



Applying customer commitments to natural gas utility energy conservation

Ted C. Peterson

Received: 3 November 2022 / Accepted: 30 April 2023 / Published online: 12 June 2023
© The Author(s), under exclusive licence to Springer Nature B.V. 2023

Abstract Previous energy conservation research highlights the importance of behavior, customer commitments, and energy efficiency programs. Much has been written on the impact of behavior energy efficiency savings documented through home energy report programs. This research expands upon utility efforts to offer behavior utility programs and documents the impact of utility customer commitment research through a formalized utility pilot program. In this pilot program in Utah, the ThermWise® (ThermWise is the company related branding for Dominion Energy’s energy efficiency programs in Utah.) Energy Pledge, natural gas utility residential customers agreed to a 2-year customer energy pledge pilot program (2019–2021). By enrolling in the pilot, customers set a goal for energy reduction. Customers received monthly text messages in the program with energy-saving tips, a monthly goal status email, cold winter text alerts, and annual emailed program reports.

Initially, in 2019, over 2000 customers enrolled in the pilot program. Following the program, an evaluation revealed significant energy savings. Most compelling in those findings discovered that customers who agreed to allow their name to be published on a corporate website had over double the savings of other program participants. The pledge program confirms the impact of customer commitments on their energy use and offers promise for future utility programs encompassing commitments. Further research is warranted on identifying how further incorporate commitments into utility programs.

Keywords Natural gas utility energy efficiency programs · ThermWise Energy Pledge · Commitment-making · Energy pledge · Natural gas conservation

Introduction

The United Nations reports that “climate change is the defining issue of our time, and we are at a defining moment” (*Climate Change*, 2020). Concerns about energy reliability and human-caused climate change lead to growing pressure on utilities to manage energy demands (Dietz et al., 2009). Since the 1970s, USA utilities have operated energy efficiency/demand side management programs. The first utility energy-efficiency programs emerged amidst the 1973 energy crisis. The first programs initially emerged in

Supplementary information The online version contains supplementary material available at <https://doi.org/10.1007/s12053-023-10122-8>.

T. C. Peterson (✉)
University of Utah, Salt Lake City, UT, USA
e-mail: ted.peterson@dominionenergy.com

T. C. Peterson
Dominion Energy, Salt Lake City, UT, USA

the electric utility industry. States such as California (1975) and Wisconsin (1980) authorized programs as early as 1975 with an emphasis on least-cost planning (Nadel, 1992); (Nadel & Geller, 1996); (Eto, 1996).

Energy efficiency's impact can greatly alleviate a utility's supply needs. One study notes that 18% of America's electricity generation in 2015 could be construed as derived from energy efficiency efforts (Molina et al., 2016). As utility energy efficiency programs mature with better data and an improved understanding of consumption, utility programs seek to expand savings on equipment operation by directly addressing behavior. Utility behavioral energy programs apply social science theories of both human behavior and decision-making to encourage behavior change without eliminating choice or changing economic incentives (Sussman & Chikumbo, 2016). The results of such programs often referred to as "nudges," have been identified through field experiments in a variety of economic sectors (Thaler & Sunstein, 2008).

In 2007, OPOWER (now part of Oracle) designed a residential comparative usage home energy report (Savenije, 2016). These home energy reports use social comparisons and personalized customer information to promote behavior change ((Nolan et al., 2009); (Schultz et al., 2007)). In 2023, many providers (i.e., Oracle (Opower), Bidgely, Uplight) offer home energy reports that provide insight into a residential home's energy usage, how that usage compares to neighbors' usage, and estimated monetary savings from suggested conservation actions. Leading home energy report provider, Opower as of 2015, worked with 100 utility companies in nine countries sending reports to 15 million households (Allcott & Kessler, 2019). The reports have been shown to be cost-effective, producing energy savings ranging from 2 to 6% ((Allcott, 2011); (Ferraro & Price, 2013); (Torres & Carlsson, 2018); (Allcott, 2015); (Allcott & Kessler, 2019); (Jessoe et al., 2021)).

Dominion Energy (formerly known as Questar Gas), a natural gas utility, launched energy efficiency programs in its Utah service territory in 2007. These programs included rebate incentives for high-efficient appliances, weatherization, business, and low-income programs ("Order Approving Settlement Stipulation," 2006). As reported in its 2022 Budget Filing, as of June 2021, the Company has seen 47% unique participation amongst its residential customers (*Energy*

Efficiency Program Proposal: ThermWise® Market Transformation Initiative, 2021). Through 2020, Dominion Energy's Utah energy efficiency programs have saved customers 11.4 million dekatherms (about the equivalent use of 143,000 typical homes). Dominion Energy Utah began operating in the late 1920s in Utah (Hampshire, 1998), and as of 2022, it had approximately 1.1 million customers.

Understanding the importance of behavior in making decisions related to energy efficiency coupled with the findings of apparent success highlighted by electric and some natural gas utilities with home energy reports, in 2011, the utility launched a pilot for an internally developed ThermWise¹ Energy Comparison Report. Like home energy reports used at other companies, this report allowed customers to compare their natural gas usage with neighboring homes and encouraged them to employ energy efficiency measures and behaviors (Bell & Nelson, 2011).

Based on the program pilot success, in 2015, the Company moved the report out as a stand-alone energy efficiency program to claim energy savings on the program (*Energy Efficiency Program Proposal: ThermWise® Energy Comparison Report*, 2014). As the program grew and matured, the Company sent out this report regularly to 1/4 to 1/3 of its residential customers. In its most recent Budget filing in 2022, the Company projected that the Energy Comparison Report saved up to 25% of the entire projected annual energy portfolio savings with a budget of \$544,000 (Exhibit 1.10 Budget, 2021). In 2021, the program saw 34% of the total annual energy savings at less than 2% of the total budget (Orton, 2022). Evaluations of the Energy Comparison Report's energy revealed that energy savings are on par with previously mentioned studies (*Energy Efficiency Program Proposal: Energy Comparison Report*, 2021).

