm a linkage between regulatory awareness and EE program participation is to look at the regulatory awareness levels of customers who have already participated in an EE program compared to customers who have not. Did survey respondents who participated in an EE program prior to the survey have higher levels of regulatory awareness? Among respondents who participated in an EE program prior to the survey, 30.5% had regulatory awareness, while this number was 23.9% among those who did not participate in an EE program prior to the survey (Figure 18). This difference is statistically significant ($t= 6.67$, $p= 0.05$, $n_{\text{PriorEEParticipation}}=2,423$, $n_{\text{NoPriorEEParticipation}}=15,746$). The pattern was consistent among all jurisdictions and

provides further evidence of a linkage between Regulatory Awareness and EE Participation.

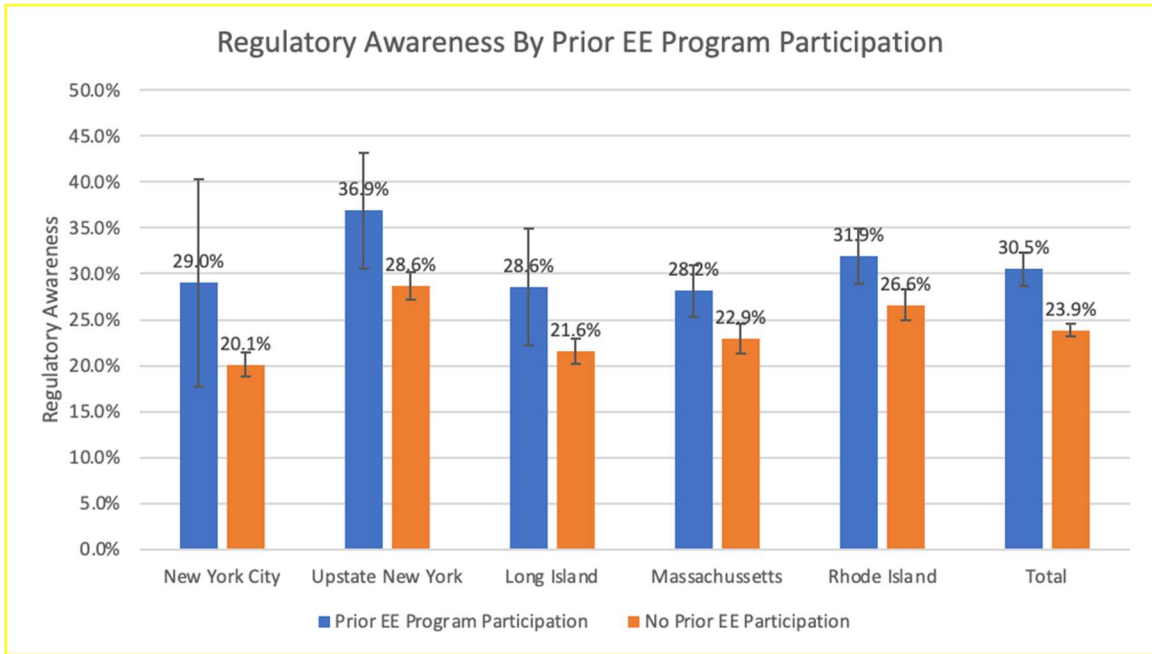


Figure 18. Regulatory awareness by prior EE program participation by jurisdiction.

Error bars represent 95% confidence level. Regulatory awareness calculated from survey data and cross-referenced with program participation data for period prior to survey (January 2012- February 2017) (National Grid, 2017).

Yet another way to look at this linkage is to examine EE program participation rates post-survey. When looking at the participation rate of the respondents who participated in their first EE program after they completed the survey, among those who had a higher regulatory awareness score (3 or higher) the participation rate was 14.4%, while the participation rate for those who did not have regulatory awareness was 10.7% (Figure 19). The difference was significant ($t= 5.75$, $p= 0.05$, $n_{\text{Aware}}=3,757$, $n_{\text{Not Aware}}=11,989$) and this finding supports the hypothesis that higher regulatory awareness

was associated with higher levels of EE program participation. It also supports the hypothesis that regulatory awareness is associated with an increase of participation of at least 20%.

