414 Nicollet Mall
Minneapolis, MN 55401

November 1, 2017

—Via Electronic Filing—

Daniel P. Wolf
Executive Secretary
Minnesota Public Utilities Commission
121 7th Place East, Suite 350
St. Paul, MN 55101

RE: RESIDENTIAL TIME OF USE RATE DESIGN PILOT PROGRAM
DOCKET NO. E002/M-17-775

Dear Mr. Wolf:

Northern States Power Company, doing business as Xcel Energy, submits this Petition for approval of a Residential Time of Use (TOU) Rate Design Pilot Program. This Petition is submitted in conjunction with the Company's Grid Modernization Report in Docket No. E002/M-17-776, which complies with Minn. Stat. § 216B.2425, subd. 2(e) and 8 (the Grid Modernization statute).

Pursuant to Minn. Stat. § 216.17, subd. 3, we have electronically filed this document, and served copies on all parties on the attached service lists. If you have any questions about this filing, please contact Amber Hedlund at amber.r.hedlund@xcelenergy.com or (612) 337-2268 or me at holly.r.hinman@xcelenergy.com. or (612) 330-5941.

Sincerely,

/s/

HOLLY HINMAN
REGULATORY MANAGER

Enclosures
c: Service Lists

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

Nancy Lange	Chair
Dan Lipschultz	Commissioner
Matthew Schuerger	Commissioner
Katie J. Sieben	Commissioner
John A. Tuma	Commissioner

IN THE MATTER OF THE PETITION OF NORTHERN STATES POWER COMPANY FOR APPROVAL OF A TIME OF USE RATE DESIGN PILOT PROGRAM	DOCKET NO. E002/M-17-775 **PETITION**

INTRODUCTION

Northern States Power Company, doing business as Xcel Energy, submits this Petition for approval of a Residential Time of Use (TOU) Rate Design Pilot Program. This Petition is submitted in conjunction with the Company's Grid Modernization Report in Docket No. E002/M-17-776, which complies with Minn. Stat. § 216B.2425, subd. 2(e) and 8 (the Grid Modernization statute). This provision requires a utility operating under an approved multiyear rate plan to identify in its Biennial Transmission and Distribution Plan:

> *investments that it considers necessary to modernize the transmission and distribution system by enhancing reliability, improving security against cyber and physical threats, and by increasing energy conservation opportunities by facilitating communication between the utility and its customers through the use of two-way meters, control technologies, energy storage and microgrids, technologies to enable demand response, and other innovative technologies.*

The certification process was developed with the Company's first Distribution Grid Modernization Report, filed in 2015.[1] The Company's Report, filed in tandem with this Petition, is the Company's second biennial opportunity to report on plans to modernize the grid and to seek certification of specific projects for later rider recovery. In its Report, the Company discusses the foundational investments we are making and planning to make in the grid, and seeks certification of two projects under Minn. Stat. § 216B.16, subd. 7b(b)(5):

[1] In the Matter of Xcel Energy's 2015 Biennial Distribution Grid Modernization Report, October 30, 2015, Docket No. E-002/M-15-962, and Commission order of June 28, 2016 in that docket.

- A Residential TOU rate pilot, which is summarized in the Report and detailed in this Petition, and
- A reliability improvement project – Fault Location, Isolation, and Service Restoration (FLISR), which relies on FAN (Field Area Network) infrastructure and involves installation of intelligent field devices.

The Report discusses the Company's grid modernization strategy and details the supporting technologies. It also includes a request to allow the Company to return to the Commission off-cycle, in one year on November 1, 2018, with an updated biennial report and certification request for additional grid modernization projects.

In this Petition, the Company describes in greater detail the features of its pilot proposal, including the goals, the rate design, pilot components, and the implementation plans to bring it forward to residential customers. We note that our intended implementation of the pilot is contingent on affirmative Commission actions in both the grid modernization filing certification request as well as this current TOU pilot petition. If the Commission does certify the TOU pilot, we would then request cost recovery through our next Transmission Cost Recovery (TCR)/Grid Mod Rider filing. As the Commission is aware, the Company is in a multi-year rate plan and the majority of these investments are not a part of that rate plan so, to the extent any of these costs are not approved in the TCR, the Company would stop the pilot process and wait for a future rate case to bring the pilot and any remaining costs forward.

We appreciate the Commission's interest in utility pilot projects that allow for exploration and evaluation of new models executed in our service territory with a limited customer impact over a limited timeframe. We believe pilots provide a valuable opportunity to test assumptions, to develop and refine strategies, and to implement learnings efficiently prior to broader implementations. We believe the Company has brought forth a comprehensive proposal for a significant learning opportunity that is responsive to stakeholders, grounded in sound analytics, leverages existing research, and delivers an effective platform to evaluate a new rate design and implement technology innovations.

In this Petition, we respectfully request the Commission

- approve our request for certification of the Residential TOU Rate Pilot;
- approve our proposal for implementing a Residential TOU Rate Pilot;
- approve our proposed pilot Tariff;
- approve our requested accounting treatment; and
- establish a procedural schedule for consideration of this request that aligns with a Commission decision no later than June 1, 2018.

The balance of this filing describes key pilot program features, including:

- *Pilot program description*— the Company will implement new residential Time of Use rates in two communities of the Twin Cities metropolitan area, and enable customer participation through the deployment of new meters and information services.
- *Pilot program background & objectives* — the Company aims to explore the ability to reduce peak demand by providing customers with price signals, and to further enable customers to shift to off-peak energy use through awareness-building, education, and data access. The Company's proposal is the culmination of extensive stakeholder input and a rigorous analytical methodology.
- *Terms of participation* —customers in the target areas will participate in the two year pilot through auto-enrollment with the opportunity to opt-out, and will have an opportunity for a partial bill true-up to flat rates during the pilot. The pilot program's tariff details the terms of service.
- *Customer engagement strategy* —the Company will prepare pilot area participants with extensive communications prior to the pilot launch, will support time-shifting energy use behaviors with education and support throughout the pilot, and will enable meaningful evaluation through customer surveying before, during, and after the pilot.
- *Reporting and Analysis*—the Company will share learnings with stakeholders and the Commission at the midpoint and at the conclusion of the pilot, and will develop a detailed plan for measuring pilot outcomes.
- *Cost recovery proposal* —the Company estimates total TOU pilot costs of approximately $8 M in capital and $2.9 M in O&M. Upon project certification and pilot approval, the Company will seek recovery of the majority of pilot costs through the annual Transmission Cost Recovery (TCR) Rider under Minn. Stat. § 216B.16, subd. 7b.

The Company includes the following Attachments in support of its Petition:

Attachment A	Bio of Lon Huber
Attachment B	Customer Survey Results
Attachment C	Case Studies of Other TOU Programs
Attachment D	Maps of Pilot Deployment Areas
Attachment E	Cost Duration Method
Attachment F	Residential TOU Pilot Program Service Tariff
Attachment G	Bill Impact Analysis

Attachment H Pilot Participant Sample Bill
Attachment I Cost Estimate Comparison of AMI and Alternative

I. SUMMARY OF FILING

A one-paragraph summary is attached pursuant to Minn. R. 7829.1300, subp. 1.

II. SERVICE ON OTHER PARTIES

Pursuant to Minn. R. 7829.1300, subp. 2 and Minn. Stat. § 216.17, subd. 3, Xcel Energy has electronically filed this document. A summary of the filing has been served on all parties on the enclosed service lists for Docket No. E002/M-15-662, and our Miscellaneous Electric Service list.

III. GENERAL FILING INFORMATION

Pursuant to Minn. R. 7829.1300, subp. 3, the Company provides the following information.

A. Name, Address, and Telephone Number of Utility

Northern States Power Company doing business as:
Xcel Energy
414 Nicollet Mall
Minneapolis, MN 55401
(612) 330-5500

B. Name, Address, and Telephone Number of Utility Attorney

James Denniston
Assistant General Counsel
Xcel Energy
401 Nicollet Mall, 8th Floor
Minneapolis, MN 55401
(612) 215-4656

C. Date of Filing

The date of this filing is November 1, 2017.

D. Statute Controlling Schedule for Processing the Filing

Minn. Stat. § 216B.16 subd. 1 requires 60-days of notice to the Commission of a proposed tariff change. Under the Commission's rules, the proposed tariff change discussed in this Petition falls within the definition of a miscellaneous tariff filing under Minn. R. 7829.0100, subp. 11, since no determination of Xcel Energy's general revenue requirement is necessary. Minn. R. 7829.1400, subp. 1 and 4 permit comments in response to a miscellaneous filing to be filed within 30 days and reply comments to be filed no later than 10 days thereafter.

Under the Grid Modernization statute, Minn. Stat. § 216B.2425, Subd. 3, Commission action to certify, certify as modified, or deny certification of the Residential TOU Rate Design Pilot Program is required by June 1, 2018 as this Pilot Program is part of the efforts of the Company to modernize the Company's grid. Following certification by the Commission, the Company will seek rider recovery in a forthcoming docket for the certain Pilot costs associated with investments in distribution facilities such as AMI, software and implementation costs, customer engagement costs, and measurement and verification costs.

E. Utility Employees Responsible for Filing

Aakash Chandarana
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(612) 215-4663

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Manager, Regulatory Affairs
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IV. MISCELLANEOUS INFORMATION

Pursuant to Minn. R. 7829.0700, the Company requests that the following persons be placed on the Commission's official service list for this proceeding:

James R. Denniston
Assistant General Counsel
Xcel Energy
401 Nicollet Mall, 8th Floor
Minneapolis, MN 55401
james.r.denniston@xcelenergy.com

Carl Cronin
Records Analyst
Xcel Energy
401 Nicollet Mall, 7th Floor
Minneapolis, MN 55401
regulatory.records@xcelenergy.com

Any information requests in this proceeding should be submitted to Mr. Cronin at the Regulatory Records email address above.

V. EFFECT OF CHANGE UPON XCEL ENERGY REVENUE

The proposed TOU rate design will not change the monthly customer charge for pilot participants and the energy charges are designed to recover the same revenue as present energy charges for the residential class average customer. To the extent that pilot participants represent the residential class and do not change their energy usage patterns, no material change in revenue is anticipated. To the extent pilot participants reduce their usage, the reduced sales and revenues will be captured in the Revenue Decoupling Rider calculations, an important mechanism that reduces the disincentive for the Company to bring forward proposals that result in reduced sales. However, as the primary objective of the pilot is to provide an incentive for customers to develop a lower-cost usage pattern, some revenue reduction is anticipated as customers respond to TOU price signals.

A revenue requirement impact is expected, however, from the necessary costs, including advanced metering, required to conduct the pilot study. These costs are expected to be addressed in a forthcoming request for recovery of eligible costs through the TCR Rider.

VI. DESCRIPTION AND PURPOSE OF FILING

In this Petition, we seek Commission approval of a new project: a pilot that provides select customers with pricing specific to the time of day energy is used. The pilot also provides participants with increased energy usage information, education, and support to encourage shifting energy usage to daily periods where the system is experiencing low load conditions. Price incentives that shift load away from peak may reduce or avoid the need for system investments in fossil fuel plants that serve peak electric load.

The pilot was developed partially in response to customer and stakeholder feedback about the benefits of alternative rate designs as developed in a prior regulatory proceeding. Through the pilot, the Company will study the impact of rigorously designed price signals with technology-enabled data on customer usage patterns for a subset of customers. The Company will share learnings about the effectiveness of these techniques to inform future consideration of a broader Time of Use rate deployment in Minnesota.

VII. BACKGROUND

In developing this proposal, the Company began with a review of the enabling statute, reviewed the development of prior regulatory proceedings, retained an external subject matter expert, engaged stakeholders in a "deep dive" approach aimed at sharing ideas and gathering feedback, performed market research to gather preliminary data on customer perceptions, and surveyed other programs for best practices to inform the pilot's design. Each of these efforts is described here.

A. Grid Modernization Statute

In 2015, the Minnesota Legislature passed the Grid Modernization Statute, which directs utilities with an approved multiyear rate plan to identify investments in its Biennial Transmission and Distribution Plan that modernize the grid. The statute authorizes the Commission to "certify" grid modernization projects. The utility may then seek to recover the costs of certified projects under the corresponding automatic annual adjustment mechanism, the Minnesota Transmission Cost Recovery (TCR) Rider, informally known as the "Grid Modernization" (or "Grid Mod") Rider.[2]

In 2015, the Company petitioned the Commission for certification of its first distribution grid modernization projects, (1) an advanced distribution management system (ADMS) project and (2) a solar and battery storage demonstration project (the Belle Plaine project). While the Commission declined to certify the Belle Plaine project, it certified the ADMS project, which has provided the foundation of grid modernization activities in the Company's Minnesota service territory. Since that time, the Company has continued to pursue its grid modernization goals and has investigated the additional benefits of such investments, including increased reliability, resiliency, operational efficiency, and increased customer choice opportunities. This ongoing effort has led to the development of this Pilot proposal, which aligns with the goals of the statute.

The Grid Modernization statute establishes Commission certification for projects that achieve grid modernization by "[…] increasing energy conservation opportunities by facilitating communication between the utility and its customers through the use of two-way meters, control technologies, energy storage and microgrids, technologies to enable demand response, and other innovative technologies." The TOU pilot project falls squarely within this definition as it represents an investment directly linked to the

[2] Minn. Stat. § 216B.16, subd. 7b(b)(5) authorizes Rider recovery for costs associated with investments in distribution facilities to modernize the utility's grid that have been certified by the Commission under section 216B.2425.

benefits contemplated under the statute. Namely, the pilot will increase conservation opportunities for customers, as participants receive advanced metering capabilities to facilitate communication between the utility and customer, in service of driving on-peak energy efficiency and load-shifting behaviors. It also enables demand response activities through increased communication capabilities, customer information and education, and targeted price signals.

In addition to energy conservation and communication benefits, the features of the pilot also modernize the grid by enhancing reliability. The technology selected for this pilot, Advanced Metering Infrastructure (AMI), provides data to the ADMS to improve grid operations. AMI also includes outage reporting functionality that enhances outage response capability and improves reliability. For these reasons, the pilot is eligible for certification under the statute.

Further, the pilot is reasonable and in the public interest. The pilot project stands to generate significant benefits, including learnings about the ability of residential customers to respond to price signals and tailored educational messages. Those responses may include engaging in energy efficiency and shifting energy usage to non-peak periods. The pilot and its stakeholders benefit from learnings elsewhere, too. By leveraging findings from other jurisdictions, the Company's pilot design draws upon established best practices.

The pilot is designed with reasonable parameters that balance practicality and precision, and is reasonable in scope. By limiting the TOU rate and technology implementation to a subset of customers, the Company will measure and verify key assumptions about the project in advance of a wider TOU rollout. The pilot provides early bill protections for participants, as they transition onto a new rate structure, and a moderated roll-out of new technology and new rate designs. The implementation plans balance the need to achieve statistically significant results with the need to minimize potential impacts during the learning phase. We believe the Company has appropriately balanced these objectives, resulting in a pilot proposal that is reasonable and consistent with the public interest.