This paper studies an extension of the utility home energy report concept emphasizing social norms through a uniquely developed pilot of a customer pledge. This paper contributes to practitioners and the academy by investigating the research question, do utility customers who make a commitment to save energy end up following through?

¹ ThermWise® represents the company branding for its programs.

Relevant literature

For those making decisions, it is essential to note that consistency stands as an important character trait for those desiring to adjust their behaviors (Cialdini, 1993). Research shows that when individuals “take a stand” on an issue, the attitude, position, and the implications of such a position may become more salient and less denied or forgotten in later situations. Kiesler (1971) developed commitment theory describing the act of making a commitment as an action that pledges an individual to a specific behavior. This connection to the action has the potential to influence both attitudes and behaviors (Kiesler, 1971).

Katzev and Johnson (1987) identify three approaches to motivate people to change energy-related behavior: antecedent (before) communications, consequences (feedback, incentives, disincentives), and social influences (rewards based on group behavior) (Katzev & Johnson, 1987). Lewin (1947) first examined the act of making a commitment suggesting that there was not a direct link between one’s attitudes, beliefs, ideas, or behaviors, but that making a decision could create that connection (Lewin, 1947).

Previous research has found that providing information inadequate in advancing pro-environmental behavior (Bolderdijk et al., 2013); (Schultz et al., 2016). In contrast, commitment-making tends to produce relatively durable changes in behavior (Lokhorst et al., 2011). Research further finds that the act of making a commitment (e.g., making a pledge, taking a stance (Joule et al., 2007)) tends to promote behavioral follow-through ((Cialdini, 1993; (Kiesler, 1971); (Lokhorst et al., 2011)).

An individual who makes a commitment while initially holding opposing attitudes towards that behavior tends to modify his or her attitude to be in line with the committed behavior. Festinger’s (1962) consistency model predicts that an individual should attempt to resolve discrepant attitudes and behaviors. For those with initially consistent attitudes, a commitment should strengthen the attitude (Festinger, 1962).

With self-perception theory, people derive their attitudes, beliefs, and values from behaviors and the context under which those behaviors take shape. This self-perception occurs in a similar manner as one uses observation to infer the internal state of

others (Bem, 1972). In that realm, a voluntarily-made commitment supports a related self-image and advances continued behavior change (Cialdini, 1993). For that commitment to influence an internal state (i.e., self-concept, or attitude), research suggests that the commitment must be made on a voluntary basis and without coercion (Kiesler, 1971); (Cialdini, 1993).

Notably, when individuals make a public commitment to their position, they are more likely to comply with a subsequent request for an additional attitude-related behavior rather than those who only commit privately. Illustratively, in the context of the environment, when an individual has previously taken a stand (i.e., recycling or adjusting a home thermostat), this previous decision and action may make cues about the attitude position resulting in the immediate situation. To that end, one’s attitude may form an anchor for later situations (Halverson & Pallak, 1978). More recently, Jaeger and Schultz (2017) found that in a study of water conservation messaging in California that those who were asked to commit and received normative information showed longer-term reductions in water use (Jaeger & Schultz, 2017).

A study finds that when examining newspaper recycling, written commitments appear to be more effective than verbal commitments. In fact, only households that committed by signing a statement were still recycling when a follow-up was conducted (Pardini & Katzev, 1983). McKenzie-Mohr (2011) notes that whenever possible, ask permission to make a commitment public (McKenzie-Mohr, 2011).

The dramatic impact of public commitments is illustrated in a study in which either a private commitment to conserve electricity and natural gas was obtained, or a public commitment was obtained, in which names would be published in the local newspaper. Those who agreed to a public commitment saved significantly more energy than did households who made a private commitment. Still, this commitment persisted even after the researchers informed the participants who had agreed to a public commitment that their names would not be published, and they continued to save energy. While the names were never publicized, simply asking for this permission brought about a 15% reduction in natural gas use and a 20% reduction in electricity use. Importantly, these reductions were still observable 12 months

later (Pallak et al., 1980). Public commitments are likely so effective because of our desire to be consistent. In short, the more public a commitment, the more likely we are to honor it (Festinger, 1962).

Research question

As mentioned, this study investigates the research question, “do utility customers who make a commitment to save energy end up following through?”.

This question was explored through a commitment pilot energy study conducted at Dominion Energy in Utah. In this case, a utility customer makes a “commitment” or pledge to reduce their energy consumption. In this case, the paper examines whether customers follow through by examining individual customers’ de facto usage.

Pledge program details

Based off the cost-effective success of Dominion Energy’s internally produced home energy report, the ThermWise[®] Energy Comparison Report, the Company proposed a new type of behavioral energy efficiency program to engage with residential customers. In 2019, the Company created a 2-year pilot program to provide interested residential customers the chance to commit to saving energy. By creating a program that allowed customers to pledge their commitment towards energy conservation, the Company could track the effectiveness of an energy pledge program through the lens of a formalized utility energy efficiency program.

The program aimed to combine understanding of previously mentioned commitment literature by applying twenty-first century Information Technology communication through email, text messages, and its web site. Notably, this case study involves a natural gas utility in Utah with a fairly high natural gas heating load and cold winter environment located in the United States. Other utilities in North America have attempted commitments via providing incentives for energy reduction (i.e., BC Hydro Team Power Smart (Join Team Power Smart, 2023) and Pacific Gas & Electric’s Winter Savings Program (*PG&E Winter Gas Savings Program Offers Incentive for Conservation*, 2010).