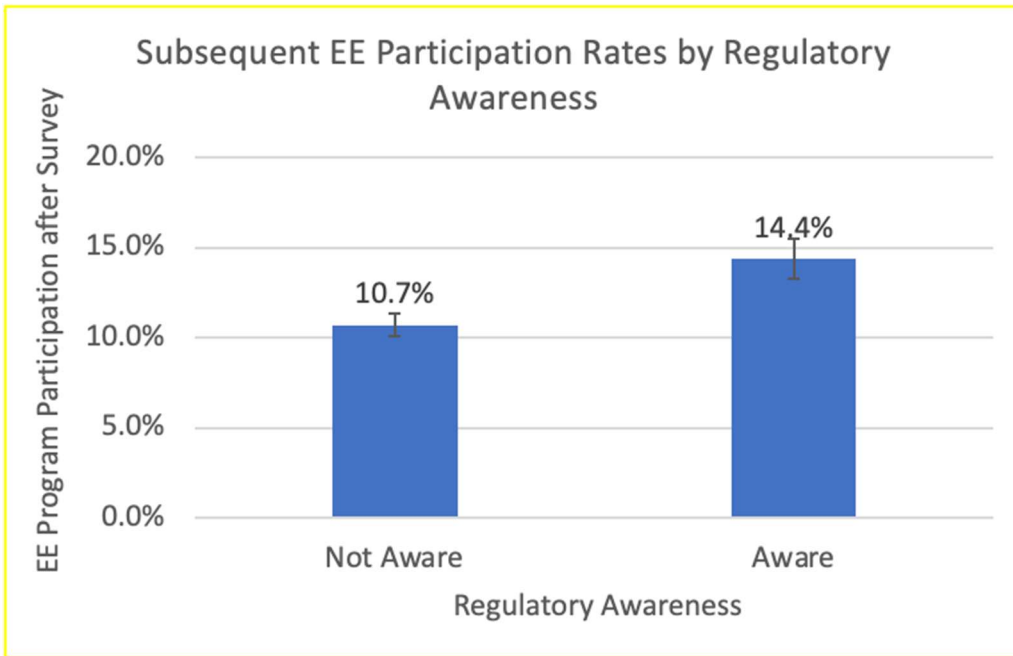


Figure 19. Post-survey EE program participation by regulatory awareness

Error bars represent 95% confidence level. Regulatory awareness calculated from survey data and cross-referenced with EE program participation data for period after survey (April 2015-April 2020) (National Grid, 2017).

Across all jurisdictions there was a higher level of participation among those respondents who had higher regulatory awareness compared to those who had lower regulatory awareness (Figure 20). However, the difference in scores was not consistent. The greatest difference is in Upstate New York (4.4 percentage points, $t= 3.45$, $p= 0.05$, $n_{\text{Aware}}=978$, $n_{\text{Not Aware}}=2,437$), and New York City was the only other jurisdiction to

individually reach the threshold of statistical significance ($t= 2.23$, $p= 0.05$, $n_{\text{Aware}}=717$, $n_{\text{Not Aware}}=2,851$).