B. Alternative Rate Design Docket

The Alternative Rate Design Docket, No. E002/M-15-662, arose out of a settlement between parties during the Company's electric rate case filed in 2013. Parties and stakeholders built the public record in this proceeding through written comments and also participated in workshops exploring the potential, both positive and negative, of various alternative rate designs. The Commission has contemplated different

procedural paths to advance this dialogue. The Company's TOU pilot builds off of the learnings from that proceeding.

C. Stakeholder Engagement

The Company presented its preliminary plans to develop a TOU pilot at a Commission Planning Meeting on April 11, 2017. There, the Company set forth a conceptual framework and preliminary objectives for its pilot and shared plans for intensive stakeholder engagement to support the development of a pilot project. The Company presented the conceptual framework as follows:

- update the current TOU rate option,
- address emerging technologies,
- deploy geographically focused smart grid investments to complement TOU offering,
- leverage new investments and rate to meet new Demand Response requirement, and
- share learnings with stakeholders.

During the Commission's informational meeting, the Company also set forth preliminary objectives for its pilot as follows:

- modify current TOU without offering incentives,
- increase ratio of residential customer participation,
- understand the changes to rate structure, marketing and education to increase the number of customers using time of use rates,
- make progress towards requirement to add 400 MW of demand response by 2023, and
- engage stakeholders and customers.

To advance this initiative, the Company sought external subject matter expertise and retained Lon Huber, a senior director at Strategen Consulting. Mr. Huber is well known for providing independent analysis, strategy, and policy solutions to some of the energy sector's most pressing issues. See Attachment A for Mr. Huber's biography.

To facilitate the intensive stakeholder engagement envisioned for the development of the pilot, the Company partnered with Great Plains Institute (GPI) and Center for Energy and the Environment (CEE) to convene stakeholders over a five month period. The Company met with stakeholders on eight occasions, including two large group forums and six working group sessions. In addition to CEE, GPI, and the Company, the working group was comprised of representatives from the Department

of Commerce, the Minnesota Office of Attorney General, the Citizens' Utility Board, Fresh Energy, the law firm of Stoel Rives, the Suburban Rate Authority, and Energy CENTS Coalition.

The goals of the stakeholder process were to provide advisory input during the development of the Company's pilot, and to identify and prioritize objectives for the pilot's design. The detailed notes from some of those discussions are filed in the public record.[3] We appreciate the intensive participation and time dedication of so many parties in this process.

D. Market Research

As the Company began the process of developing this pilot proposal, we deployed market research to increase our understanding of customer interests, knowledge level, and preferences with respect to potential Time of Use pilot program features. In July, we deployed an online customer survey to a random sample[4] of residents in the Hiawatha West and Midtown area of Minneapolis. We deployed an identical survey in August to customers in and around Eden Prairie.

The objectives of the surveys were to learn about customer input on a range of topics related to the pilot and to gain baseline understanding of key issues and behaviors. The customer survey objectives are detailed at Table 1.

[3] See "e21 Stakeholder Meeting Notes on XE TOU Proposal," September 11, 2017. Docket No. E002/M-15-662, *In the Matter of an Alternative Rate Design Stakeholder Process for Xcel Energy.*

[4] The survey includes Residential customers with active email addresses on file with the Company.

Table 1. Customer Survey Objectives

Program Drivers	What factors are most important to customers when deciding whether to participate in a new pricing program?
Interest	How interested are customers in a new pricing program that allows them to return to their standard plan at any time?
Incentive or Guarantee	Among customers who are not interested in a new pricing plan, would either a $100 incentive to participate or a guaranteed low rate make a difference?
Energy Bill	How much time do customers typically spend reviewing their energy bills? How often have customers experienced a higher than normal energy bill?
Past Energy Behavior	Have customers tried to save money on their bill by reducing how much electricity they use or by shifting the use to a different time of day? How successful were those previous efforts?
Energy Terminology	How knowledgeable are customers about energy terms, especially those terms related to variable pricing plans?
Communications	How do customers prefer to hear from Xcel Energy about new pricing programs? What educative efforts or tools are needed?
Barriers to Acceptance	What factors may derail a Peak Pricing plan for MN?

Both groups of respondents had similar results. The combined results of the customer surveys are illuminating, and are included at Attachment B. We learned that saving money and protecting the environment are the top drivers customers identify for their reduction in energy use during peak periods. We also learned that most customers spend very little time reviewing their bill and lack familiarity with certain bill components and energy terminology. Perhaps most significant of all, we learned that more than two thirds of customers were pleased or very pleased to participate in a Time of Use program that allows a return to flat rates at any time. Survey learnings are summarized in Table 2 below.

Table 2. Customer Survey Learnings

Program Drivers	When it comes to a new pricing plan, Minnesota customers are motivated primarily by a desire to save money and to protect the environment.
Interest	Seventy percent of customers expressed interest in taking steps to reduce energy use and two thirds were comfortable with a Peak & Off Peak program that provided an option to return to their standard plan.
Incentive or Guarantee	Among customers uninterested in the peak program, offering a guaranteed lower rate increased interest but a $100 incentive did not.
Energy Bill	Most customers spend very little time reviewing their bill. The majority of customers experienced higher than expected electric bills in the past.
Past Energy Behavior	Nearly every customer tried to save money by reducing electricity use and most succeeded a little. 40 percent tried to shift usage during the day.
Energy Terminology	Customers have no or minimal knowledge of many of the terms related to variable pricing; terms that had some resonance were bill credit, peak demand, kilowatt hour and customer charge.
Communication	Customers prefer an email from Xcel Energy to learn about new rate pilots. Tools, such as an app, would be used occasionally by customers and most prefer an email with a webpage link be notified about personal or household energy use.
Barriers to Acceptance	Lack of confidence in the perceived effectiveness of customers' actions to reduce energy use and the belief that little can be done to further reduce energy use are important attitudinal considerations. Additionally, many customers are not motivated by the prospect of changing behavior.

These learnings were helpful to the development of the pilot, and informed the pilot features. Some of the key takeaways of the Market Research is summarized in Table 3 below.

Table 3. Market Research Takeaways

Education is Critical	Given the considerable lack of knowledge around many energy terms, especially those related to variable pricing, and the lack of experience in 'shifting energy use to different times,' substantial effort must be expended to educate customers on not only the intended benefits of the pilot but also the actual mechanics of how to leverage savings.
Dwelling Constraints	With a large percentage of customers who rent and a large number of apartment dwellers, there may be constraints to how effectively customers can curtail energy use or modify behaviors. Landlord engagement may help increase the success of the pilot.
Limitation of Information	The role that information, especially frequent consumption feedback, can play in changing behavior is largely unknown.
Simplicity Reigns	General information, not a lot specific details, will help set the course for the program. Customers are not interested in details as evidenced by their cursory review of energy bills. Introduce simple ways to reduce electricity usage and promote confidence in small steps that make an impact.

E. National Best Practices

In addition to surveying customers in preparation for pilot development, the Company also reviewed the best practices from similar utility programs throughout the country. The Company began with recent learnings from Xcel Energy's Colorado jurisdiction, where an opt-in rate pilot is underway. We also reviewed non-Xcel Energy programs for key learnings. Four pilots in particular stood out, each offering different lessons. These include Sacramento Municipal Utility District (SMUD), National Grid, Baltimore Gas and Electric Company, and the City of Fort Collins.

The Company drew on the experience of SMUD to support the use of an opt-out approach to customer enrollment. SMUD experienced a relatively low level of attrition in its pilot program, and operated its program cost effectively on an opt-out basis.

Participants in a National Grid program overwhelmingly selected AMI meters and, similar to Minnesota customers, were motivated by saving money and helping the environment.

The Company also reviewed Baltimore Gas and Electric Company's behavioral demand response program which now realizes more than 300 MW per peak event.

The City of Fort Collins initiated a 7,200 customer opt-out TOU rate pilot which found a standard TOU rate was better at reducing load than a tiered TOU rate. Brief case studies of these projects are included at Attachment C.

Additionally, the Company found the use of a five-hour peak duration is consistent with many other TOU rates, among them: the City of Fort Collins 7,200 customer opt-out TOU rate[5], the Arizona Public Service TOU rates (a decades long leader in time of use rate adoption)[6], Hawaiian Electric Companies[7], and several of the pilot TOU rates in California[8]. The five hour peak duration and other pilot features are discussed in more detail below.

VIII. Pilot Program Description

The Company provides a detailed description of the components of its pilot program proposal, including the pilot's goals and objectives, size and duration, key features, enabling technology, customer engagement strategies, proposed accounting treatment, and other details for implementation and administration.

A. Goals and Objectives

1. *Adequate Price Signaling to Reduce Peak Demand*

Through this pilot, the Company hopes to learn more about the effectiveness of price signals at encouraging customers to shift energy usage outside of designated periods of peak system demand. By pricing the use of electricity at higher on-peak rates and lower off-peak rates, and by more closely representing cost levels in energy prices, the Company hopes to learn about customer response to price signals based on time of use.

2. *Explore and Identify Effective Customer Engagement Strategies*

A key objective of the pilot is to explore and identify effective customer engagement strategies around TOU rates and technologies. As we develop a detailed customer engagement plan, the Company will build upon learnings generated through the Time

[5] https://www.fcgov.com/utilities/residential/rates/time-of-use/
[6] https://www.aps.com/en/ourcompany/ratesregulationsresources/serviceplaninformation/Pages/residential-sheets.aspx
[7] https://www.hawaiianelectric.com/save-energy-and-money/time-of-use-program
[8] http://www.cpuc.ca.gov/General.aspx?id=12154

of Use pilot recently launched in our sister jurisdiction in Colorado. Other sources of data to inform a detailed plan will come from our existing market research, as well as ongoing customer survey learnings generated pre-launch and during the pilot.

3. Understand Customer Impacts by Segment

In developing this pilot, the Company desires to understand how customers respond to information, tools, messages, and price signals, and to gain insights into how these responses are distinguished by market segment. By measuring variations in how different types of customers engage with and respond to these elements, the Company will be well-positioned to develop potential revisions to the proposed pilot design, or the features of administering a future roll-out. Market segments to consider may include: seniors, segments by household income, EV ownership, and the general population.

4. Support Attainment of Demand Response Goals

Another goal of the pilot is to support the achievement of the Company's demand response goals, as articulated in the Commission's January 11, 2017 Order. The Commission directed the Company to acquire an additional 400 MW of additional demand response by 2023.[9]

TOU pricing programs can expand the benefits of demand response, and the Company's proposed TOU pilot is a complimentary effort as we explore opportunities to grow our demand response portfolio. The Company is reviewing new opportunities for demand response by determining cost-effective potential across our service territory – through qualitative analysis and discussions with customers. We are hosting working sessions with stakeholders to discuss financial impacts and the scope of demand response efforts in Minnesota compared to other states. Our stakeholder process is also designed to share ideas and examine challenges and future policies needed to succeed. Our analysis has begun and near-term workgroups are scheduled and will wrap up in May 2018.

5. Understand Integration of Pilot Elements in our Service Territory

Another goal of the Company's proposed pilot is to gain experience executing a new TOU rate pilot and providing a significant increase in customer usage information. While we benefit from learnings about certain best practices from other programs,

[9] See Order Point 10, ORDER APPROVING PLAN WITH MODIFICATIONS AND ESTABLISHING REQUIREMENTS FOR FUTURE RESOURCE PLAN FILINGS, January 11, 2017. Docket No. E002/RP-15-21, In the Matter of Xcel Energy's 2016-2030 Integrated Resource Plan.

the pilot presents a first opportunity for the Company to gain operational knowledge prior to a wider TOU implementation. The Company anticipates that, by deploying the pilot in select parts of our service territory, we will gain learnings about the ability to provide increased customer energy usage information to empower customers to make choices that support conservation and efficient energy use. By increasing the accessibility of customer usage information – both through increased granularity and frequency – we hope to enable customers to understand their patterns and identify opportunities to benefit from Time of Use rates.

B. Pilot Size and Duration

The Company's goals in sizing and deploying its pilot were to capture a representative sample of Residential customers, inclusive of a broad range of personal incomes, housing types, and energy usage patterns. The Company also will ensure the pilot is sized so as to generate statistically significant results. With these goals in mind, the Company will deploy its pilot to a total of 10,000 customers in two geographic areas: customers served out of the Hiawatha West/Midtown substation in Minneapolis, and the Westgate substation in Eden Prairie and surrounding communities. A map of these locations is included at Attachment D. Pilot participation will be split with roughly equal numbers, approximately 5,000 from Hiawatha West/Midtown and 5,000 from Westgate. Additionally the Company will include approximately 7,500 customers in the control group, divided between the two areas.

The Hiawatha West, Midtown, and Westgate Substations were selected because they allow the Company to capture results from a diverse customer population – including a diversity of single family and multifamily homes, home sizes, both high and low energy users, and a range of household incomes. The selected substations also will possess the enabling technology that will allow the use of AMI most efficiently. By siting the pilot in the footprint of other AGIS deployments, the pilot is enabled by the communication infrastructure provided by FAN deployment, for example.[10]

1. Customer Selection: Geography and Demography

a. Hiawatha West and Midtown

The Hiawatha West/Midtown location has slightly fewer than 21,000 households. Average income in the area is 60 percent of the Company's average Minnesota

[10] The Field Area Network (FAN) provides the wireless communications to each device required for management and control the system. This component of grid modernization, including FAN Mesh and FAN WiMAX, is described in the Company's November 1, 2017 Grid Modernization Report, Docket No. E002/M-17-776.

customer income. In this area, customers' annual energy usage is approximately 65 percent of the Company's average Minnesota customer income. Hennepin County Assessor data indicates a higher proportion of multiple family housing types (including condominiums, duplexes, and apartments) in the Hiawatha West/Midtown area compared to the Eden Prairie location. This section of Minneapolis also consists of older housing stock as compared to housing stock in and around Eden Prairie.

b. Westgate

The Westgate substation serves customers in Eden Prairie and a small portion of the surrounding area, including parts of Chanhassen and Minnetonka. This area is largely comprised of customers in the middle to upper end of the income spectrum for our service territory. The housing types from the available Hennepin County Assessor data indicate a higher proportion of more expensive single family homes than the other pilot area. Average annual income levels in the Westgate area are more than double that of Hiawatha West/Midtown. Electricity usage in the Eden Prairie area is nearly double as well. Housing stock includes a sizeable portion of homes built since 2000. Approximately four times as many customers here are enrolled in Saver's Switch, indicating a much higher concentration of central air conditioning facilities compared to Hiawatha West/Midtown. A small proportion of the customers here have received energy assistance payments.

c. Comparison to Service Territory

Comparing against all of the Company's Minnesota electricity customers indicates the proposed pilot areas cover much of the customer income spectrum. The pilot area does not capture other types of diversity, however, as both locations are within the Twin Cities metropolitan area and no rural customers are represented, nor combination electricity and natural gas customers. The Company's average Minnesota residential customer falls largely in the middle of the two pilot locations proposed for income and electricity use. The total percent of customers receiving energy assistance payments is lower for the service area at large compared to the pilot area.