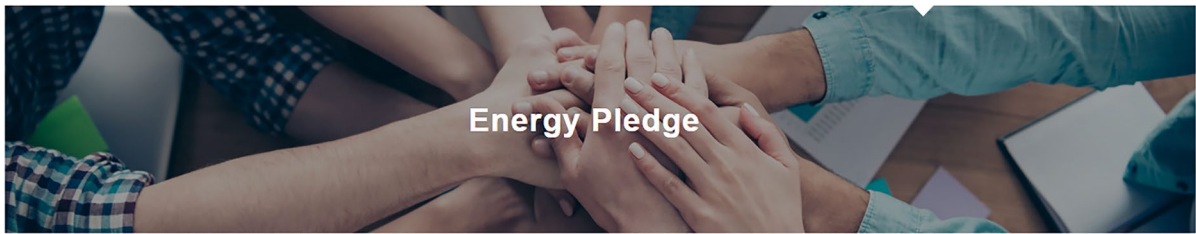
In its request for program approval with the Utah Public Service Commission, Dominion Energy noted its 2018 annual telephone customer energy efficiency survey revealed that a combined 29% of customers indicated that they participated in the Company’s rebate programs either to “save energy” or “to protect the environment” (*Energy Efficiency Program Proposal: Energy Comparison Report*, 2020). The filing cited further research indicating that individuals that make a commitment to changing their behavior are more likely to follow through and do so (Pallak et al., 1980). The pilot program allowed residential customers the opportunity to make a commitment to saving energy. During the campaign, customers received monthly status emails and monthly text message tips from the utility on reducing their energy consumption. The Company also sent customers cold winter text alerts in anticipation of forecasted cold winter. Finally, the pilot sent out an annual customer report after each successful full year of the pilot.

Starting in the second half of 2019, Dominion Energy Utah made enrollment available on its customer web portal for any interested and qualified customers (criteria described below). Dominion Energy Utah also sent a direct email to 50,000 customers soliciting enrollment. In the email invitation, email recipients could simply click on the email and be automatically enrolled in the program.

In November 2019, the Company officially launched the pilot program. The ThermWise Energy Pledge successfully enrolled over 2000 customers. During the campaign, customers received monthly status emails, text messages, cold weather alerts, and an end-of-year report from Dominion Energy. For this program, customers pledged their commitment to energy conservation. Moreover, the Company provided opportunities for customers to exercise interest through a formalized program.

Similar to what Pallak, Cook, and Sullivan (1980) found in identifying the importance of public commitments, the Company allowed customers the option to make their commitment public by listing their name on the Company’s rebate web site (ThermWise.com). Participants could view their name on the web site as a manifestation of their commitment (Fig. 1).

Figure 1 shows the web page. As an incentive for continued pledge participation, the Company awarded an Ecobee smart thermostat to two random customers at two separate intervals during the program. This



ThermWise Energy Pledge

Dominion Energy would like to acknowledge the following individuals who have joined the ThermWise Energy Pledge to conserve natural gas. To find out more details regarding the ThermWise Energy Pledge visit the [Frequently Asked Questions](#).

Abduljabar, Anamaria	Gallegos, Amber N	Redington, Daniel T
Aberegg, Scott K	Gallegos, Joe	Reid, Jacob
Adams, Robyn S	Garlock, Lindsay	Reyes, Steve

Fig. 1 A illustration of the Public Pledge Participants (<https://www.thermwise.com/energy-pledge/>)

occurred after the first year and at the conclusion of the pilot.

The Company invited customers to participate in the Pledge Program based on the following criteria:

1. Are striving to reduce natural gas consumption
2. Are willing to receive monthly updates from Dominion Energy
3. Are Utah residential customers
4. Are consuming at least 40 dekatherms of natural gas annually²
5. Have at least 12 months of continuous usage at their residence
6. Have a web self-service login on dominionenergy.com (ThermWise Pledge FAQ, 2019).

The Company also noted in its program materials that it used a commonly used industry factor of temperature-adjusted (weather-normalized) consumption to take into consideration the impact of weather. As noted, temperature changes can have a significant impact on energy use. In short, to help moderate significant swings in weather-related events, Dominion Energy used a common industry practice of normalizing the impact of

weather on a customer's gas bill. The ThermWise Energy Pledge Program takes weather-adjusted consumption into consideration to allow for easy year-over-year comparison (ThermWise Pledge FAQ, 2019).

Program discussion

Originally, 2389 customers enrolled in the program via email solicitation or by opting into the program via the Company's web site. The Pledge Program ran from November 2019 to December 2021. At program sign-up, customers selected an energy savings goal. This goal ranged from 2 to 10%. The Company restricted the goal on the higher end so not to encourage drastic changes that could jeopardize health or safety but could realistically with some efforts, be obtainable. The breakdown for such customer goals is below in Table 1.

Table 1 Breakdown of goal for pledge customers

Goal	#
0.02	51
0.03	2,277
0.05	39
0.07	5
0.1	17

² The company initially chose 50 dekatherms but later modified that to 40 dekatherms for a wider possible audience. At the time of the study, the typical annual residential consumption in Utah totaled 80 dekatherms.