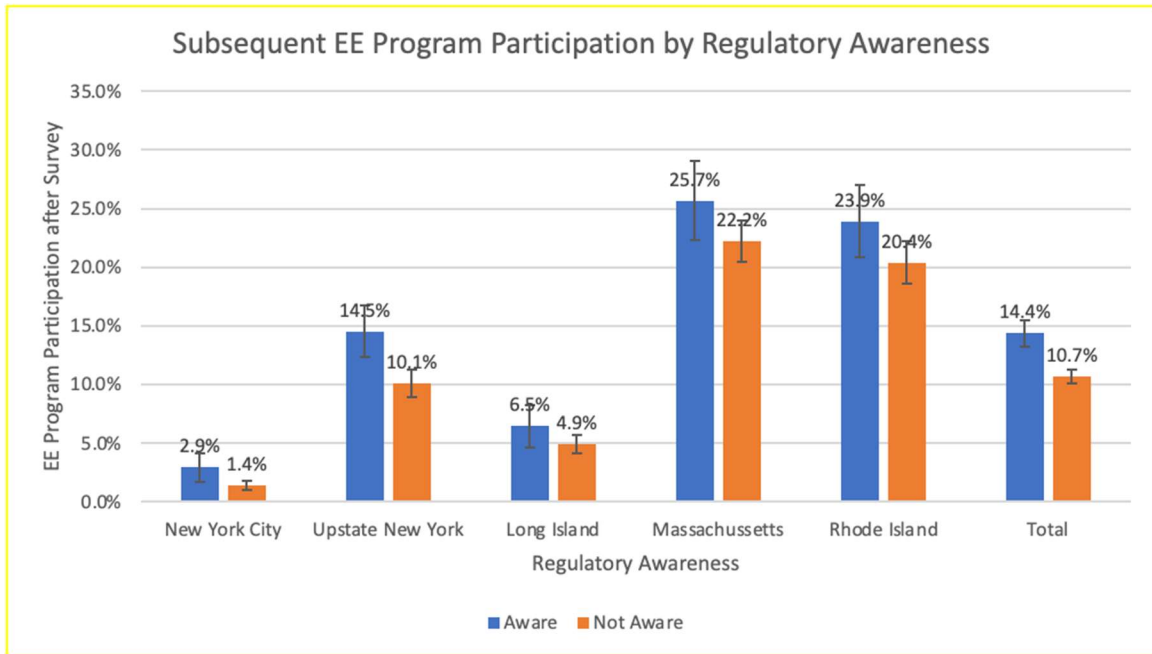


Figure 20. Post-survey EE participation by regulatory awareness by jurisdiction.

Error bars represent 95% confidence level. Regulatory awareness calculated from survey data and cross referenced with EE program participation data for period after survey (April 2015-April 2020) (National Grid, 2017).

Accounting for EE Marketing Activities

Utilities spend heavily to market EE programs to customers. These communications are often targeted towards the demographics that are most likely to participate (e.g. homeowners) and are designed increase their participation rates. Different EE programs have different marketing campaigns with varying budgets and successes across jurisdictions. With all of these variables, it is possible that utility marketing efforts are increasing program awareness among target groups – who are also

more likely to have regulatory framework awareness – and this may be influencing participation rates seen in this analysis.

The questionnaire included a specific question that allowed for a very clear quantification of the impact these marketing efforts had on the survey respondents. This question was: “How familiar are you with energy savings or rebate programs from National Grid that help you with ways to use less gas or electricity?” It was offered with a scaled response Very/Somewhat/Not Very/Not At All Familiar.

It is reasonable to expect a linkage between EE Familiarity and Regulatory Awareness, and this is indeed confirmed in the data. Respondents who indicated they are Very Familiar with EE Programs had a Regulatory awareness level of 32%, while those who indicated they are Not At All Familiar with EE Programs had a Regulatory Awareness level of 17%.

For the purposes of this analysis, the relationship between EE Familiarity and Regulatory awareness is not necessarily a negative. As seen in earlier analysis, higher levels of Regulatory Awareness were associated with greater EE communications recall and more positive sentiment towards these types of communications. When the goal is to increase participation in these programs, getting people to become familiar with these programs is an important prerequisite. However, within the scope of this research, it is also important to differentiate the effects of marketing from the effects of regulatory awareness on EE program participation. To address this, weights were applied using the base weights method as described by Valliant, Dever and Kreuter (2013). Essentially, each survey response was assigned a weight to “correct” for over or under representation within a given analysis stratum. For this analysis, survey responses from those who had

EE Familiarity in the Aware group were assigned smaller weights and survey responses from those who had EE Familiarity within the Not Aware group were assigned larger weights, so that they are equally represented in both groups. The weights used in this process were not extreme and ranged from 0.8 to 1.2. After weighting, the difference in participation rates between those who had regulatory awareness and those who did not changed only very slightly. Among those who had higher regulatory awareness, the participation rate was 14.1%, while the participation rate for those who did not have regulatory awareness was 10.8% (Figure 21). The difference in percentages was statistically significant ($t= 5.07$, $p= 0.05$, $n_{\text{Aware}}=3,753$, $n_{\text{Not Aware}}=11,974$).