Table 4. Demographic Information on Pilot Areas

	Chanhassen	Eden Prairie	Minnetonka	Other	**Subtotal 1**	Minneapolis	**Subtotal 2**	**Total Pilot**	**% Pilot**	All MN	% All MN
Upper Income Groups 1-3	889	9,800	391	38	**11,118**	966	**966**	**12,084**	**33.9%**	417,906	38.4%
Middle Income Groups 4-7	59	2,686	88	82	**2915**	8,680	**8680**	**11,595**	**32.6%**	508,827	46.7%
Lower Income Groups 8-10	70	721	0	47	**838**	11,082	**11082**	**11,920**	**33.5%**	162,421	14.9%
Subtotal	1,018	13,207	479	167	**14,871**	20,728	**20,728**	35,599		1,089,154	
Average 2014 kWh	8,499	9,380	10,865	10,917	**9,371**	5,091	**5,091**	**6,879**		7,905	
Average 2015 kWh	8,230	9,042	10,497	10,302	**9,037**	4,856	**4,856**	**6,603**		7,580	
Average 2016 kWh	8,352	9,020	10,504	10,156	**9,029**	4,927	**4,927**	**6,640**		7,578	
% Energy Assistance Payments	0.5%	1.4%	0.4%	6.7%	**1.3%**	7.9%	**7.9%**	**0.4%**		0.4%	
Average Annual Income	123,429	115,359	102,198	160,877	**115,144**	45,424	**45,424**	**74,549**		77,172	

Annual Income is obtained through Census data at the ZIP+4 level

Unidentified segments represent residential accounts where our service address information does not match any records sufficiently with the segment vendor's data

% Energy assistance payments represent any customers with 1 or more payments during a recent twelve month period.

2. Customer Eligibility

Customers included in the treatment group will include renters and homeowners; subscribers to the Company's renewable energy programs including Windsource, Solar*Rewards Community, and Renewable*Connect, Energy Assistance recipients; electric vehicle owners (who are not on an EV charging tariff); and Saver's Switch and other Conservation Improvement Program (CIP) participants.

Nearer to the time the pilot is implemented, the Company will select the households for participation in the pilot. Initial selections for meter installations will be driven in part by the following deployment planning factors:

- Strength of communications to the existing meter prior to replacement to ensure minimal disruption;
- Efficiency of meter deployment crews in dense geographic areas (i.e. maximizing efficiency by installing all meters in a community at the same time);
- Proximity to the substation as there are implications for communications, reliability, and cost;
- Availability of fully tested technical architecture for data collection, processing, integration, and storage prior to deployment;
- Management of pre-deployment customer communications to ensure awareness and increase engagement; and
- Completion of location-specific technical training for employees/contractors engaged in the deployment.

The Company's pilot design excludes certain customers, even those present in the targeted pilot areas, due to the additional complexity of serving them in the treatment group. Ineligible customers include those with electric space heating, net metering service, dual fuel service, limited off-peak service, and those on the EV charging

service tariff. The additional complexity is based on limitations to our current billing system capabilities as well as the incompatibility of existing rate designs with the TOU pilot structure. We estimate that the impact of these combined exclusions would cause between 1 and 2 percent of the potential populations to be ineligible. While we understand there are valuable learnings that will be foregone by excluding some segments, the Company believes its approach is reasonable for purposes of the pilot, and strikes a practical balance between developing learnings while allowing for administrative feasibility.

3. Pilot Duration

The pilot will be operated for two years. Time of Use pilot rate implementation will begin for all treatment group participants simultaneously, enabling a common twenty four month period of study for the pilot.

C. Pilot Features

1. Opt-Out

The Company proposes to implement its pilot project on an opt-out basis, meaning participants in the targeted pilot areas will, after several advance communications, receive a new electric meter and be auto-enrolled in TOU rates. Customers retain the ability to opt-out of the pilot and return to flat rates at any time. There are numerous benefits to enrolling customers in an opt-out structure. These include the relative cost-effectiveness of this approach in acquiring and retaining a statistically significant sample for evaluation purposes, the elimination of selection bias that is introduced when customers opt-in, and the higher overall peak demand savings that can result from the volume of participants identified for a pilot on an opt-out basis. The concept of an opt-out approach has been vetted throughout the stakeholder process for this pilot, and stakeholders appear to generally support the Company's approach to enrollment.

The Company's opt-out design is also informed by the recent experiences of our sister jurisdiction in Colorado. There, the utility is devoting substantial resources to attract volunteers to participate in its TOU pilot. In Minnesota, the Company hopes to devote more resources to facilitating customer education and satisfaction with engaging tools and targeted messages in lieu of spending resources attracting customers to the rate.

2. Rate Design and Methodology

We provide a detailed description of our rate design and the methodology that supports it, including an overview of the pricing for the pilot, the method for selecting the time periods associated with the pricing, and the seasonal differentials included in the design.

a. Pricing Overview

The rates developed for the Company's TOU Pilot are shown in Table 5 below, along with a comparison to current flat rates[11]. Table 5 shows the pricing inclusive of fuel costs. The energy rate design is derived from the Cost Duration Method. This Method was developed to better link the recovery of system costs to the time periods during which system assets are being utilized. The Cost Duration Method, as well as the use of forecast year test basis for the rate design, is detailed at Attachment E.

Table 5. TOU Pilot Rate Design

Proposed TOU Pilot Energy Rates with Standard Rate Comparison		TOU Ratio		Rates - Cents per kWh Average Monthly	June - September	October- May
TOU Pilot Rate						
On-Peak	3PM-8PM Weekdays	4.20		23.821	25.949	22.385
Mid-Peak	Other Hours	1.95		11.070	12.125	10.430
Off-Peak	12AM-6AM All days	1.00		5.676	5.676	5.676
Standard Flat Rate				12.386	13.437	11.742
TOU Percent Change from Standard Rate						
On-Peak	3PM-8PM Weekdays			+92%	+93%	+91%
Mid-Peak	Other Hours			-11%	-10%	-11%
Off-Peak	12AM-6AM All days			-54%	-58%	-52%
Notes: 1) Rates include fuel cost, 2) On-Peak excludes designated holidays						

In the rate summary above, the on-peak price level compared to the off-peak price level provides a strong 4:1 on-peak to off-peak ratio. The summer on-peak rate reaches 25.949 cents per kWh which provides a strong price signal for demand reduction at a price level at

[11] The Company will provide updated pricing in advance of final electric rates to go in effect in 2019.

the edge of what can be justified when looking at the cost on marginal investments like a new combustion turbine.

The rate produces symmetry in pricing with each time period effectively doubling to get to the peak rate. Meanwhile, the price for most hours is 10 percent less than the current flat rate which gives a steady stream of mid peak savings to participants.

A key feature of the TOU rate is the off-peak time window from midnight to 6:00 a.m. Stakeholders and surveyed customers both expressed strong interest in "Shifting customer energy use to overnight periods when wind generation is highest." The Company examined times with low load conditions and used existing data from MISO to confirm times with higher than average renewable energy on the margin. This led to the off-peak pricing of the rate plan.

While the Cost Duration Method focuses on assigning embedded costs to high load hours, the output of the model clearly shows strong price signals that act as marginal cost proxies. Indeed, when evaluating LMP prices ratios, the final rate design provides greater spreads between TOU periods. This is partly because LMP energy prices are just that, energy linked prices, while the TOU rate is primarily focused on capacity savings. Again, this aligns with goals identified by stakeholders to "Reduce peak demand-related system costs to mitigate need for future investments in the system."

b. Selecting TOU Rate Periods

Under the pilot program, the Company proposes that three TOU rate periods would be established: an on-peak period from 3:00 p.m. to 8:00 p.m. on non-holiday weekdays, an off-peak period from 12:00 a.m. to 6:00 a.m. on all days, and a middle period for all other hours. These periods and associated rates are intended to achieve several objectives. First, the on-peak period is intended to reduce peak demand by encouraging customers to reduce consumption during peak load hours. Several recent TOU pilot programs have established a body of evidence and best practices for successfully designing TOU rates to achieve peak demand reduction.[12] A key lesson learned from these experiences is that achieving peak demand reduction depends on setting a meaningful price signal that customers can respond to. In general, this means that TOU rates with higher on-peak to off-peak ratios and a narrower peak window are likely to be more successful at achieving peak demand reductions. For example, the results of 67 TOU study treatment groups showed that the reduction in peak demand for a less than 2:1 peak to off-peak ratio was only 6 percent on average, while a ratio of greater than 4:1 was 15 percent on average.[13]

[12] See U.S. DOE Smart Grid Investment Grant Program, https://www.smartgrid.gov/document/CBS_Results_Time_Based_Rate_Studies.html
[13] *Ibid.*

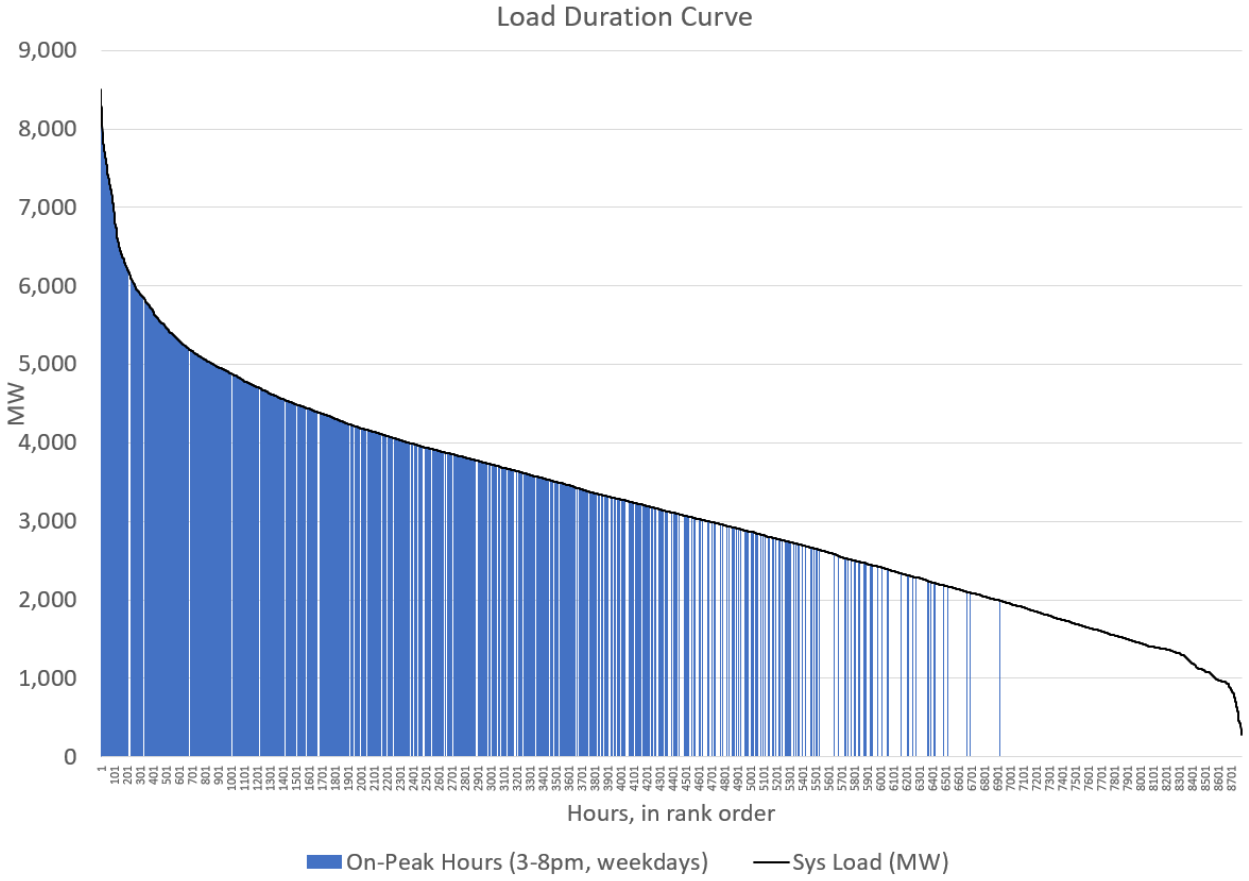
Accordingly, we have selected a TOU period that achieves a greater than 4:1 on-peak to off-peak ratio. Additionally, we have selected a 5-hour on-peak window to make the design manageable for customers. Long duration peak windows give customers fewer opportunities to respond to the TOU price signal by reducing demand. In contrast, utilities with successful TOU programs, such as those in the Southwest U.S. where participation in opt-in TOU rates is especially high, typically have peak window durations in the 3 to 7 hour range.[14] However, a trade-off with shorter periods is the introduction of a "snap back" in demand for the hours right after the last peak hour.

"Snap back" can be an issue if the hour directly after the last peak hour still has high demand levels. Also, to a lesser extent, shorter perk periods may not fully recognize the ramp-up of load and marginal energy costs immediately preceding the peak period.

We selected a time period for the on-peak window that appropriately balances these considerations and generally correlates the Company's anticipated net peak load hours as shown in the figure below.[15] Over 60 percent of the hours in the peak time period fall within the top quartile of net peak load hours on the projected load duration curve. Meanwhile, zero hours in the peak period fall within the bottom quartile of load hours.

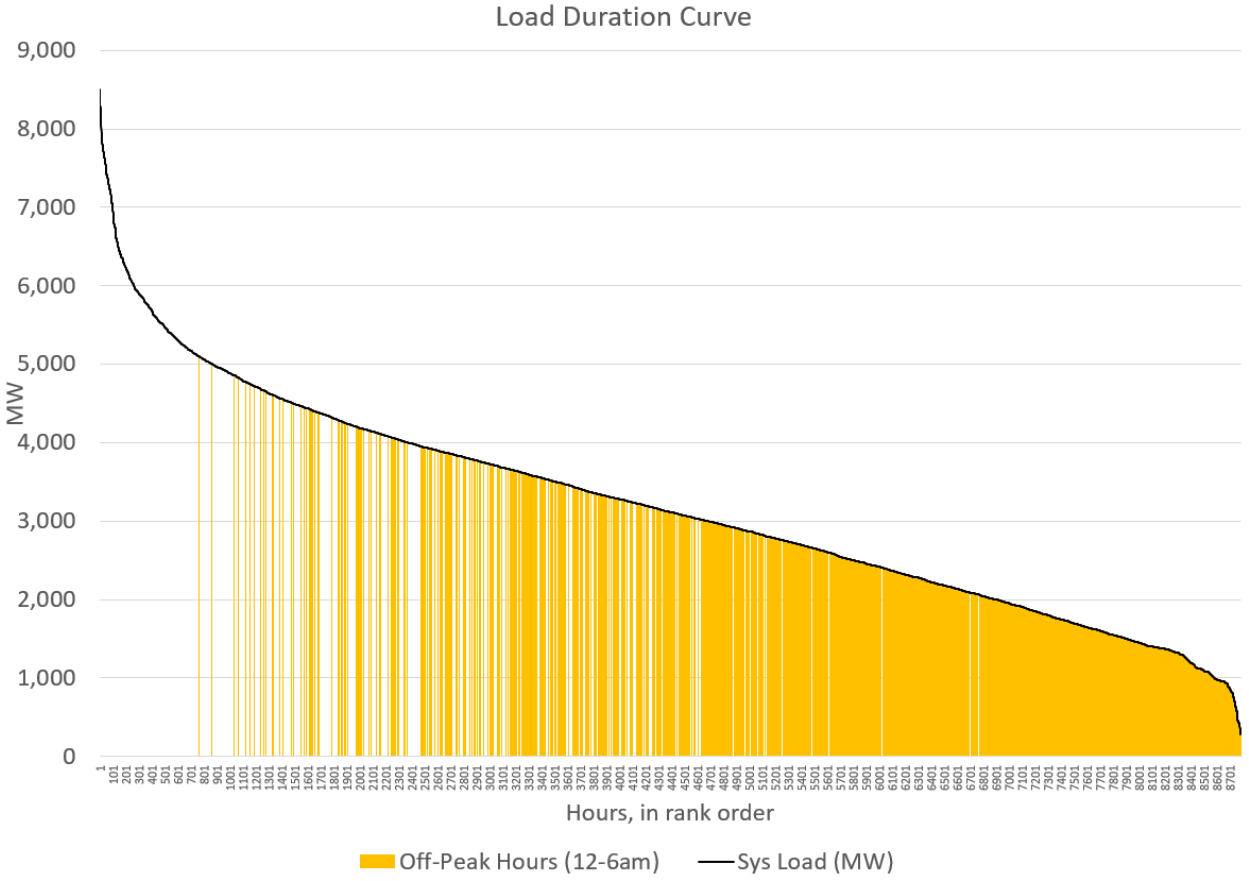
[14] For example, see Salt River Project EZ-3 and Arizona Public Service ET-2 rates.
[15] This represents the Company's projected 2024 net load duration curve.