Fig. 2 Pledge Emails sent by month

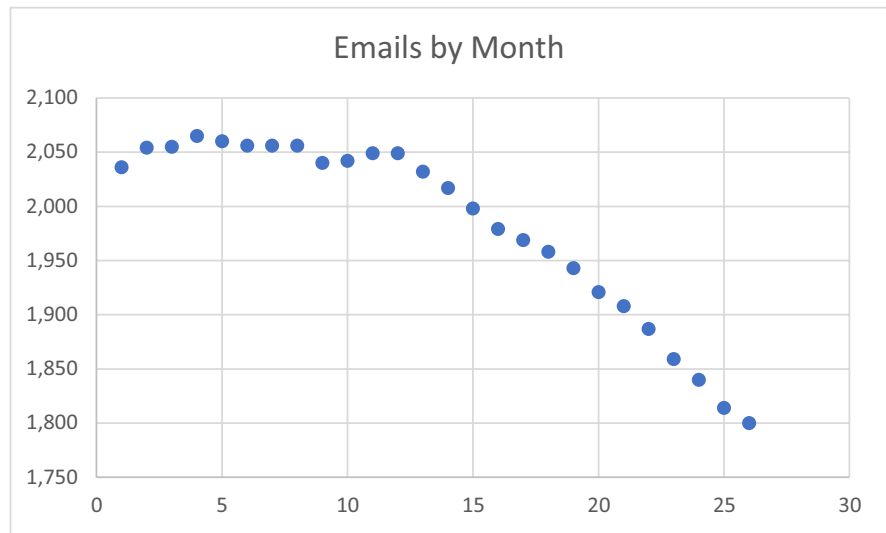
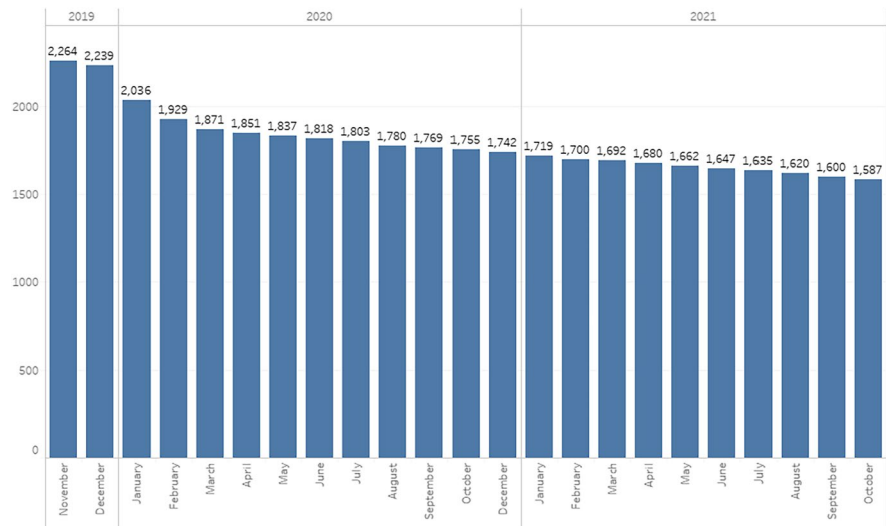


Fig. 3 This figure shows the number of customers receiving text messages by month



It should be noted that most customers enrolled in the program via email solicitation from the Company. The Company allowed for a single click from the email to enroll. Customers were not required to login to their customer account, alleviating potential hurdles for easy enrollment. To simplify this process, the default goal for customers who selected the one-click option was 3%. As a result, most customers (95%) selected 3% as their respective goal (See Table 1).

Also, at program enrollment (sign up), customers selected whether they wanted to make their pledge public by having their name listed on the company

web page. Of the 2389 customers in the pledge, 251 agreed to have their names listed on the company web site. The following Fig. 2 shows the total number of pledge pilot program recipients by month for the email. Next, Fig. 3 reveals the total pledge texts messages distributed per month. Figure 4 illustrates the tips per month provided for customers.

The company set up cold winter alerts based off historical peak load which is highly weather dependent. The Company set up the requirements to trigger a cold winter alert based on an average temperature forecast in the daily forecast. The formula includes the following IF/THEN statement:

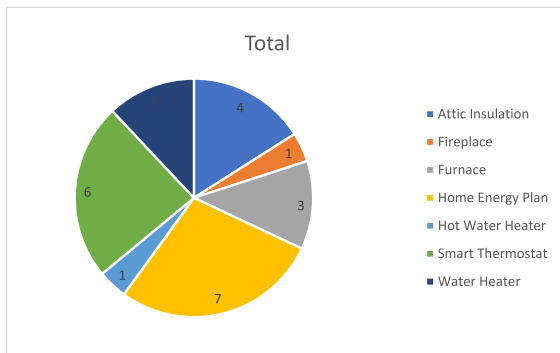


Fig. 4 Breakdown of monthly customer tips

- IF average forecasted temperature $< 21^{\circ}\text{F}$, THEN a cold winter alert text would be sent out.
- The average temperature calculation was derived from the formula = (forecasted high temperature + forecasted low temperature)/2.

Three cold winter alerts took shape over the course of the pilot via text Message. The forecasted temperatures were 13, 19, and 20. These text messages were sent out February 4, 2020 to 2135 customers, December 27, 2019 to 2371 customers, and January 9, 2020 to 2283 customers. The messages included one of the following language messages:

“In residential homes space heating drives natural gas consumption. The next 24 hours are anticipated to be an especially cold day, please conserve wherever possible. Remember “If you conserve, you can save.” Reply STOP to opt out of the ThermWise Energy Pledge.”

“The next 24 hours are anticipated to be an especially cold winter day, please conserve wherever possible. By conserving you can help keep your ThermWise Energy Pledge. Remember “If you conserve, you can save.” Reply STOP to opt out of the ThermWise Energy Pledge.”