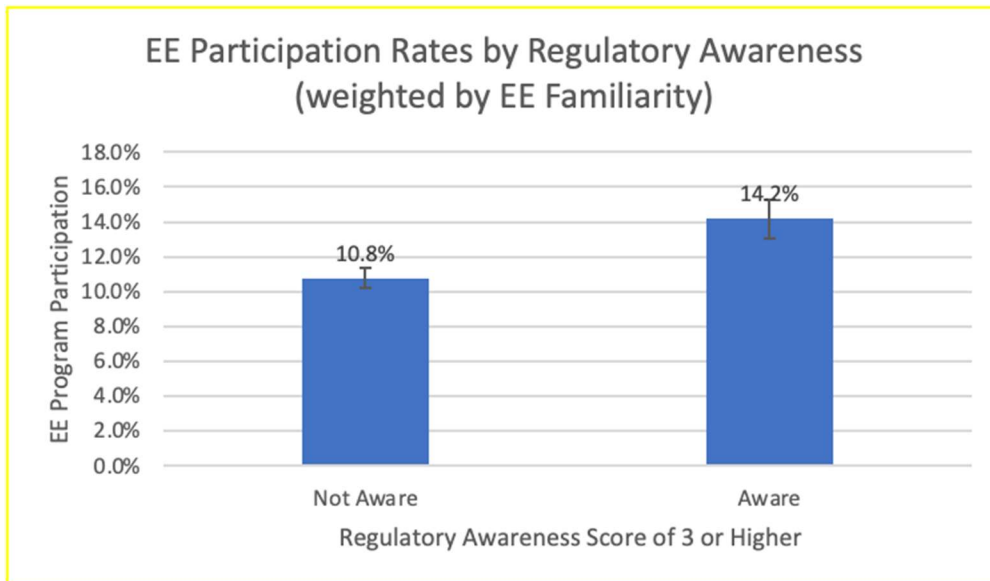


Figure 21. Post-survey EE participation rates by regulatory awareness (EE familiarity weighting)

Error bars represent 95% confidence level. Regulatory awareness calculated from survey data and cross referenced with EE program participation data for period after survey (April 2015-April 2020) (National Grid, 2017).

Upon closer observation, we see that the EE participation rate among those who have awareness, but not familiarity (12.8%) rivaled the participation rate of those who have familiarity, but not awareness (13.3%) and suggests that awareness on its own can cause customers to seek information on EE programs at levels that are comparable to the effects of marketing.

Accounting for Demographic Differences

Another potential bias stems from differences in program participation rate and regulatory awareness rates between demographic groups. Homeowners had more EE programs available to them, so it is not surprising that their EE participation rates were higher than renters.

Weighting was also used to address this. Prior analysis had confirmed that Regulatory Awareness increases with age, income, education and is associated with homeownership. However, weighing by a large number of variables can introduce instability into the analysis from excessively small or large weights applied to the survey data.

There was also multicollinearity between these demographic variables that can further contribute instability to the analysis. To identify the demographic variables most relevant to this analysis, stepwise linear regression was applied using the four demographic variables as the independent variables and post-survey program participation as the dependent variable. The resulting regression model identified homeownership and education as the combination of variables that was most predictive of EE program participation among the variables included. These two variables were subsequently used for demographic weighting. Weighting was conducted using the base

weights method as described by Valliant, Dever & Kreuter (2013), similar to weighting described for EE familiarity.

After the application of weights, the difference in the program participation rates for the two groups decreased, but remained statistically significant ($t= 3.89$, $p= 0.05$, $n_{\text{Aware}}=3,838$, $n_{\text{Not Aware}}=11,963$) and supported the hypothesis that regulatory awareness was associated with a 20% increase in program participation (Figure 22).