Figure 1



Another objective of the design is to encourage customers to shift consumption to a focused off-peak period of lowest system loads when low cost wind energy is also likely to be on the margin. As more wind is added to the system we anticipate that instances of wind energy on the margin and negative pricing will increase in frequency, especially during the off-peak period. Thus, it is more beneficial for consumption to occur during this time period versus other times in order to avoid curtailing wind energy and to take advantage of negative wholesale prices. The off-peak period was designed so that 60 percent of the hours in the period are within the bottom quartile of load hours, and only 2 percent are within the top quartile.

Figure 2



Finally, the TOU periods are also selected so that the mid-period, which represents the majority of hours, results in a rate that is similar to today's existing volumetric flat rates. Important note: the above graphs are a high-level illustrations of hour allocation and the resolution is not high enough to accurately reflect the number of hours within a particular TOU period.

c. Seasonal Differentials

Another important part of the TOU rate design process is developing the appropriate seasonal price differentials for each of the three proposed TOU rate periods, which are consistent and compatible with the seasonal rate differentials in established rates.

No seasonal differential is recommended for the off-peak rate to recognize the minimal cost and load differences throughout the year for the proposed 12:00 a.m. to 6:00 a.m. off-peak rate period. The same seasonal rate differential as for existing flat rates is used for the mid-peak rate period to recognize its rate level similarity with proposed mid-peak rates. In the final step of this process, the on-peak seasonal

differential is calculated such that the residential TOU load weighted average seasonal rate differential for proposed TOU rates matches the existing flat rate differential.

d. Saver's Switch Discount

Residential Service customers with central air conditioning have the option of participating in our Saver's Switch program that provides a discount for Company control of their air conditioner, which is provided through the Residential Controlled Air Conditioning and Water Heating Rider. An additional discount is also available if these customers have an electric water heater that is controlled. The Saver's Switch program is not available to customers receiving service through the existing Residential Time of Day Service tariff, which provides a competing price incentive through the on-peak rate to reduce energy usage during the same system peak conditions that are associated with Company use the Saver's Switch program to control air conditioners. Additionally, providing the Saver's Switch discount of 15 percent of energy and fuel rates to an on-peak rate would provide an excessive discount level. Applying this percent-based rate design to both on-peak and off-peak energy rates, in addition to fuel rates, is also significantly more complex than its application to the Residential Service flat energy rate.

As a reasonable and administratively efficient approach to allowing pilot participants to continue receiving a Saver's Switch discount, our proposal includes a revised rate design for a Saver's Switch discount. The revised discount is a monthly $10 bill credit applied during the billing months of June through September. TOU participants also will indirectly receive an additional discount for control of their air conditioners through reduced on-peak usage that avoids pricing at the TOU pilot on-peak energy rate. An additional consideration for this proposal is that a comparable annual $40 credit has been used and well received in Xcel Energy's Colorado service territory.

The revised Saver's Switch discount for TOU pilot participants, described in the proposed TOU Pilot tariff at Attachment F, also includes a discount for customers that have controlled electric water heating in addition to controlled central air conditioning. The revised version of the additional controlled electric water credit is a monthly credit applied each billing month.

e. Distribution of Customer TOU Bill Impacts

A primary consideration for TOU rate design is balancing the benefit of more precisely cost-based price signals with the resulting change in the individual customer bills as compared to existing flat energy rates. TOU rates improve customer equity by more closely representing the cost of individual usage patterns and more importantly,

provide customer incentives to develop lower-cost usage patterns. However, a direct result of these benefits is that most customers will experience comparative decreases or increases in their electric bills by moving from flat rates to TOU rates.

To test whether the proposed TOU rates provided a reasonable distribution of bill impacts, we compared standard flat rate bills and proposed TOU rate bills for sample load research customers using their individual hourly loads for the year 2016. This comparison, which is based on past energy usage that was billed on standard flat energy rates, represents a static case of *no TOU price response*, meaning, it compares the rates as if customers made no changes in usage patterns. Our finding from this analysis is that the proposed TOU rates provide a reasonable range of bill impacts.

For example, 88 percent of customers had bill changes of less than six percent (48 percent bill reductions and 40 percent bill increases). Another interesting finding is for the majority of customers, average bill impacts for the static case with no TOU price response are related to annual energy usage, such that customers with lower usage see reduced bills with TOU pricing and customers with higher usage see increased bills with TOU pricing. The detailed bill comparison results are included at Attachment G.

f. Comparison of Existing and Proposed TOU Rates

We have offered an optional residential TOU rate for over 35 years that has low participation. This existing tariff is a two-part TOU rate with a twelve hour on-peak period of 9:00 a.m. to 9:00 p.m. weekdays except designated holidays. Although it is cost based and remains consistent with current system loads and marginal energy costs, the long on-peak period significantly limits the price response potential by residential customers. Correspondingly, the twelve hour long off-peak period impedes a focus on the lowest cost hours. Another potential impediment to its acceptance is its incremental two dollar per month customer charge to recover higher TOU metering costs. To remove this potential impediment and to anticipate an eventual rollout of more capable metering to all customers, the proposed TOU tariff retains the same monthly customer charge as the existing flat rate tariff.

Further, the on-peak to off-peak ratio of the current TOU tariff is 3:1, in comparison to the proposed three-part TOU pilot tariff that provides a stronger on-peak to off-peak ratio of over 4:1.

3. Potential Customer Insights Tools

In addition to the use of the carefully designed rates for TOU pilot participants, the Company continues to explore other available means of achieving peak demand reduction. These include customer insights tools that provide increased opportunities for customer information-sharing and targeted messaging to produce desired customer behaviors. These tools, known as behavioral demand response and peak time rebates, are under consideration by the Company. This is discussed below under "Technology Procurement."

4. Bill Protection

As the Company embarks on a TOU rate pilot, a key consideration is designing the pilot to maintain customer satisfaction and retain participants. While significant adverse bill impacts are not anticipated in the pilot's design, they are possible. In order to maintain customer satisfaction and avoid major or unanticipated billing impacts for customers, we believe some billing protections are important to the success of the pilot.

The Company will mitigate adverse bill impacts from all pilot participants in Year 1 of the two year pilot. If, after the first year of pilot participation, the difference between a customer's standard flat rate and the new TOU pilot rate exceeds a 10 percent increase, the Company will provide an on-bill credit for the amount of difference greater than 10 percent. If a customer opts out or moves out of the pilot area during the first year, the customer foregoes this protection. This bill protection will terminate after the first year.

For customers identified in our system as energy assistance (LIHEAP) recipients[16], the Company will provide a full "true-up" to flat rates on a monthly basis for the first year. For the second year, LIHEAP recipients enrolled in the pilot will receive annual bill protection for the amount of difference from flat rates greater than 10 percent. Customers who opt out or leave the pilot area will forego this Year 2 annual protection.

These, and other terms of participation are included in the proposed tariff. A sample bill for a TOU pilot participants is provided at Attachment H.

[16] The Company will conduct a participant pre-survey that will ask customers to provide income and household size information. The survey will route customers who identify as LIHEAP-eligible to our LIHEAP program for verification and enrollment.

5. Pilot Reporting

The Company will file a mid-point report approximately 15 months from the launch of the TOU pilot rates, and a final report approximately 27 months from the launch of the pilot rates. Our reports will note progress from key indicators, including participation metrics, peak demand savings achieved, customer bill impacts, and customer satisfaction learnings.

Additionally, the Company's reports will provide an evaluation of the pilot toward achieving its key objectives as known at that time, including an analysis of the price signal effectiveness, the outreach and engagement strategy effectiveness, and learnings about impacts by customer segment.

6. M&V Approach

In order to understand if the pilot meets both its quantitative and qualitative objectives, a Measurement and Verification (M&V) effort will be necessary. Four of the five objectives listed above (adequate price signaling to reduce peak demand, exploring and identifying effective customer engagement strategies, understanding customer impacts by segment, supporting attainment of demand response goals) will entail dedicated study to enable the Company and stakeholders to draw conclusions.

Quantitatively measuring the extent of customer demand reduction, as well as related changes in energy use for the pilot population as a whole and segments within the overall population, will require a measurement baseline for comparison. For this reason, the Company proposes to split pilot participants into "treatment" and "control" populations. Both populations will receive an interval AMI meter. The "treatment" population will also be placed on the new time of use rates, while the "control" population will remain on their current flat rate. Part of the process of identifying treatment and control populations will involve verifying eligibility requirements and identifying if any other customer program participation would conflict with the objectives of the rate pilot.

Progress towards the objective to explore and identify effective customer engagement strategies cannot easily be measured through exclusively quantitative means. A customer survey approach of pilot participants can gather qualitative customer feedback to understand which engagement strategies have been most effective. That survey approach can also gather baseline information about customer energy end-uses, demographics and energy interest/acumen as well as gather additional qualitative information about the meter installation process and customer experiences on the rate

itself. This additional information can be used to further identify quantitative impacts by customer segment.

Building and implementing an M&V plan is a complex task that will benefit from external expertise and resources that can leverage similar work from across the country. The Company plans to issue a Request for Proposals (RFP) to hire an expert to develop the detailed M&V plan and implement that plan through the life of the pilot.

D. TECHNOLOGY PROCUREMENT

As noted, participants in the TOU rate pilot will have AMI meters installed at their homes. New meters will enable the essential two-way communication and interval data capabilities required for TOU participation and will provide significant benefits to participants, as well as provide a critical learning opportunity for the Company about deployment of a new technology. While the scope of AMI capabilities and operational and customer benefits are detailed in the Company's Grid Modernization Report, we highlight key aspects of our technology selection here, including a discussion of the capabilities of our current residential metering technology (automatic meter reading or AMR) and the key benefits of the new technology. We also discuss some of the key considerations informing the Company's exploration of customer insight tools to enhance the pilot's impact.

1. Capabilities of Current Residential Meters

Current residential metering technology in the NSPM area provides for communication from metering end points to data aggregating devices upstream via the 900 MHz communications band. The initial aggregators, called MicroCell Controllers (MCCs), gather data from meters within a certain radius. The MCCs then send data to another aggregator, called a Cell-Master, over the same frequency band. Finally the Cell-Master sends data to a third-party owned database from Landis+Gyr. The data is then provided to Xcel Energy for customer billing. The communication path primarily occurs in one direction from the meters to the final destination.[17]

The meters primarily measure energy usage via an incrementing register within the meter metrology. This energy register is termed the "kilowatt-hours delivered" which is the energy delivered to the customer from the utility. This register will increment as energy is expended until it reaches the maximum register value (5 or 6 digits), and

[17] There are some areas with two-way meters and others that have limited functionality to 'ping' for the meters' status.

then will rollover. This energy usage data is gathered and the customer is billed monthly based off of their accumulated usage throughout the month. Generally, customers in NSP are provided with a total kWh usage for the billing cycle (one month) with no billing-quality intraday information.

The currently installed meters do not have any register level interval data or multiple "bin" time of use functionality and would need to be exchanged for meters that can provide this functionality in order for a residential TOU pilot to be implemented. The Company's existing vendor has some capabilities to extend their network with new meters and communications assets that could enable some TOU in specific areas. The Company is evaluating options as the current vendor's meter network contract approaches its end. See Attachment H for a cost comparison estimate of a Pilot using AMI versus the alternative approach of upgrading current technology to be able to offer TOU rates (but without the additional benefits provided by the AMI). The costs of either approach are similar, with the AMI approach estimated at approximately $11 M and the alternate approach at $9.8 M, and we believe the significant benefits contemplated through the Company's AGIS strategy, as described in the Grid Modernization Report, strongly favor AMI deployment. Accordingly, the Company proposes to deploy AMI technology for the Pilot. The Company is currently in negotiations with potential AMI vendors.[18]

2. New Technology Benefits

AMI devices allow for residential meters that have the interval data capabilities needed for a TOU pilot to proceed. AMI meters will enable the recording of customer energy usage in 5 or 15 minutes increments throughout the day. This data is aggregated and polled every four hours by the metering head-end system. This will allow for a much more granular view of the customer load and how the residential TOU rates will impact pilot customers, enabling greater energy efficiency and time-shifting usage patterns. Customers will be provided their energy usage data the next day.

AMI also provides many other valuable operational and reliability functions. First, AMI is used as a voltage input, providing data to the Company's Advanced Distribution Management System (ADMS) to improve the operation of the electric grid. Second, AMI meters utilize a last-gasp functionality which provides data on an outage when it happens. This leads to a faster response time during outages, improving reliability and customer satisfaction. Third, AMI meters also provide feedback when power is restored ensuring there are no 'nested' areas that might still

[18] We believe there is a small potential that, if necessary, the Company would remove AMI from homes in the Pilot area, incurring removal costs. We view this as a remote possibility and therefore have not included removal in our estimate.

be out of power during restoration efforts. This increases crew efficiency and has a great impact on customer experience.[19]

The incremental cost of an AMI meter versus a TOU AMR meter is relatively small and certain IT integration costs associated with AMI are being shared with PSCo. This presents a unique opportunity to couple the TOU pilot with AMI meters and in geographic locations that can most benefit from the new technology. Moreover, AMI technology is crucial to fully meeting a pilot design objective identified by stakeholders as "Give customers adequate tools to access and understand their usage data." Interval meters are a requisite technology for achieving this objective. The next step is transforming that information into additional peak demand savings.