Customer self-selection removal

Running extended pilot programs with initial groups can be challenging due to customer attrition. Attrition takes place when a customer moves homes or

alternatively makes an overt move to request removal from the program. Throughout the program, customers could opt out at any time by communicating their desire through a one click opt out selection on the email correspondence from the company. Conversely, customers could contact the Company’s customer service representatives to opt out of the program. In total, 121 customers opted out of the pledge at some point in time. In this program, customers who decided at any point in time to no longer receive text messages remained part of the pilot program, but they just did not receive the text message. A total of 885 customers opted out of receiving texts in the program at some juncture in the program.

Evaluation

Program evaluation occurred at two time intervals to measure the program’s efficacy. The evaluation method compared pre/post-energy use for two participant populations. Subsequently, the evaluation adjusted for baseline trends in energy use. Evaluations included a de post facto evaluation of an individual customer’s natural gas consumption. Given the distinction between customers in whether or not they received the text messages, the evaluation considered distinctively those who received text messages and those who opted out of the text messages at any point during the program.

One year evaluation

Following the first year of completion, the Company ran a preliminary evaluation. Initially, the Company found 1842 customers consuming an average of 69.8 dekatherms annually. Next, the Company removed outliers based on the significant swing in natural gas usage from 1 year to the next, for the savings across customers leaving 1813 customers remaining consuming on average 69.35 dekatherms annually. Next, the company examined the difference in the consumption of customers from the prior 12 months to the 12 months following participation in the program. The evaluation found an average savings of 0.92 dekatherms.

For participating customers in the program who also received text messages, the total number of potential participants dropped to 1300. After filtering for outliers, there remained 1282 customers

consuming on average 68 dekatherms annually. For customers who participated in the program and remained receiving text messages, they saw a decrease in consumption of 1.04 dekatherms.

Two-year evaluation

The 2-year evaluation consisted of a distinction between customers who received text messages throughout the duration of the program compared to those who opted to not receive text messages at any point in the program.

With text messages

The Company first examined its 2-year evaluation for customers throughout the program who received text messages. In this regard, the Company initially had 1154 customers considered. This customer group had an average usage of 73.31 dekatherms. After removing outliers in the second post-year evaluation based on swings in the difference between the post-year and the pre-average year, the Company eliminated 32 customers to arrive at a total number of customers of 1122. These customers had an average consumption of 74.27 prior to program participation. In this analysis, customers saw a decrease of 4.14 dekatherms in the second year of program participation.

Without text messages

The Company considered its 2-year evaluation for customers who did not stay on with text messages throughout the program. In this regard, the Company initially had 396 customers considered. These customers had an average usage of 74.02, taking the customer's average annual usage for required prior year preceding the program start. After removing outliers in the second post-year evaluation based on swings in the difference between the post-year and the pre-average year, the Company eliminated 12 customers to arrive at a total number of customers of 382. These customers had an average consumption of 75.21. In this analysis, customers saw a decrease of 2.98 dekatherms in the second year of program participation.

Public vs. private pledge

Further analysis looked at participants based on whether they agreed to have their names printed on the web site. For the non-text customers, 353 selected not to have their names on the web site, and 29 customers agreed to have their names on the web site. In this group, public participants saw a 7.01 dekatherm decrease vs. a 2.65 dekatherm difference with a p value of 0.06, making this statistically significant at the alpha of 0.10 level.

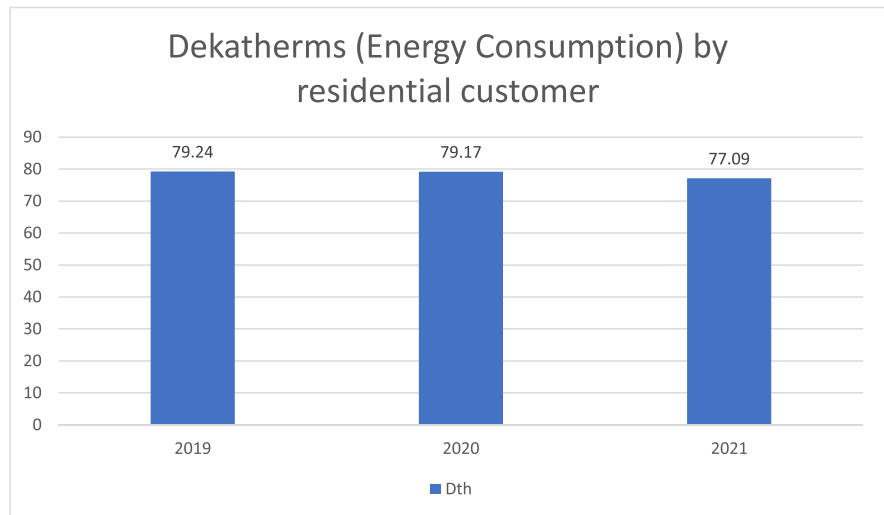
For text customers, 983 opted not to have their names printed on the web site, while 139 customers agreed to have their names printed on the web site. In this group, public participants saw an 8.03 dekatherm decrease vs. a 3.60 dekatherm decrease with a p value of 0.00 making this statistically significant at the alpha of 0.10 level.

Extenuating factors

It should be noted that this pilot took place during an unprecedented period with COVID-19 ravaging the USA and many more employees working from home than previously expected. Also, this analysis does not consider a control group like a typical home energy report evaluation would. Due to the lack of a control group, a difference-in-differences evaluative approach was not possible. The program evaluation attempted to consider a control group and overcome concerns relating to internal validity by looking at overall Utah residential customers' usage swings and making an appropriate adjustment to the program energy savings (discussed more later). It should be noted that these ThermWise Energy Pledge participant customers are perhaps more duly motivated than the other customers to reduce their energy consumption, given that they voluntarily signed up for this program. It is likely that these customers have already taken advantage of a series of energy efficiency rebate programs and actively work to reduce their energy consumption.