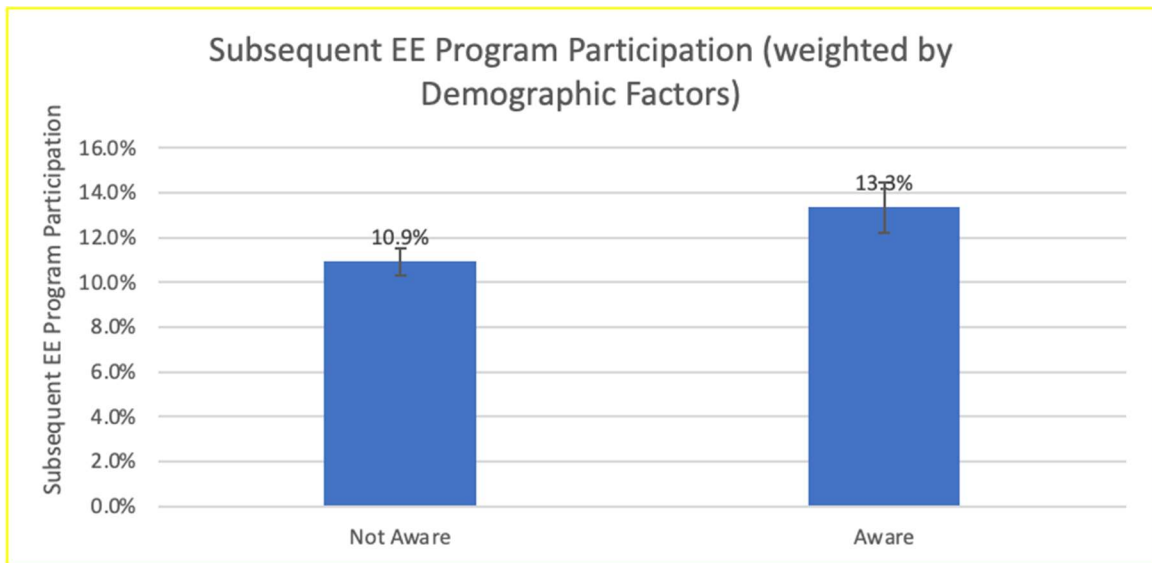


Figure 22. Post-survey EE participation rates by regulatory awareness (demographics weighting)

Error bars represent 95% confidence level. Regulatory awareness calculated from survey data and cross referenced with EE program participation data for period after survey (April 2015-April 2020) (National Grid, 2017).

It is also important to point out that differences in regulatory awareness between homeowners and renters is not unexpected. Renters often do not pay for heating directly and do not have the ability to upgrade heating equipment or install additional insulation. There are more EE programs available to homeowners. The EE program participation

rates were much lower for renters (5.1%) than homeowners (13.7%), although EE participation rates were higher for both groups among respondents who had regulatory awareness. They were 15.5% higher for renters and 30% higher for homeowners.

Chapter IV

Discussion

The results from this analysis provide evidence of the relationships outlined in the hypotheses: the relationships between regulatory understanding and customer likelihood to remember EE advertising, their likelihood to view this advertising positively, and ultimately their likelihood to participate in an EE program (Figure 23). This evidence provides support to the proposed conceptual model path from regulatory awareness to increased EE program participation and is further bolstered by evidence of a relationship between regulatory understanding and customer distrust/trust and EE familiarity.

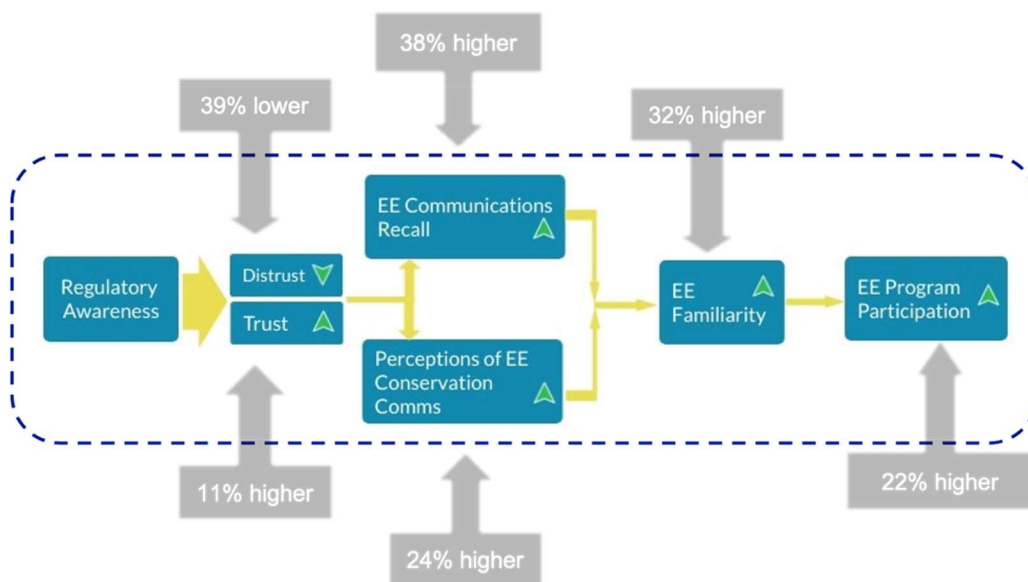


Figure 23. Path from regulatory awareness to EE participation with observed outcomes.