3. Insight Tools

We believe a key element that drives impacts in TOU programs such as retaining high demand savings past year one or two, is to have a variety of customer options and programs that complement each other. Time of use rates (potentially with a demand rate component), peak rebates and behavioral demand response do just that and offer the opportunity to engage all customers without additional onsite hardware other than the meter. Leveraging opportunities to reduce peak demand is of considerable importance to the Company, especially given the Company's peak demand reduction goals.

As shown by BGE's program and others, a sizable reduction in peak demand can occur through a behavior demand response platform, particularly when coupled with monetary incentives.[20] However, these platforms and programs are not without costs. The Company intends to continue to explore additional customer insight tools and will likely issue an RFI or RFP to the market to fully understand the latest in vendor capabilities and costs.

The Company is hopeful that this pilot can be a test bed for new capabilities that lead to high customer satisfaction while providing system benefits. To that end, we believe there could be a compelling case to be made to unlock these additional customer insight tools, like behavioral demand response and peak time rebates. While the Company does not currently have precise data, preliminary estimates based on other pilots suggest that there can be a stacking of demand savings from different programmatic elements.

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[19] See the in-depth discussion of the benefits of the enabling technologies in the Company's Grid Modernization Report, filed in parallel with this Petition in Docket No. E002/M-17-776.

[20] https://www.oracle.com/customers/glendale-1-opower.html

For instance, non-monetary behavioral demand response might lead to approximately 2.5 percent peak demand savings, a TOU rate an additional 8-10 percent, and peak time rebate, a further 5-10 percent.[21] [22] We believe findings in other jurisdictions are instructive about the ability to implement customer insight tools cost effectively, as the Company does not have current firm pricing for these services. For instance, the Maryland Commission stated the following: "We conservatively estimate that customers will receive $1.28 on a net present value basis for every $1 invested in the AMI system."[23]

It is important to note that if peak rebates are used in this pilot, they would be deployed to engage all non-Saver's Switch customers, serving as a non-hardware based alternative for customers. The Company will continue to review options to integrate these tools during the pilot.

E. Customer Engagement

As we roll out the pilot and install meters at customer homes, our customer engagement strategy will be grounded in transparent, proactive communications. This will help facilitate customer trust with both the new rates and the new meters.

Customer information and engagement efforts will be grouped into two phases designed to create a positive customer experience and help the Company better understand customers' interests, concerns and response to new meters and TOU rates. Phase one will focus on the meter installation, including effective change management. Phase two will focus on the new rates, raising awareness and sharing tools and education materials to facilitate increased customer knowledge and positive participation.

1. Anticipating Customer Questions

The Company will develop a set of messages tailored for the target audience. Messages will likely address topics such as new meter benefits, installation, resources for assistance, new meter concerns, TOU rate questions, bill protection offered, system and environmental benefits of TOU rates, details of participation on the TOU rates, and how to opt out.

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[21] http://aceee.org/sites/default/files/pdf/conferences/eer/2015/Nick_Payton_Session5E_EER15_9.22.15.pdf

[22] https://energy.gov/sites/prod/files/2016/12/f34/CBS_Final_Program_Impact_Report_Draft_20161101_0.pdf page 68

[23] http://www.psc.state.md.us/wp-content/uploads/Order-No.-87591-Case-No.-9406-BGE-Rate-Case.pdf

2. Communication

Portions of the proposed pilot areas have diverse populations. We will develop communications customized to reflect that diversity, reaching audiences with a range of income levels and understanding of their electric service. We will work on a local level to provide resources for those with non-English language needs where those efforts would enable us to better reach a significant number of customers. Also, we will explore the potential to leverage our Partners in Energy program to facilitate local community engagement.

Consistent with its commitment to proactive customer communication, the Company is developing a robust plan to support, inform and engage customers throughout the deployment of new rates and meter technology. The development of customer communications and engagement strategies is built on Company experience with previously executed customer education campaigns, including the recent introduction of tiered rates in Colorado.

F. Estimated Costs and Accounting Treatment

The Company estimates the total costs for the Residential TOU Pilot Program to be approximately $11 million. These estimated costs are detailed at Table 6, and represent total program costs. The recovery request will exclude any internal labor costs. These costs do not include capital expenses for FAN (Wi-MAX) technology which are incorporated in the latest approved electric rate case Docket E002/GR-15-826 (Parent ID 11802573) and will be recovered as part of base rates.

Table 6

Estimated TOU Pilot Costs			
Cost Item		Capital	O&M
FAN - Mesh*	$533,197	$503,177	$30,020
Metering	$4,111,852	$3,858,191	$253,661
AMI Software Licenses	$252,000	$252,000	$0
AMI Software Maintenance and Support**	$120,000	$0	$120,000
Head End	$2,449,409	$2,382,693	$66,716
CRS	$946,400	$922,740	$23,660
Strategen Consultant	$100,000	$0	$100,000
Program Management Labor	$675,000	$0	$675,000
Marketing Communications	$420,000	$0	$420,000
M&V Consultant	$1,200,000	$0	$1,200,000
Customer Data Presentment	$145,000	$141,375	$3,625
TOTAL:	**$10,952,858**	**$8,060,176**	**$2,892,682**

*FAN Wimax is being installed as part of base capital.
**Maintenance and support would be required for 10 years. The $120,000 only includes two years of these payments to represent the pilot. Total 10 year cost would be approximately $600,000.

1. Cost Treatments

As shown in Table 6 above, the Company expects to incur costs related to FAN – Mesh technology, meters, meter software licenses and support/maintenance agreements, Head End system development, updates to the billing system, and marketing.

a. Allocation of Head End Software Costs

The AMI Head End software and related integrations are an enterprise-wide software system that is being developed for use by any Xcel Energy operating company that deploys AMI technology. As this software investment will be utilized by more than one Xcel Energy legal entity, the carrying costs associated with the asset will be shared amongst the operating companies that benefit from the investment. This is routinely done to share the carrying cost of capital investments associated with facilities and network equipment which are owned by one Xcel Energy operating company but provide benefit to many.

For the AMI Head End system, the software assets will be owned by Public Service Company of Colorado (PSCo), an Xcel Energy operating company, since PSCo has a

full AMI meter deployment already underway. The asset carrying cost will be calculated annually, including both the annual depreciation expense as well as a rate of return on the investment. A portion of the asset carrying cost will then be allocated to NSP-MN based on the relative number of AMI devices deployed in each operating company. A new cost allocation methodology to support this shared asset cost will be requested in the next annual update of Service Company Allocations.

b. Other Costs

The Company has included certain installation and integration costs in its estimates in order to represent total costs of the project. As the program advances, we will evaluate internal resource availability in order to complete the work and will treat any internal labor expenses consistent with the Commission's Order in Docket No. E002/M-12-50. We will exclude internal labor costs from the Company's request for recovery of the project costs through the Grid Modernization Rider.

As described above, the Company retained an external consultant for help with development of this pilot and plans to amortize these expenses over the length of the pilot.

2. Recovery Mechanism

Following certification of the TOU Pilot, the Company will file a request for recovery of certain costs through the mechanism identified in statute: the TCR (Grid Mod) Rider.

G. Implementation and Administration

1. Timing

As discussed in our Grid Modernization Report, the Company anticipates that by the end of 2017, contract negotiations will be complete with an AMI vendor. This will enable the designing, building, and testing of the IT system to begin in early 2018, and customer engagement to begin in 2019. By Q1 of 2019, the head-end system will be complete, allowing FAN communications to be installed in Q2 of 2019. Meter installation for pilot participants will begin in Q3 of 2019. Once the new meters are installed in Q3-Q4 of 2019, the Company can begin receiving data to establish a baseline of customer usage data to study against. The pilot will launch for all participants once baseline data is collected, likely in Q1 2020.

2. Program Administration

As noted, throughout the pilot, the Company will provide ongoing program administration support, ongoing measurement and verification of pilot results, along with continued customer support, reporting, analytics, education efforts, communications, billing, and the exploration and management of any additional customer insights tools. This will require internal program staff, external measurement and verification expertise, IT improvements, the development of online content on energy efficiency and time-shifting strategies, and communications efforts to help customers with initial and ongoing awareness of their participation in the pilot. We anticipate these efforts will require one dedicated program manager plus a part-time marketing assistant or intern.

CONCLUSION

We appreciate the opportunity to bring forward an innovative pilot project, rooted in deep stakeholder engagement and rigorous analysis, to advance the Company's strategic vision for grid modernization in Minnesota. Xcel Energy respectfully requests that the Commission:

- approve our request for certification of the Residential TOU Rate Design Pilot Program;
- approve our proposal for implementing a Residential TOU Rate Design Pilot Program;
- approve our proposed pilot Tariff; and
- approve our requested accounting treatment.

Dated: November 1, 2017

Northern States Power Company

STATE OF MINNESOTA
BEFORE THE
MINNESOTA PUBLIC UTILITIES COMMISSION

Nancy Lange	Chair
Dan Lipschultz	Commissioner
Matthew Schuerger	Commissioner
Katie J. Sieben	Commissioner
John A. Tuma	Commissioner

IN THE MATTER OF THE PETITION OF NORTHERN STATES POWER COMPANY FOR APPROVAL OF A TIME OF USE RATE DESIGN PILOT PROGRAM	DOCKET NO. E002/M-17-775 **PETITION**

SUMMARY OF FILING

Please take notice that on November 1, 2017, Northern States Power Company, doing business as Xcel Energy, filed with the Minnesota Public Utilities Commission a Petition for approval of a Residential Time of Use Rate Design Pilot Program that provides select customers with variable pricing based on the time of day energy is used. The pilot also provides participants with increased energy usage information, education, and support to encourage energy efficiency and shifting energy usage to daily periods where the system is experiencing low load conditions. Strategies that shift load away from peak may reduce or avoid the need for system investments in fossil fuel plants that serve peak electric load.

LON HUBER

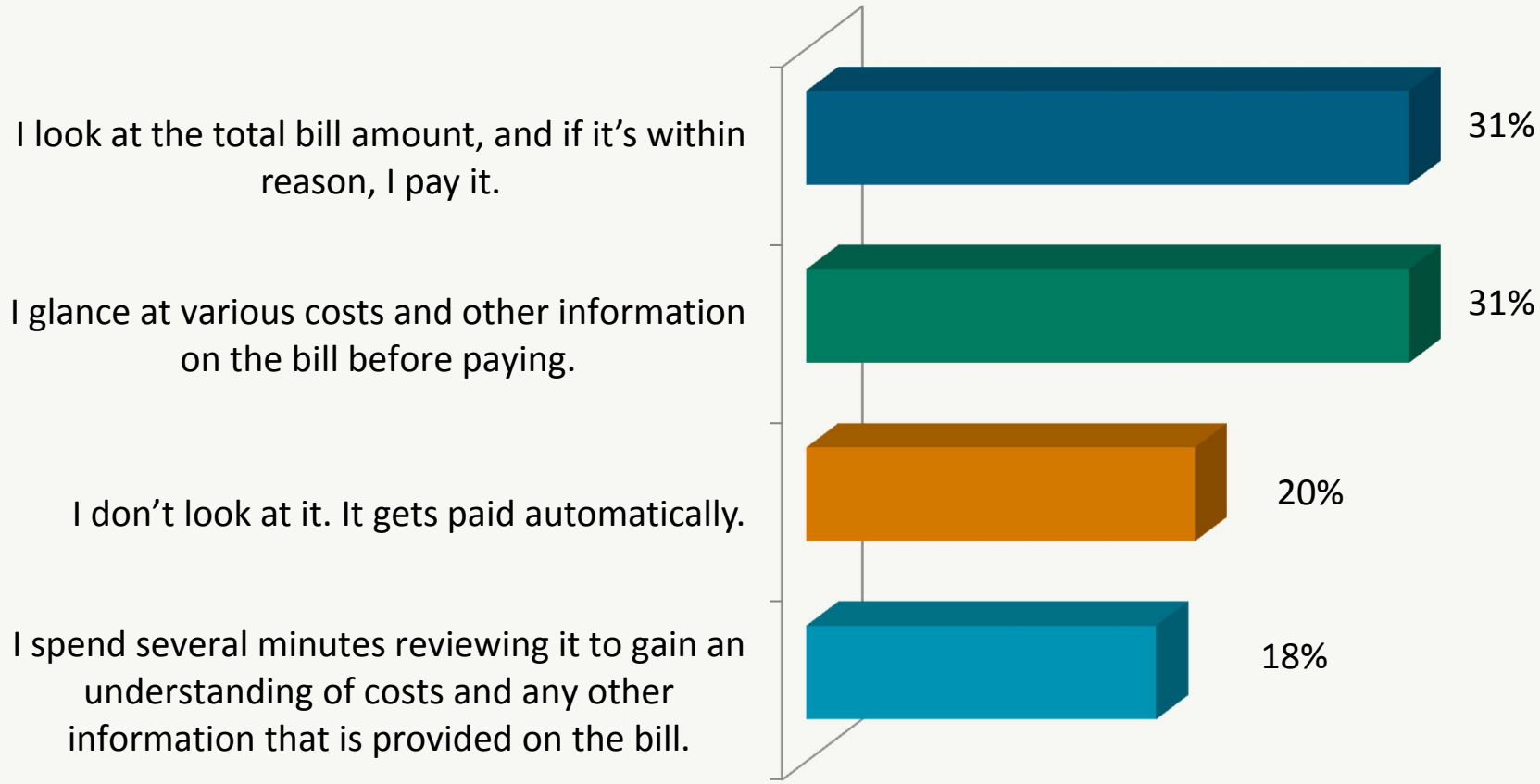
BIO

Lon Huber directs Strategen's private sector consulting practice. In this capacity, Mr. Huber provides independent analysis, strategy, and policy solutions to some of the energy sector's most cutting edge issues. On behalf of a diversity of clients, he is involved in numerous public proceedings across the US, covering such topics as rate design modernization, community solar, and the designing of new ratepayer friendly market structures. He is frequently cited in trade press and speaks regularly at industry conferences. Prior to joining Strategen, Lon worked for the consumer advocate office in Arizona, in the private sector for energy related technology firms and in academia at an-energy focused research institute.

Lon has received a congressional recognition award for his work around solar energy and recognized as a "40 under 40" winner for leadership, community impact, and professional accomplishment. Lon holds a Bachelor of Science degree in Public Policy and Management and a Master's of Business Administration from the Eller College of Management at the University of Arizona.