For reference, in November 2019 when the program started, the usage 12-month total average consumption for all Utah residential natural gas customers totaled 79.24 dekatherms per year. In November 2020, this consumption level declined to 79.17 dekatherms. In November 2021, at the conclusion of this program, the Utah natural gas residential customer consumption level dropped to 77.09

Fig. 5 Utah Dominion Energy residential usage by customer



dekatherms. In other words, due to natural trends irrespective of the program, customer usage per customer dropped by 2.15 dekatherms over this time frame (see Fig. 5).

Adjusted dekatherm program energy savings

Given that the Utah customer average residential natural gas usage dropped by 2.15 during this time period, an adjusted analysis would place the pledge's impact at 0.83 for those not receiving the text message and 1.90 dekatherms for customers who received the text. However, it is likely that the program would see persistence on savings; based on prior research with home energy reports, the company identified 79% persistence in its comparison report. To that end, it is likely that the energy savings with these customers likely persist beyond just the time period for the program. Persistence may either extend the time period or measure life beyond one year or conversely add to the savings level for the current (measure life) year. For regulatory purposes, in Utah, the Company considers persistence as an added level for the current measure year and does not extend the measure life beyond that year. Applying the same persistence level as utilized with the Energy Comparison Report, revealed an adjusted savings of 2.35 for those program participants not receiving the text message and 3.27 dekatherm savings for program participants who received text messaging throughout the program.

The evaluation also looked at the potential relationship between pledge participants energy savings

compared to the energy savings goal selected by those customers at the time of enrollment to ascertain if a relationship existed. In this regard, the paper looked to see if a strong correlation existed for customers between pledge energy savings goal and pledge energy savings achieved. Unfortunately, the evaluation did not find a statistically significant relationship with the correlation coefficients (r) being at 0.03 for both text and non-text customers. This finding is likely impacted by the single-click enrollment option from email customers that defaulted customer enrollments to a 3% energy savings goal for the pledge.

Effect of attrition and discount rate on program savings

As noted during the program, customers dropped off from the program largely due to relocation and not due to requesting to be removed from the program. Overall, the Company lost around 236 customers from the first year to the second year in the pilot. For the first year, the Company sent out an average of 2050 emails per month and 2301 texts to unique customers. Program participation dropped to 1915 emails and 2284 texts in the second year. The following two tables (Tables 2 and 3) examine customer savings for pledge pilot program participants. Table 2 includes customers who ended in the pilot with both email and text messages.

Table 2 Pledge pilot savings results: text + email

	Group	Description		Energy Savings in Dekatherms
1	Text + email group	1127 participating customers (raw savings)		4.14
2	Attrition impact	Savings adjusted for program attrition	-	0.16
3	Persistence	Savings adjusted for program persistence	+	3.27
4	Customer usage Adjustment	Adjustment based on residential customers' overall usage trend	-	2.15
5	Total program savings			5.10

Table 3 Pledge pilot savings results: email

	Group	Description		Energy savings in dekatherms
1	Email group	1138 participating customers (raw savings)		2.98
2	Attrition impact	Savings adjusted for program attrition	-	0.30
	Persistence	Savings adjusted for program persistence	+	2.35
3	Customer usage adjustment	Adjustment based on residential customers' overall usage trend	-	2.15
4	Total program savings			2.88

These customers opted out of seeing texts at some point in the pilot

The following components describe the various elements arriving at the program savings for the two preceding figures (Tables 2 and 3).

Line 1 in both figures represents the initial study estimate of energy savings for all pilot customers combined prior to the adjustments for persistence and attrition.

Line 2 incorporates an adjustment for participation attrition and applies program persistence rate from Energy Comparison Report to program.

Line 3 adjusts program savings for the change in use for the average customer in this time period.

Line 4 represents total dekatherm (energy) savings attributed to the program.

Results/next steps

Through the Dominion Energy Utah pledge pilot, it was found that most (269 out of 382 or 70%) email evaluation and 814 out of 1125 (67%) text evaluation) unique customers who made commitments appeared to follow through in that effort. While the precise number is subject to statistical uncertainty

due to many other influences on energy use, the proportion is likely meaningful. Customers who agreed to make their commitment public on the Company's web site saw even more savings (7.01 vs. 2.65 (2.6×) and 8.03 vs. 3.59) (2.2×). This research corroborates findings with previous research on energy customers who make an overt action to reduce their research. Certainly, the utility, program implementers, scholars, and interest groups are encouraged by the energy savings from pilot success for the ThermWise® Energy Pledge.

In 2021, in its 2022 Energy Efficiency Budget filing, the Dominion Energy acknowledged this early success and stated that a program solicitation for the second Pilot Group B will start in the summer of 2022 with the official start for Pilot Group B in November 2022.³ In turn, Pilot Group B will run for the 2022 to 2023 budget cycles (*Energy Efficiency Program Proposal: Energy Comparison Report*, 2021). It remains to be seen if the Company can duplicate savings efforts for the second pilot and the

³ Since this Energy Efficiency Budget filing, the Company decided to postpone the second Pilot Group B until November 2023 due to billing system updates in 2022.

degree to which an expanded group of customers will actively participate in these types of challenges. After all, as an Accenture (2017) report notes, most customers spend little time annually engaging with their utility (Mezger, 2018).