EE participation rate weighted by demographics was used for this graph. Regulatory awareness and other attitudinal measures calculated from survey data and cross referenced with EE program participation data for period after survey (April 2015-April 2020) (National Grid, 2017).

The analysis provided multi-dimensional evidence of the relationship between regulatory understanding and EE program participation. This relationship was noted both by higher levels of regulatory awareness among pre-survey EE program participants, but also by higher levels of post-survey EE program participation among those who had regulatory awareness. And when controlling for the effects of marketing and demographics, the relationship remained statistically significant.

The analysis also confirmed the relationship between regulatory awareness and the intermediate customer perceptions on the proposed conceptual model at the beginning of this thesis (Figure 23). Regulatory awareness was associated with 39% lower distrust, 11% higher trust, 38% higher EE communication recall, 24% higher positive perceptions of conservation messaging, 32% higher EE Familiarity and ultimately a 22% higher EE participation rate. All of these relationships were also observed at each of the individual jurisdictional levels.

Jurisdictional Findings

The three states included in this analysis rank within the top five in the US for EE. They have a longer history of EE regulation than most states in the country and their experiences offer some context and references to other states seeking to reduce their energy usage. For states considering implementing EERS and deciding which program administration model to adopt, customer trust is one of the factors they will need to consider. This research provides evidence of the importance of this factor, but also highlights the different ways the choice in program administrator can impact the importance of this factor. The analysis suggests that regulatory awareness is more

important in jurisdictions where there are multiple program administrators such as New York.

The proposed model was supported by evidence for all the jurisdictions included in this analysis, but had different levels of intensity. The relationship was strongest in New York, the jurisdiction that had numerous program administrators. In the jurisdiction where the utility is the single program administrator (Rhode Island) the relationship between regulatory awareness and program participation was not as strong. The weakest relationship was seen in Massachusetts, the jurisdiction where multiple program administrator identities are masked behind a unified third-party marketing brand. The analysis suggests that a specialized EE marketing brand can circumvent some of the impact of regulatory awareness, but not all.

Findings Relevant to EE Marketing

This research also suggests that EE program marketers should consider regulatory awareness when designing their marketing efforts. Reviewing existing communications through the lens of believability is a relatively low-cost way to potentially increase the effectiveness of these communications. These communications are important not only to drive higher levels of participation in EE programs, but also to simply drive higher levels of conservation behavior. While marketers will traditionally want to focus on communicating the benefits of these programs, they may want to include a reference to the regulatory framework in their communications to make them more credible

They may also want to market programs in a way that leverages existing regulatory awareness in the customer base. One possibility would be to look at bundling

EE programs so that customers who participate in one program are invited to participate in other programs too. Another option would be to incentivize referrals.

These findings are also relevant when defining EE marketing budgets. Many EE programs have defined marketing budgets that are dedicated to individual programs, and these are often defined in the early stages of program development. My analysis suggests that increased regulatory awareness may drive increased participation across different programs. It may be worthwhile to view these individual program budgets more holistically to account for a common benefit generated by communications that address the need for greater customer awareness.

This research also suggests that other regulatory interventions could achieve higher levels of customer participation with greater awareness of the relevant regulatory framework. Supplier choice is an example. As discussed in the introduction, it has been many years since decoupling was introduced in Massachusetts, Rhode Island, and New York, yet this analysis shows that a significant percentage of the ratepayers are not familiar with the basics of the decoupled energy market. With the introduction of supplier choice, customers can choose to switch their energy provider. However, it is unclear how customers could pursue their interests in this market if many of them are not even aware that they are already participants in this market. This can also leave unknowing ratepayers vulnerable to deceptive marketing practices.