What Customers Know

Most Customers Spend Very Little Time Reviewing Their Bill and Are Unlikely to Know What They're Paying For

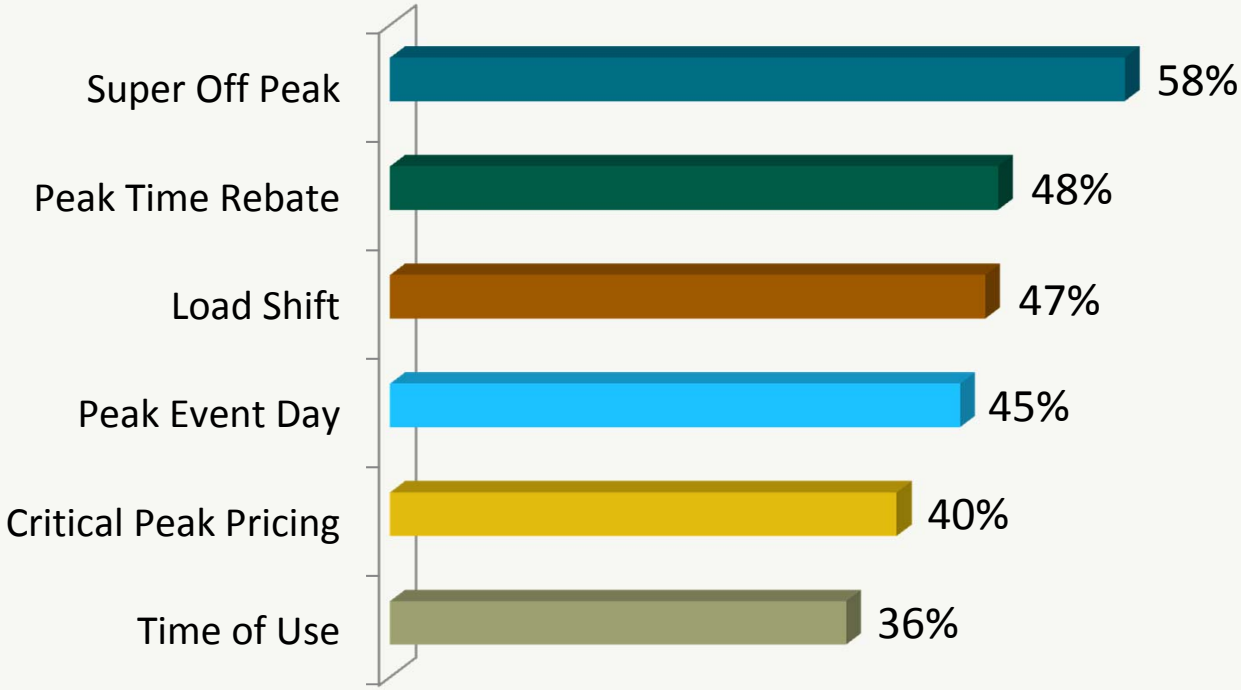


N=1431

Q. When you review your monthly energy bill, which of the following statements most closely resembles how you deal with it?

Most Customers Have Not Heard of Energy Terms Related to Variable Pricing

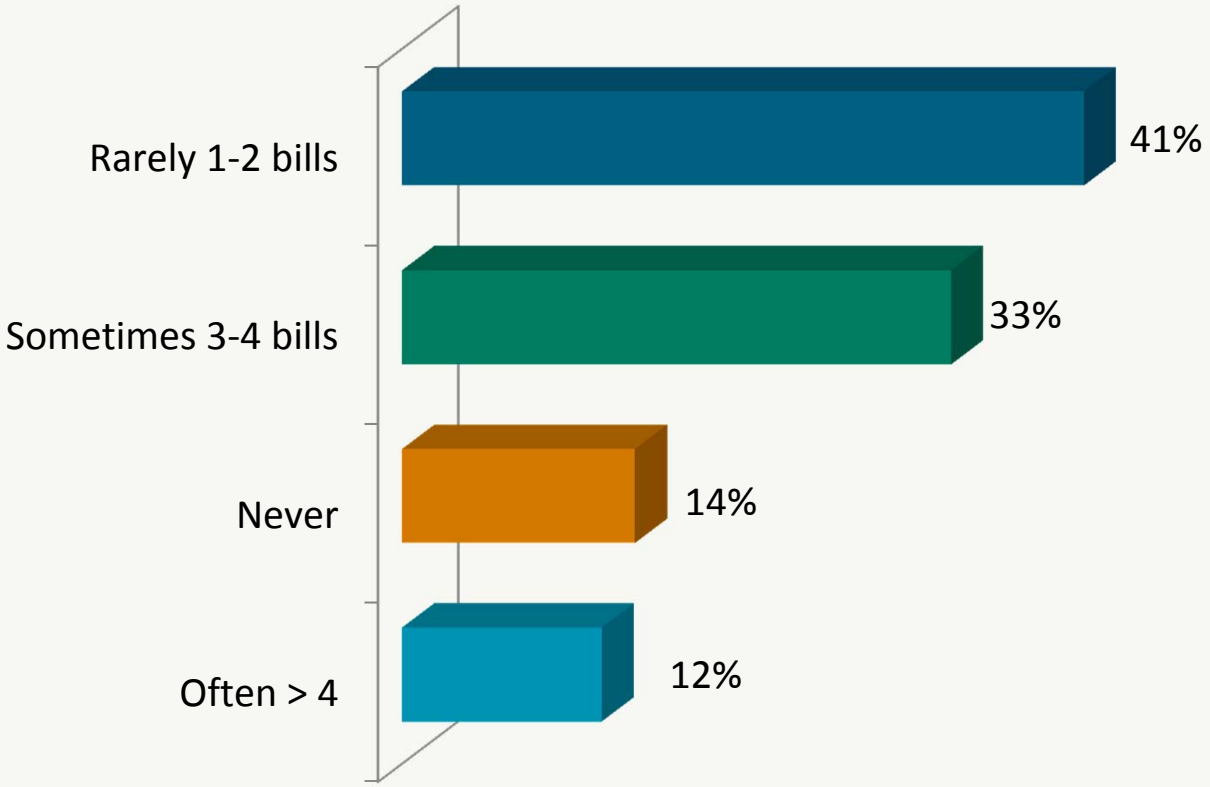
I have not heard of the term …



N=1423

Q. How well do you understand the following energy-related terms?

The Majority of Customers Experienced Higher than Expected Electric Bills



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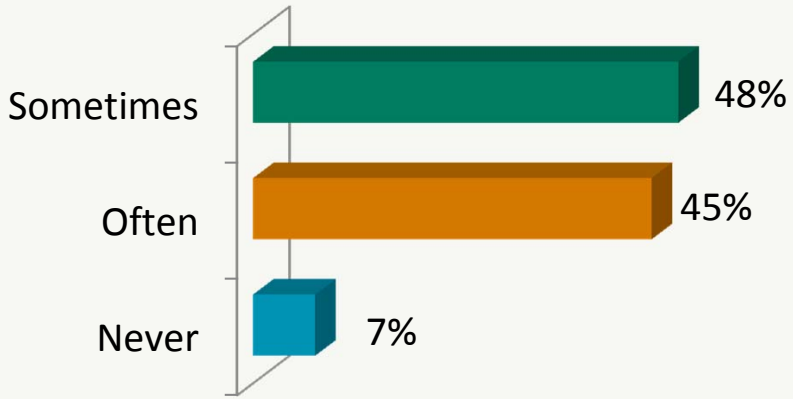
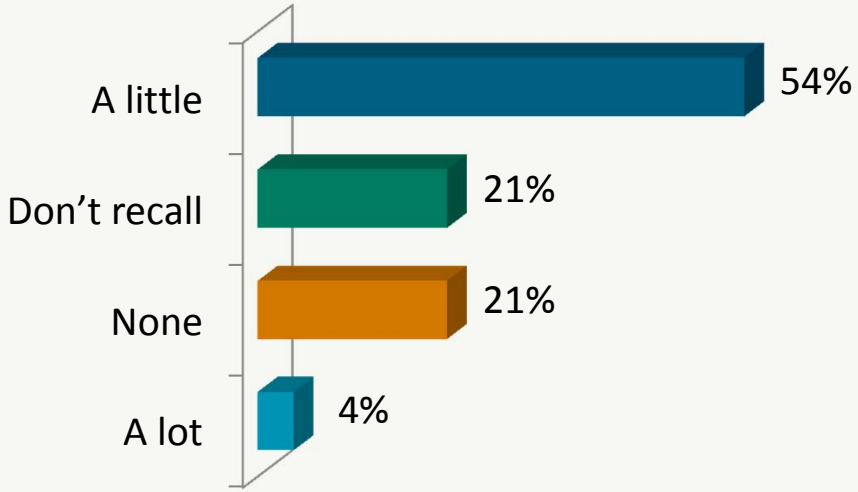
Q. In the past 12 months, how often did you receive an electric bill that was higher than you expected?

Nearly Every Customer Tried to Save Money by Reducing Electricity Use and Most Succeeded a Little

Reduced Use



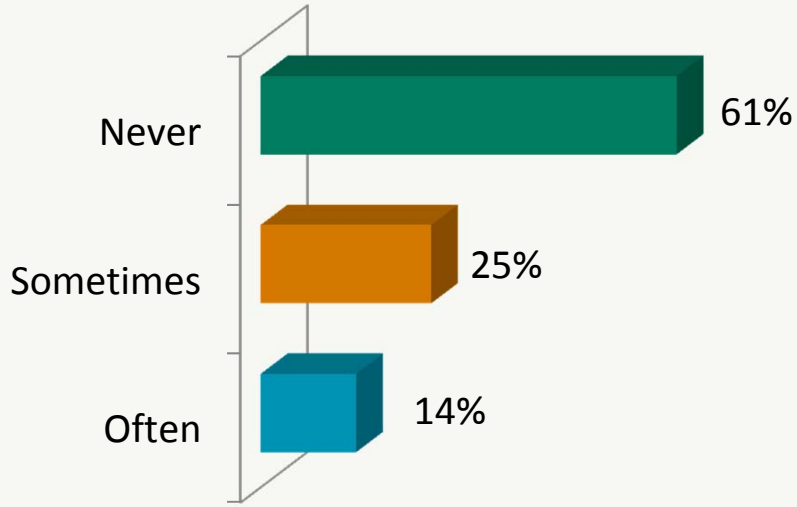
Saved Money



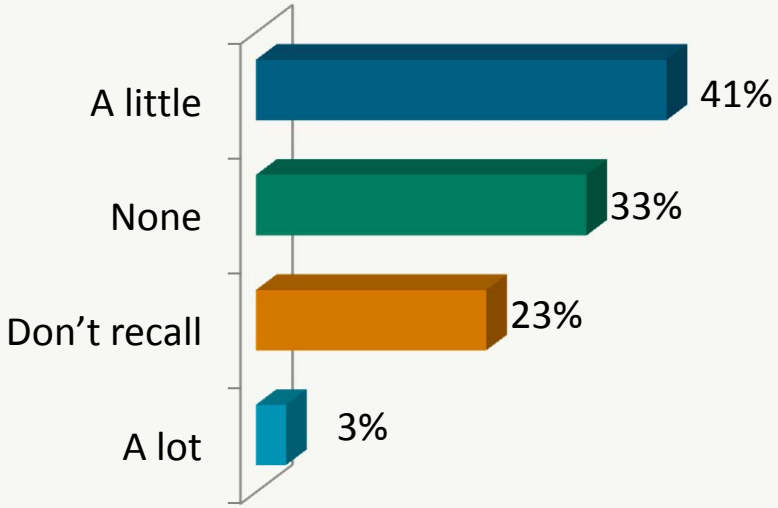
Q. In the past, have you tried to save money on your bill by reducing how much electricity you use?
Q. How much savings did you notice on your bill from reducing how much electricity you use?

Shifting Electric Use to Different Times of Day is Not Typical Customer Behavior

Majority of Customers Never Shifted Electric Use to a Different Time of Day

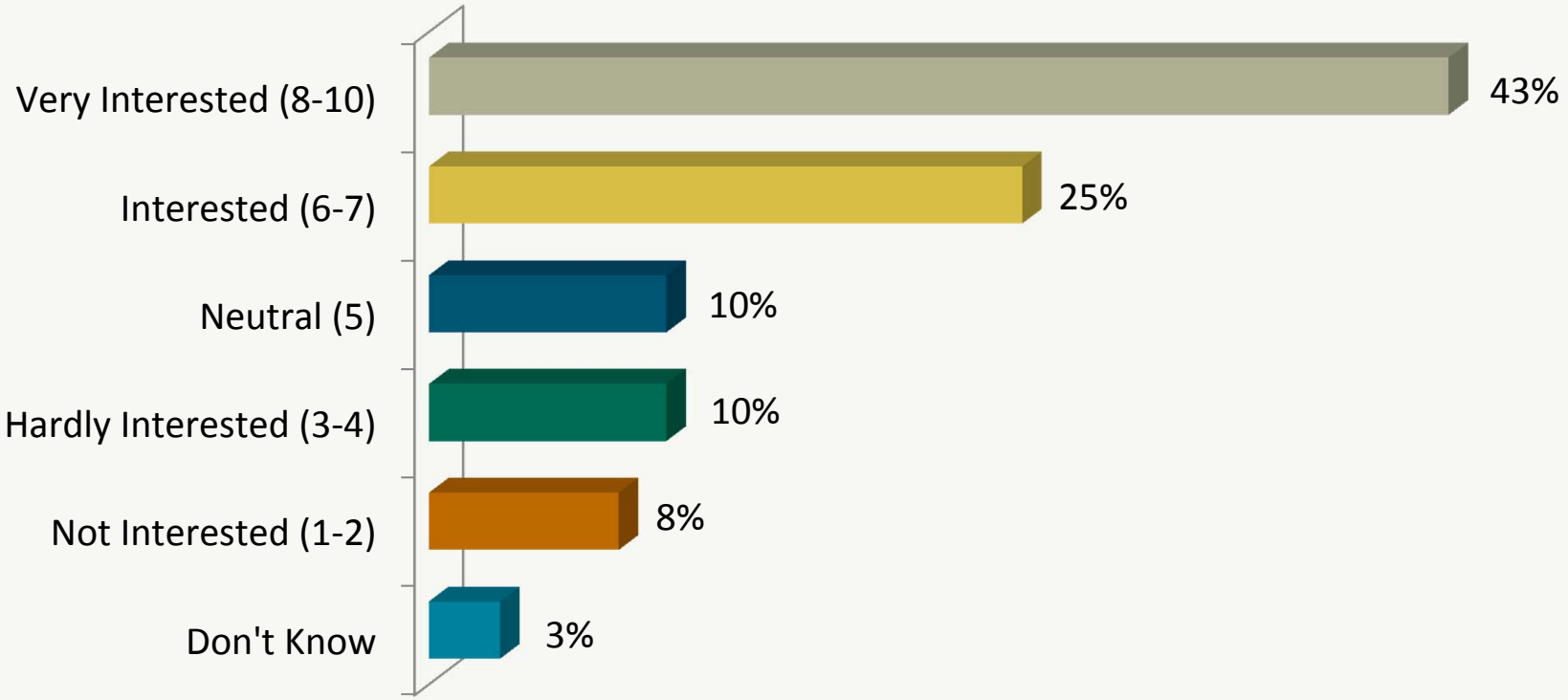


Among Those Who Shifted Use, Most Had a Little to No Savings



Q. In the past, have you tried to save money on your bill by shifting electricity use to a different time of day, such as evenings?