As noted, the Company was encouraged by the early response and use of text messages as an approach of engaging with customers. Previously, in its Utah jurisdiction, the Company had never used text messages as a means of communicating with customers. The Company intends to consider text messages through other messaging to assist in energy efficiency programs, such as expanding cold winter alerts to its home energy report customers (*Energy Efficiency Program Proposal: Energy Comparison Report*, 2021). Given that the Company has over 1.2 million customers in its Utah service territory, the Company believes that there is ample opportunity to expand this program, especially if it is to believe that as indicated in its telephone survey that 29% of customers already participate in its rebate programs based on environmental or energy-saving goals⁴ (*Energy Efficiency Program Proposal: Energy Comparison Report*, 2020).

More commitment research on utility programs designed for energy consumption reduction is needed. For utilities seeking to utilize these programs, scalability remains a concern. In this case, as utilities look to expand energy efficiency efforts to combat climate change, they must consider the appropriate nature of developing commitment programs to drive further energy savings. Findings reveal over double the energy savings for those who agreed to have their names posted on a corporate web site. Complementary research may better understand whether those customers who were self-selected to save more or it occurred as a consequence of the program. Further survey or interview research may reveal whether specific customer demographics save energy and the reasons for their energy savings.

Further research could explore if comparable online forums (i.e., social media platforms) may yield similar higher energy savings levels. As these pledge programs are effectively done, customer choice can be preserved but energy efficiency goals

can be achieved for the customer, society, and the utility. Moreover, as exhibited in this study states and utilities can better add these programs to their energy efficiency portfolio to produce cost-effective energy savings.

Broadly, from an environmental perspective, more commitment research needs to be studied at the national and international level for environmental goals. Illustratively, in the USA, most local and state governments have longstanding commitments to reduce energy or combat climate change; still, many fail to deliver on those promises. On the international scale, too often, those commitments fail to see much follow through other than a good photo opportunity for each country's leadership (i.e., Paris Accord in 2015, Glasgow 2020). While this research studies individual behavior actions at the individual level or residential levels, environmental pledges gain great acclaim but all too frequently, not enough work occurs in the way of follow up and progress. In short, public pledges with regular feedback may be the avenue to achieve broader scale goals.

Declarations

Conflict of interest The author declares no competing interests.

References

- Allcott, H. (2011). Social norms and energy conservation. *Journal of Public Economics*. <https://doi.org/10.1016/j.jpubeco.2011.03.003>
- Allcott, H. (2015). Site selection bias in program evaluation *The Quarterly Journal of Economics*, 1117-1165. <https://doi.org/10.1093/qje/qjv015>
- Allcott, H., & Kessler, J. (2019). The welfare effects of nudges: a case study of energy use social comparisons. *American Economic Journal: Applied Economics* 236–276. <https://doi.org/10.1257/app.20170328>
- Bell, C., & Nelson, J. (2011). *Application for approval of the 2012 year budget for energy efficiency programs and market transformation initiative*. Utah Public Service Commission. Retrieved March 10 from <https://pscdocs.utah.gov/gas/11docs/1105712/210792Application.pdf>
- Bem, D. (1972). *Self-Perception Theory Advances in Experimental Social Psychology*, 6, 1–62.
- J Bolderdijk M Gorsira K Keizer L Steg 2013 (Values determine the (in) effectiveness of informational interventions in promoting proenvironmental behavior PLoS ONE 8 12 <https://doi.org/10.1371/journal.pone.0083911>

⁴ This citation misstates “save money” with the statement should have read “save energy.”.