Regulatory awareness is associated with more positive perceptions of energy conservation communications. This association was consistently strong across the three states included in this analysis. Given the broad and consistent linkage across jurisdictions with different models of EE program administration, this finding could have

applicability among a wide group of energy policy stakeholders in other states too. With greater usage data available to utilities through broader implementation of smart meter technology, conservation tips and communications will become more customized and sophisticated. Positioning these communications in a manner that is credible and believable will be an important contributor to their success in encouraging behaviors that will limit energy usage. Although behavioral EE program participation data were not available for this analysis, this research suggests that regulatory awareness may be associated with higher levels of energy savings through those types of programs too.

Recommendations for Utilities and Other EE Program Administrators

- Proactive customer education of the regulatory framework. Recognize that many customers may not be familiar with the rules that govern their relationship with their utility. This is a barrier for EE program participation and may also impact utilities' ability to gain customer acceptance of other utility-offered services and products.
- Review existing EE communications through the lens of believability. While it is important to convince customers of the benefits of these programs, they are less likely to see these communications if they come from an entity they distrust.
- Review EE communications budgets to account for the cross-program benefit of regulatory awareness.
- Develop more programs for renters. Participation rates for renters is significantly lower.

- Recognize that homeownership is a key moment when learning about regulatory framework and EE programs can be impactful.
- Consider ways to leverage regulatory understanding among those who have already participated in an EE program. This could be done by targeted marketing to past participants or incentivizing past participants to recruit new participants.

Recommendations for Regulators

- Increase and maintain ratepayer awareness of their regulatory protections. Ratepayers need education if they are to be informed participants in the energy markets.
- When implementing regulatory change, consider a strategy for communicating this change to ratepayers and confirming that any planned educational outreach has indeed achieved the stated goals.
- Consider the customer perspective when developing a model for EE program administration. Will customers have one program administrator? Many program administrators? Are these familiar entities? How burdensome is it for customers to find EE program information? How credible will it be coming from a given source?

Questions for Further Research

Questions that might be addressed in further research include:

- Are there specifics of customer attitudes in the Northeast that limit the ability to apply these findings in other regions? While the analysis included utility

customers in three different states, all three states were in the Northeast US. It is possible that customer perceptions are different in other regions where energy usage patterns are different, economic situations are different, or cultural differences may affect the relationship between regulatory understanding and likelihood to participate in EE programs.

- Are these findings applicable to behavioral EE programs? Customers who “participate” in behavioral EE programs are not individually logged by program administrators, so we do not have a way to confirm their participation in the scope of this analysis. However, this analysis indicates that there may be a relationship and opportunity to improve the performance of these programs.
- How can the utility regulatory framework be communicated in a clear and convincing manner to customers? Utility regulation is a complex process involving many stakeholders. The resulting framework can be counterintuitive. While this research indicates a need for strengthening public awareness of these frameworks, the effectiveness of specific messages is a topic that warrants further exploration.
- Which entity is best suited to educate the public on the regulatory framework? The utility, other program administrator, government agency? Other entity? This analysis focused on utility communications. Communications from other entities may be more or less successful.
- What are some of the existing mechanisms that give customers insight into utility regulatory framework? To better understand how to educate others, it may be useful to understand how this information is currently being disseminated.

- What specific element of regulatory awareness is most influential in driving EE participation? This analysis looked at the sum of several elements of the regulatory framework. The underlying assumption is that these are all impactful. Understanding the relative importance of these elements will offer additional insights.
- Does regulatory awareness help program participation for other program administrators (such as state agencies)? As states develop new types of EE programs with potential new profiles of EE program administrators, regulatory awareness may be more or less impactful to participation.

Conclusions

This analysis presented compelling evidence of a relationship between regulatory understanding and EE program participation. It provides a conceptual pathway that suggests an explanation of the mechanics of how regulatory awareness drives EE participation and is supported by evidence at each juncture. While regulatory awareness is just one small piece of the puzzle to maximizing EE program participation, which is also one piece of the puzzle to reducing GHG emissions, it is my sincere hope that some of the recommendations offered here will eventually make a contribution to this effort.

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