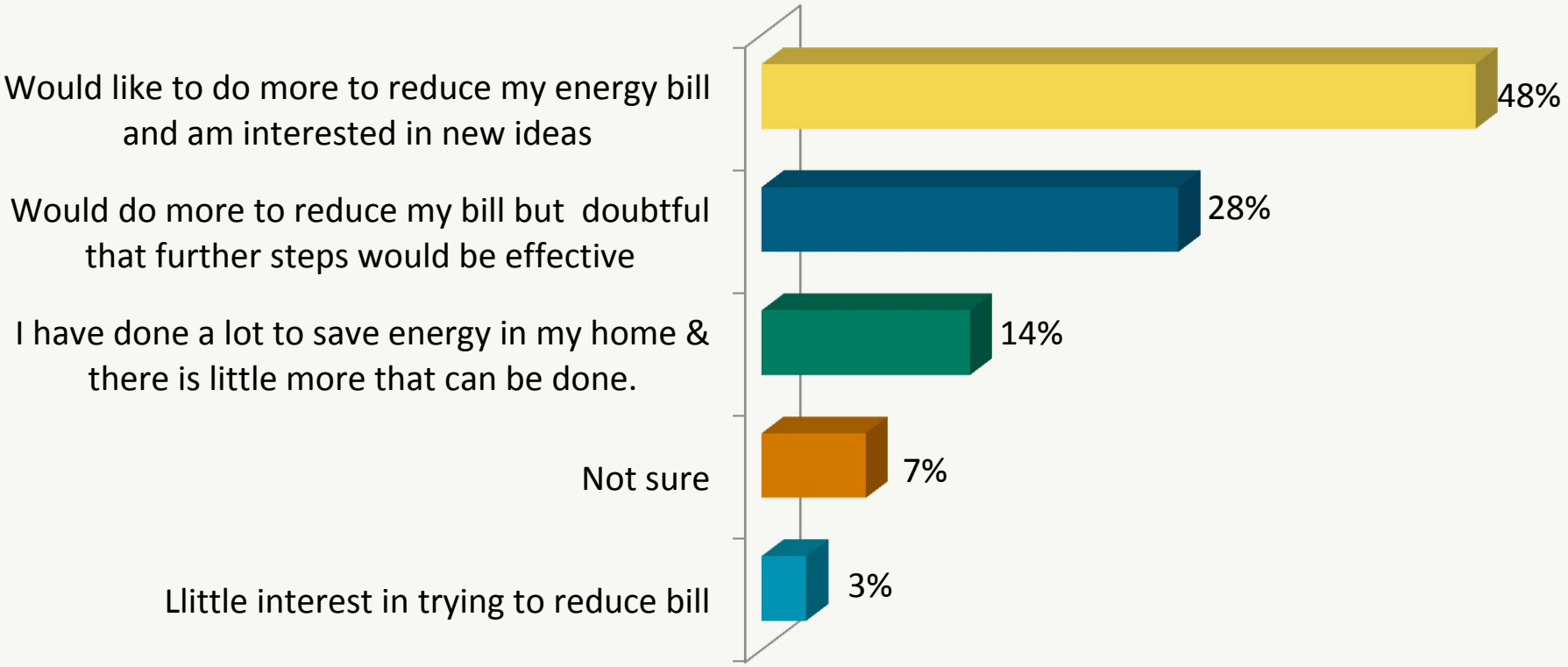
Nearly Seventy Percent of Customers Are Interested in Taking Steps to Reduce Energy Use



N=1431

Q. How interested are you in taking steps to use less energy during the weekday Peak time…

While Half of Customers Want to Take Action to Reduce Energy Bill, One-Third Doubt Effectiveness



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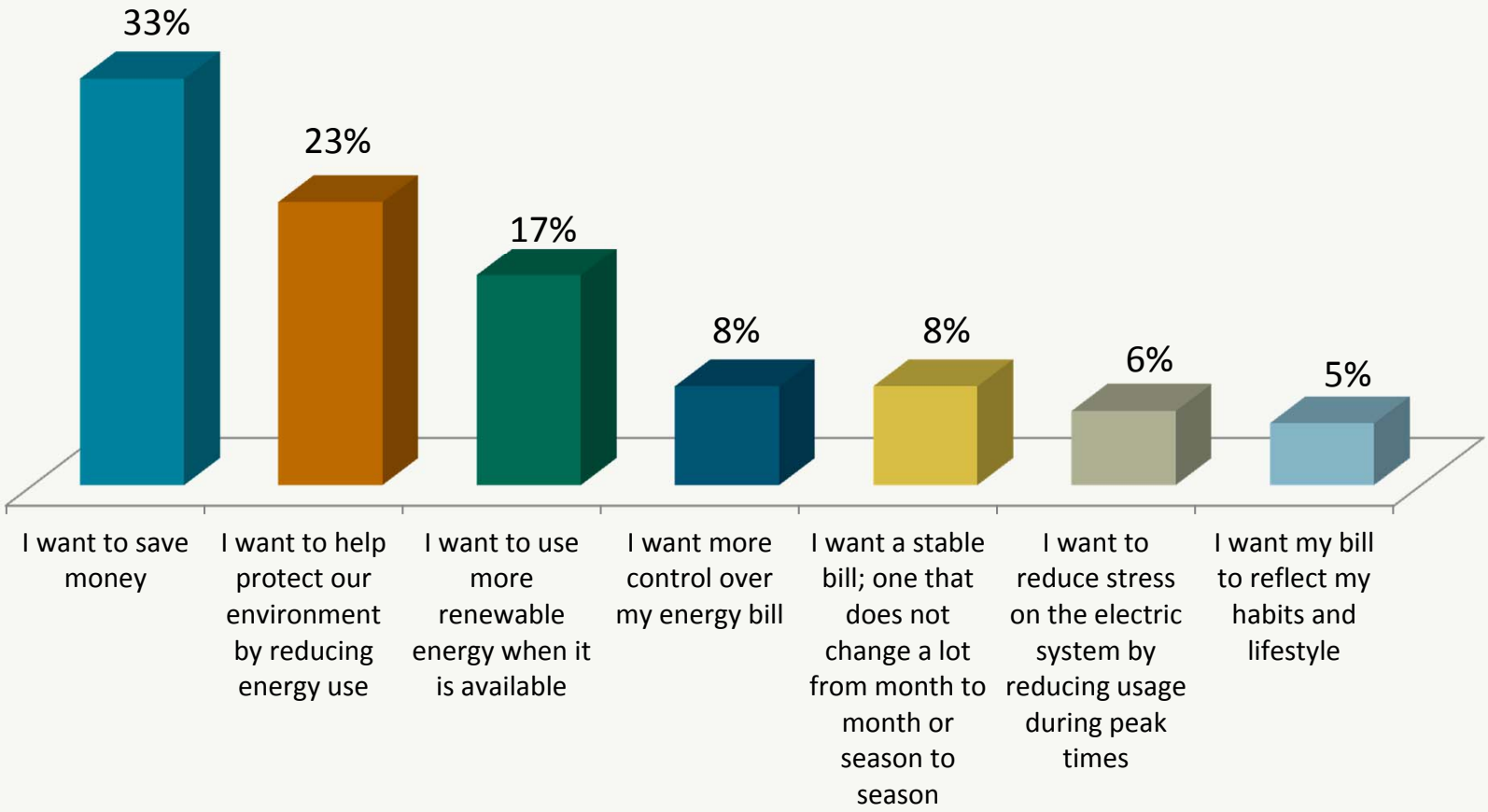
Q. Which of the following statements best describes your current attitude toward reducing your energy bill?

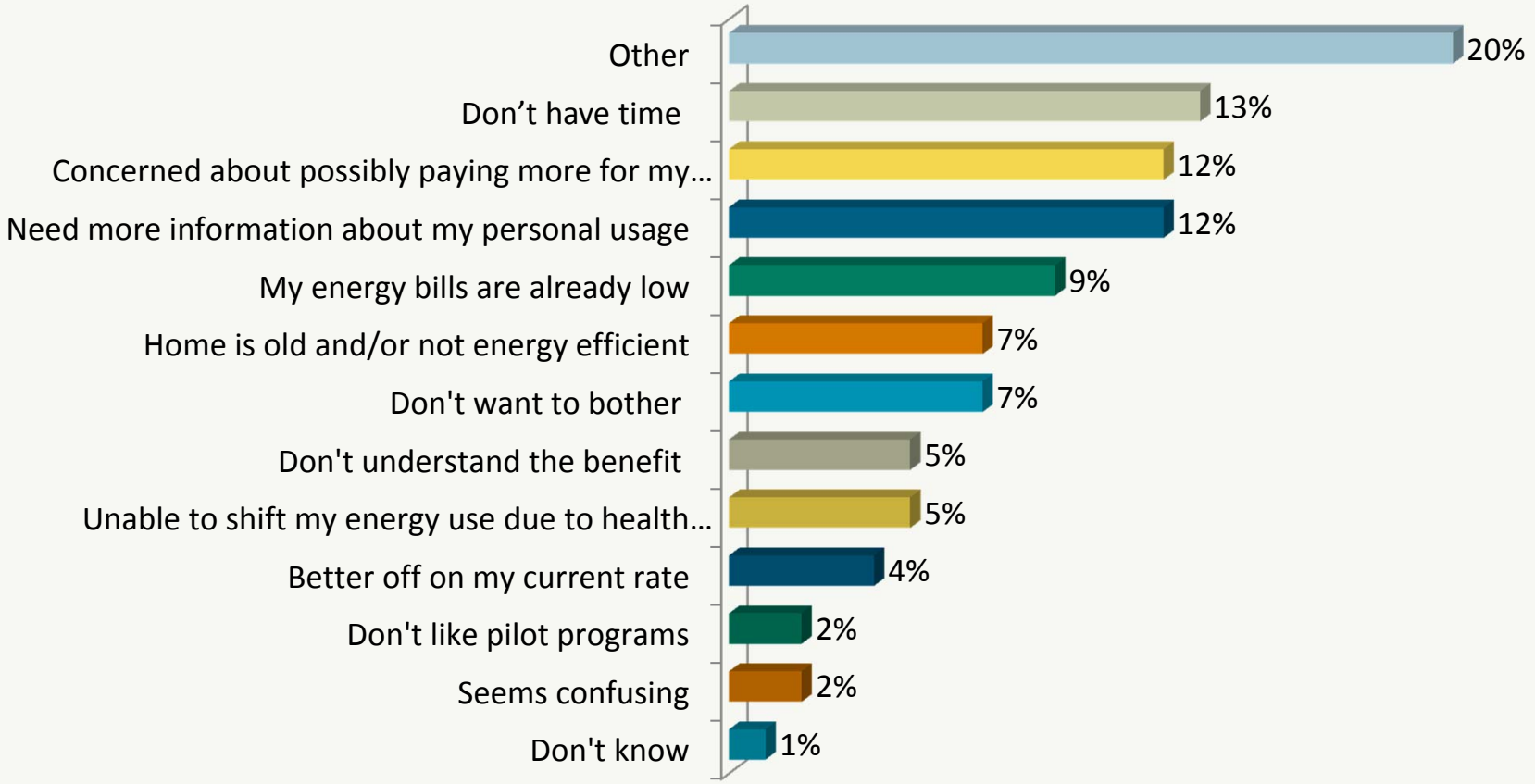
Saving Money & Protecting Environment Are Top Drivers to Using Less Energy during Peak Periods



Q. Which of the following statements best describes your current attitude toward reducing your energy bill?

Xcel Energy®

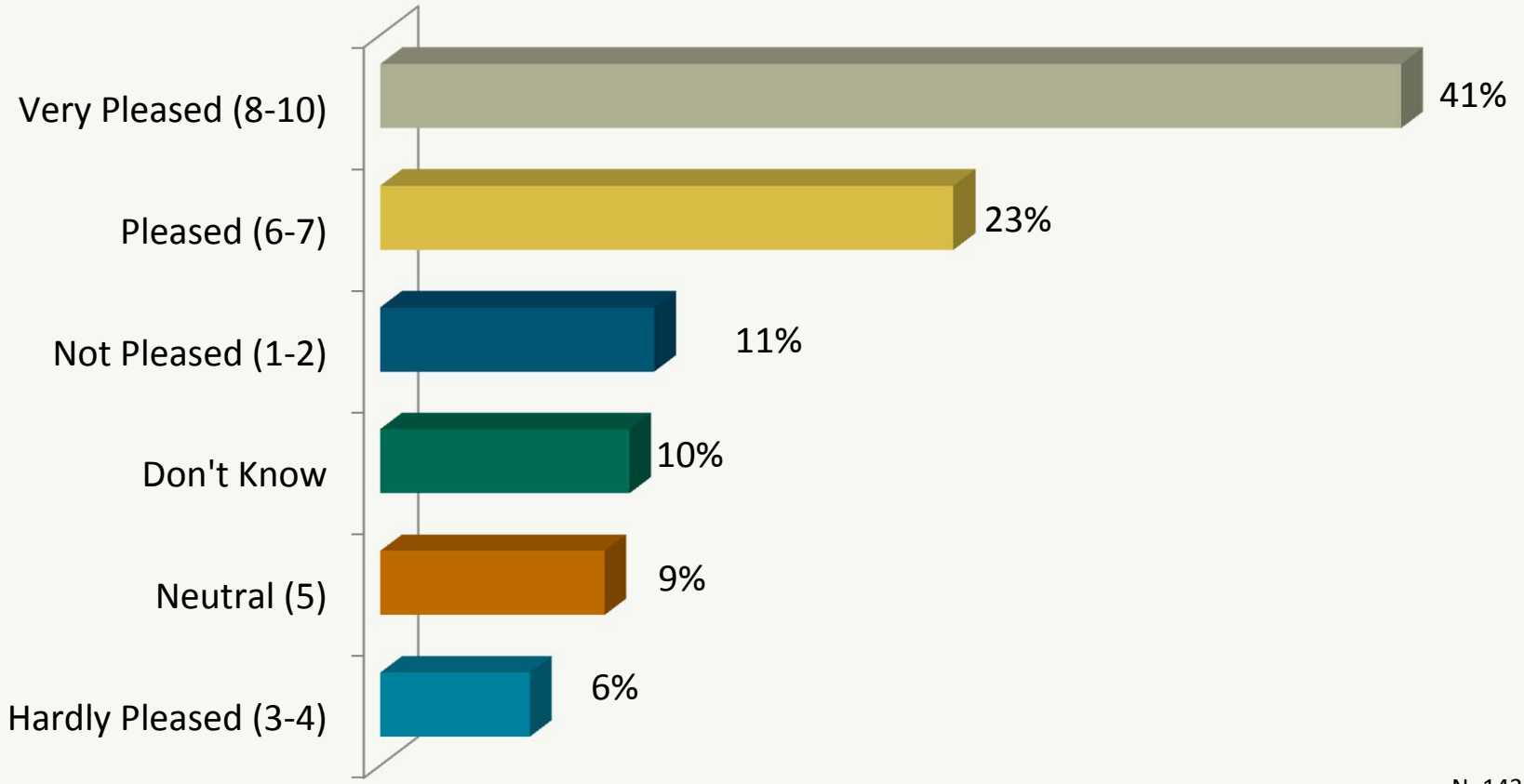
Barriers to Energy Conservation during Peak Periods Are Varied but Most Are Not Insurmountable