- Cialdini, R. (1993). *Influence: Science and practice*. HarperCollins College Publishers.
- Climate Change. (2020). <https://www.un.org/en/global-issues/climate-change>
- Dietz, T., Gardner, G., Gilligan, J., Stern, P., & Vandenberg, M. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *PNAS* <https://doi.org/10.1073/pnas.0908738106>
- Energy Efficiency Program Proposal: Energy Comparison Report. (2020). Utah Public Service Commission. Retrieved March 17 from <https://pscdocs.utah.gov/gas/19docs/1905726/310337DEUEXh1.8EnergyComparisonRprt10-16-2019.pdf>
- Energy Efficiency Program Proposal: Energy Comparison Report. (2021). Utah Public Service Commission. Retrieved March 13 from <https://pscdocs.utah.gov/gas/21docs/2105725/320904DEUEXh1.8EnergyCmpsrn10-26-2021.pdf>
- Energy Efficiency Program Proposal: ThermWise® Energy Comparison Report. (2014). Utah Public Service Commission. Retrieved March 10 from https://pscdocs.utah.gov/gas/14docs/1405725/261476ExIQGCenerEffEx1_9ECR10-14-2014.pdf
- Energy Efficiency Program Proposal: ThermWise® Market Transformation Initiative. (2021). Utah Public Service Commission. Retrieved March 10 from <https://pscdocs.utah.gov/gas/21docs/2105725/320902DEUEXh1.7AMarketTrnsfrmlntv10-26-2021.pdf>
- Eto, J. (1996). The Past, Present, and Future of U.S. Demand-Side Management Programs
- Exhibit 1.10 Budget. (2021). Utah Public Service Commission. Retrieved March 10 from <https://pscdocs.utah.gov/gas/21docs/2105725/320907DEUEXh1.10Budget10-26-2021.xlsx>
- Ferraro, P., & Price, P. (2013). Using nonpecuniary strategies to influence behavior: Evidence from a large-scale field experiment. *The Review of Economics and Statistics*, 95(1), 64–73. https://doi.org/10.1162/REST_a_00344
- Festinger, L. (1962). Cognitive dissonance. *Scientific American*, 93–106. <https://www.jstor.org/stable/24936719>
- Halverson, R., & Pallak, M. (1978). Commitment, ego-involvement, and resistance to attack. *Journal of Experimental Social Psychology*, 1–12. [https://doi.org/10.1016/0022-1031\(78\)90056-2](https://doi.org/10.1016/0022-1031(78)90056-2)
- Hampshire, D. (1998). *No western parallel: The story of Questar Corporation*. Questar Corporation
- Jaeger, C., & Schultz, P. (2017). Coupling social norms and commitments: Testing the underdetected nature of social influence. *Journal of Environmental Psychology*, 51, 199–208. <https://doi.org/10.1016/j.jenvp.2017.03.015>
- Jessoe, K., Lade, G., Loge, F., & Spang, E. (2021). Spillovers from behavioral interventions: experimental evidence from water and energy use. *Journal of the Association of Environmental and Resource Economists*. <https://doi.org/10.1086/711025>
- Join Team Power Smart. (2023). BC Hydro. Retrieved January 14 from <https://www.bchydro.com/powersmart/residential/team-power-smart.html>
- Joule, R., Girandola, F., & Bernard, F. (2007). *How can people be induced to willingly change their behavior?* The path from persuasive communication to binding communication: Social and Personality Psychology Compass. <https://doi.org/10.1111/j.1751-9004.2007.00018.x>
- Katzev, R., & Johnson, T. (1987). *Promoting energy conservation: An analysis of behavioral research*. OSTI.gov
- Kiesler, C. (1971). *The psychology of commitment; Experiments linking behavior to belief*. Academic Press
- Lewin, K. (1947). Group decision and social change In E. Newcomb & E. Hartley (Eds.), *Readings in social psychology*, (pp. 330–344). Henry Holt and Company
- Lokhorst, A., Werner, C., Staats, H., van Dijk, E., & Gale, J. (2011). Commitment and behavior change: a meta-analysis and critical review of commitment-making strategies in environmental research. *Environment and Behavior* 10.1177%2F0013916511411477
- McKenzie-Mohr, D. (2011). *Fostering sustainable behavior: An introduction to community-based social marketing*. New Society Publishers
- Mezger, S. (2018). *Customer Centricity: Must-have or a waste of energy?*
- Molina, M., Kiker, P., & Nowak, S. (2016). The greatest energy story you haven't heard: How investing in energy efficiency changed the US power sector and gave us a tool to tackle climate change. <https://www.aceee.org/sites/default/files/publications/researchreports/u1604.pdf>
- Nadel, S. (1992). Utility demand-side management experience and potential- A critical review. *Annual Review of Energy and the Environment*, 510
- S Nadel H Geller 1996 Utility DSM: What have we learned? Where are we going? *Energy Policy* 289-302 [https://doi.org/10.1016/0301-4215\(95\)00137-9](https://doi.org/10.1016/0301-4215(95)00137-9)
- Nolan, J., Schultz, P., Cialdini, R., Goldstein, N., & Griskevicius, V. (2009). Normative social influence is underdetected. *PSPB*, 913-923. 10.1177%2F0146167208316691
- Order Approving Settlement Stipulation, (Utah Public Service Commission 2006)
- Orton, M. (2022). *Docket No. 20–057–20 and 22–057–01*. Utah Public Service Commission. Retrieved March 13 from <https://pscdocs.utah.gov/gas/22docs/2205701/322330DEUEngEicncyRprtYearEndDec3120212-14-2022.pdf>
- Pallak, M., Cook, D., & Sullivan, J. (1980). Commitment and energy conservation. In L. Bickman (Ed.), *Applied Social Psychology Annual* (pp. 235–253)
- Pardini, A., & Katzev, R. (1983). The effects of strength of commitment on newspaper recycling. *Journal of Environmental Systems*, 13, 245–254. <https://doi.org/10.2190/6PN9-MXFP-3BFF-CHHB>
- PG&E Winter Gas Savings Program Offers Incentive for Conservation. (2010). Pacific Gas & Electric. Retrieved January 14 from <https://www.prnewswire.com/news-releases/pge-winter-gas-savings-program-offers-incentive-for-conservation-112558144.html>
- Savenije, D. (2016). *Oracle to buy Opower for \$532M*. UtilityDive. Retrieved March 10 from <https://www.utilitydive.com/news/oracle-to-buy-opower-for-532m/418453/>
- Schultz, P., Messina, A., Tronu, G., Limas, E., Gupta, R., & Estrada, M. (2016). Personalized normative feedback and the moderating role of personal norms A field experiment to reduce residential water consumption. *Environment and Behavior*, 48(5), 686–710. <https://doi.org/10.1177/0013916514553835>
- Schultz, P., Nolan, J., Cialdini, R., Goldstein, N., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science* 429–434 <https://doi.org/10.1111/j.1467-9280.2007.01917.x>

- Sussman, R., & Chikumbo, M. (2016). *Behavior change programs: Status and impact*. <https://www.aceee.org/sites/default/files/publications/researchreports/b1601.pdf>
- Thaler, R., & Sunstein, C. (2008). *Nudge: Improving decisions about health, wealth, and happiness*. Yale University Press.
- ThermWise Pledge FAQ*. (2019). Dominion energy. Retrieved March 13 from <https://www.thermwise.com/energy-pledge-faqs/>
- Torres, M., & Carlsson, F. (2018). Direct and spillover effects of a social information campaign on residential water-savings. *Journal of Environmental Economics and Management*. <https://doi.org/10.1016/j.jeem.2018.08.005>

Publisher's note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

Springer Nature or its licensor (e.g. a society or other partner) holds exclusive rights to this article under a publishing agreement with the author(s) or other rightsholder(s); author self-archiving of the accepted manuscript version of this article is solely governed by the terms of such publishing agreement and applicable law.