Q. Why aren't you interested in taking steps to use less energy during "Peak" periods? Please select up to two.

Customer Interest
Peak & Off Peak Pricing Plan

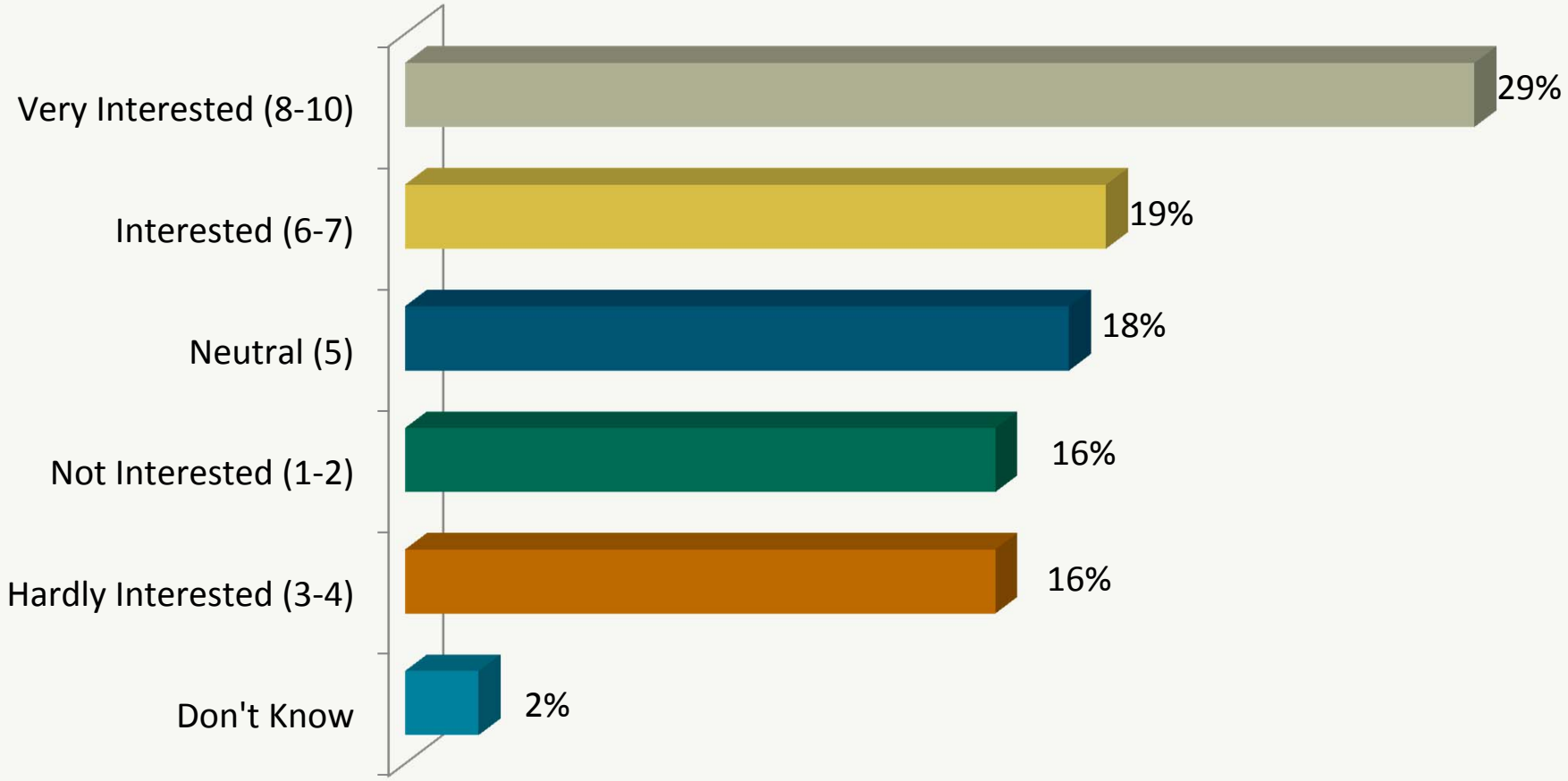
Two Thirds of Customers Are Positive toward a Peak Program that Allows Return to Standard Plan at Any Time



N=1431

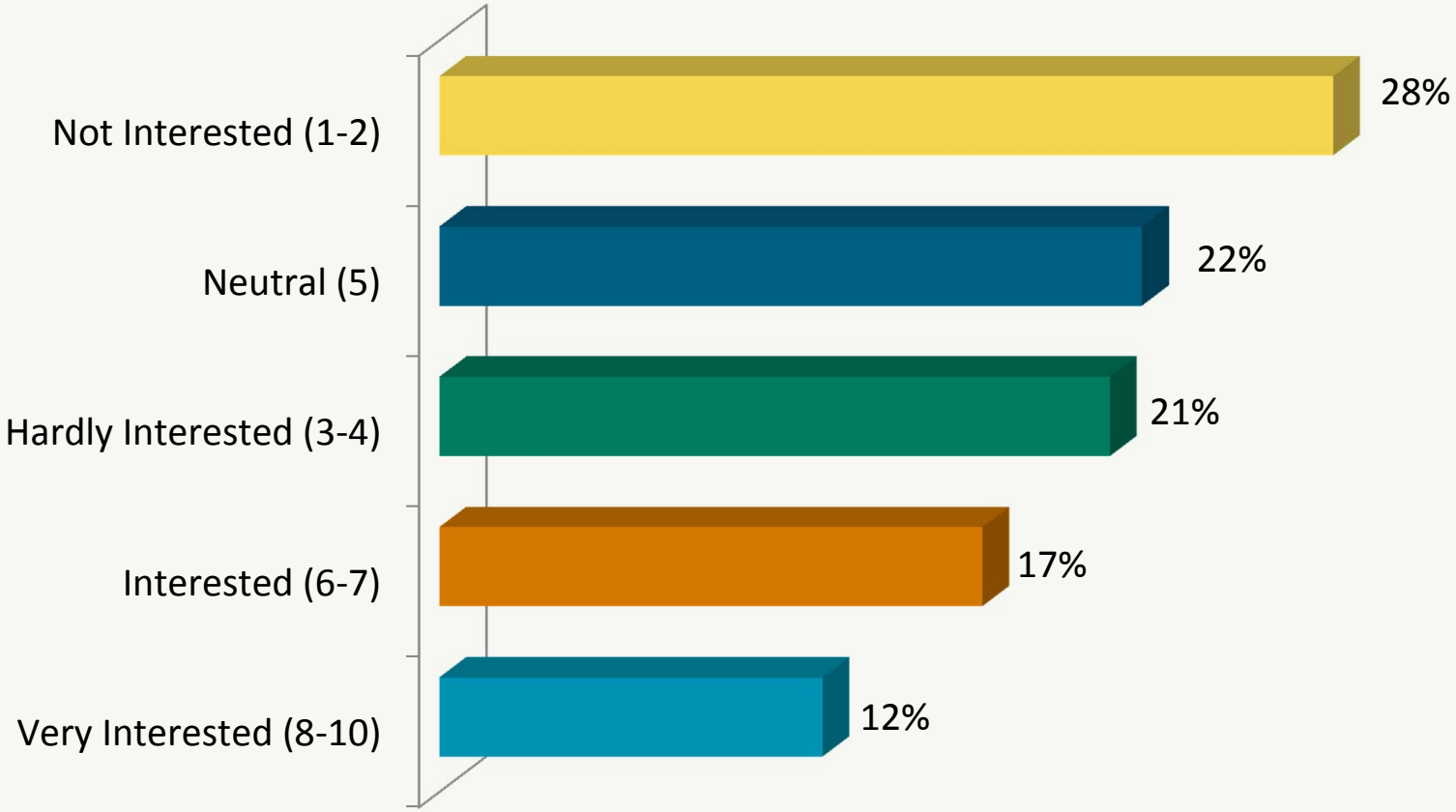
Q. How would you feel if you were placed on a trial "Peak & Off-Peak" program that gave you the option to return to your normal plan at any time?

Among Customers Negative toward a Peak Program, Offering a Guaranteed Lower Rate Increases Interest



Q. If Xcel Energy guaranteed the lower rate of either your "Peak & Off-Peak" pricing or your normal pricing, (in other words, you're no worse off) how interested would you be in the pilot program?

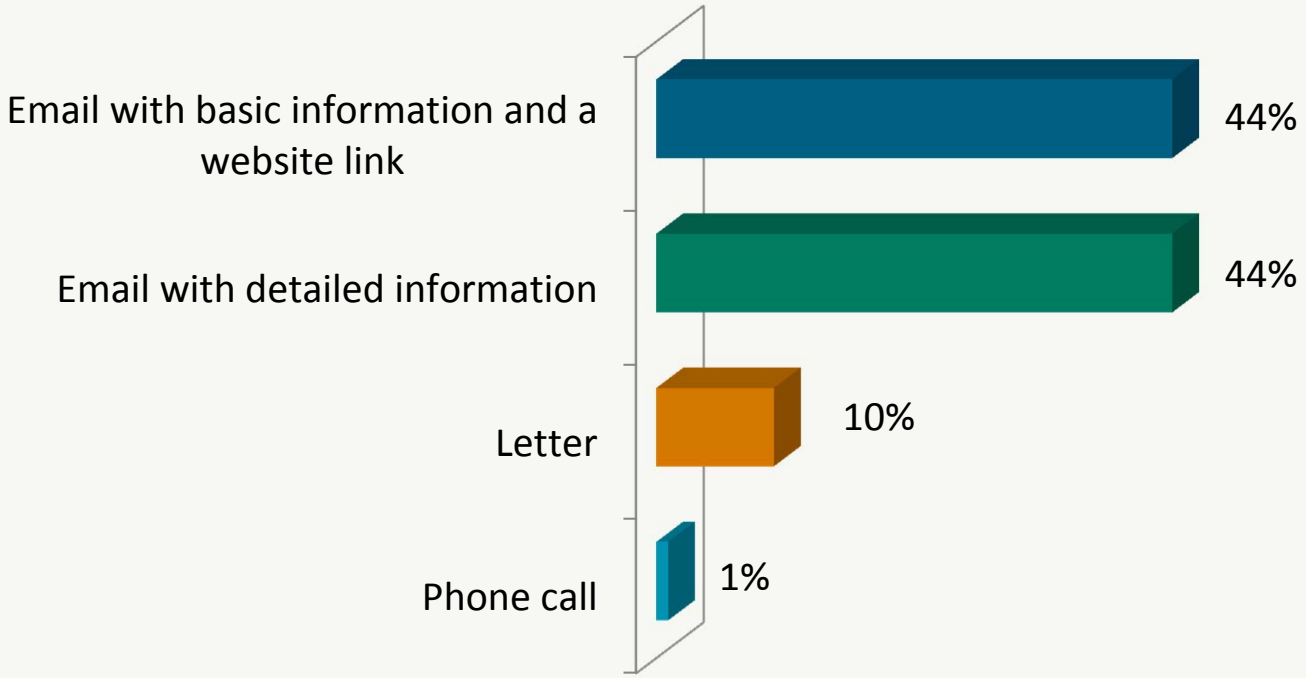
A $100 Incentive Offered Little Appeal to Those Uninterested in Program



Q. If Xcel Energy offered you $100 for your participation, how interested would you be in the "Peak & Off-Peak" pilot program?

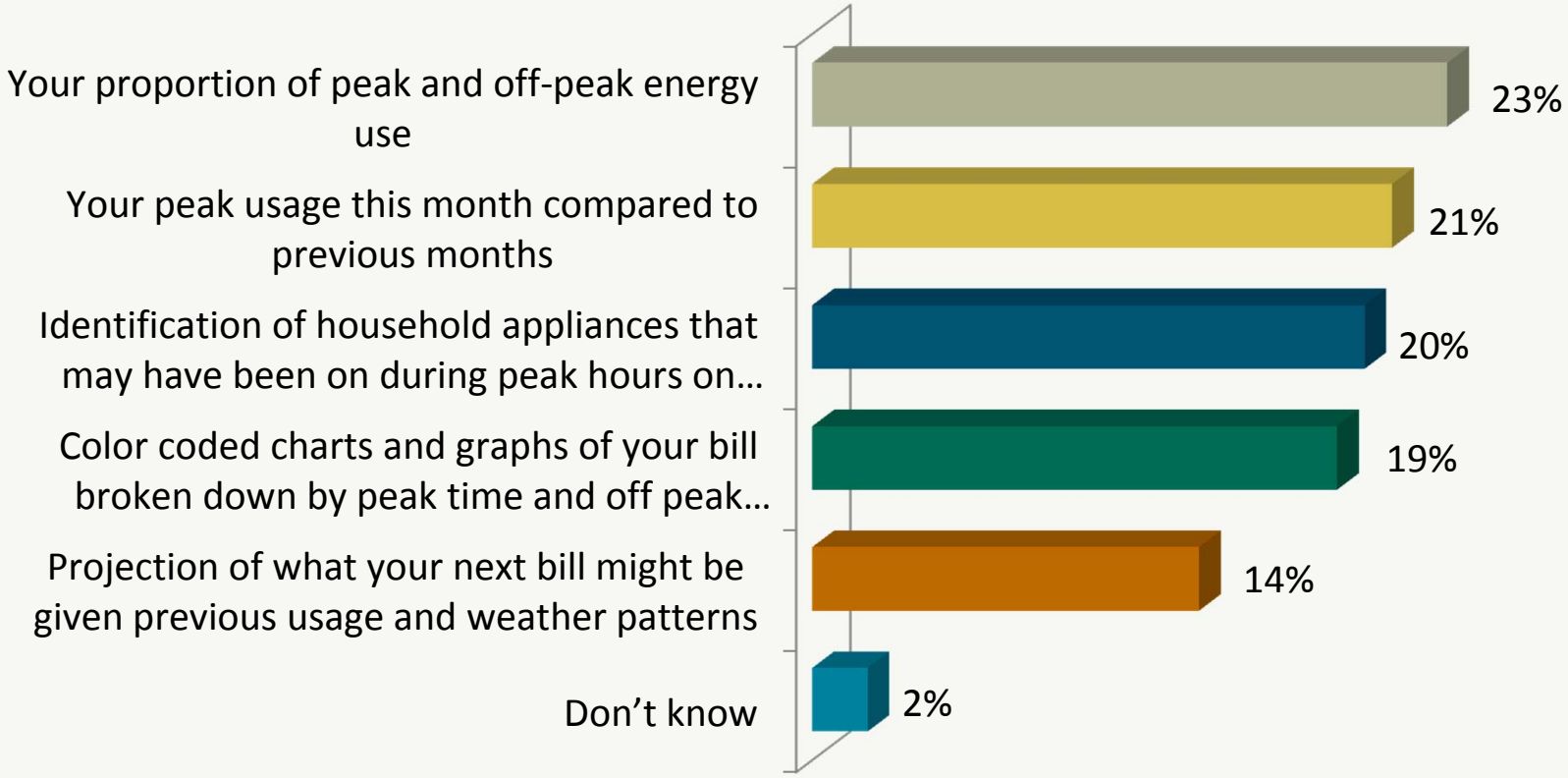
Communicating
The Peak & Off Peak Pricing Plan

Learning about Pricing Plan: Make it Email



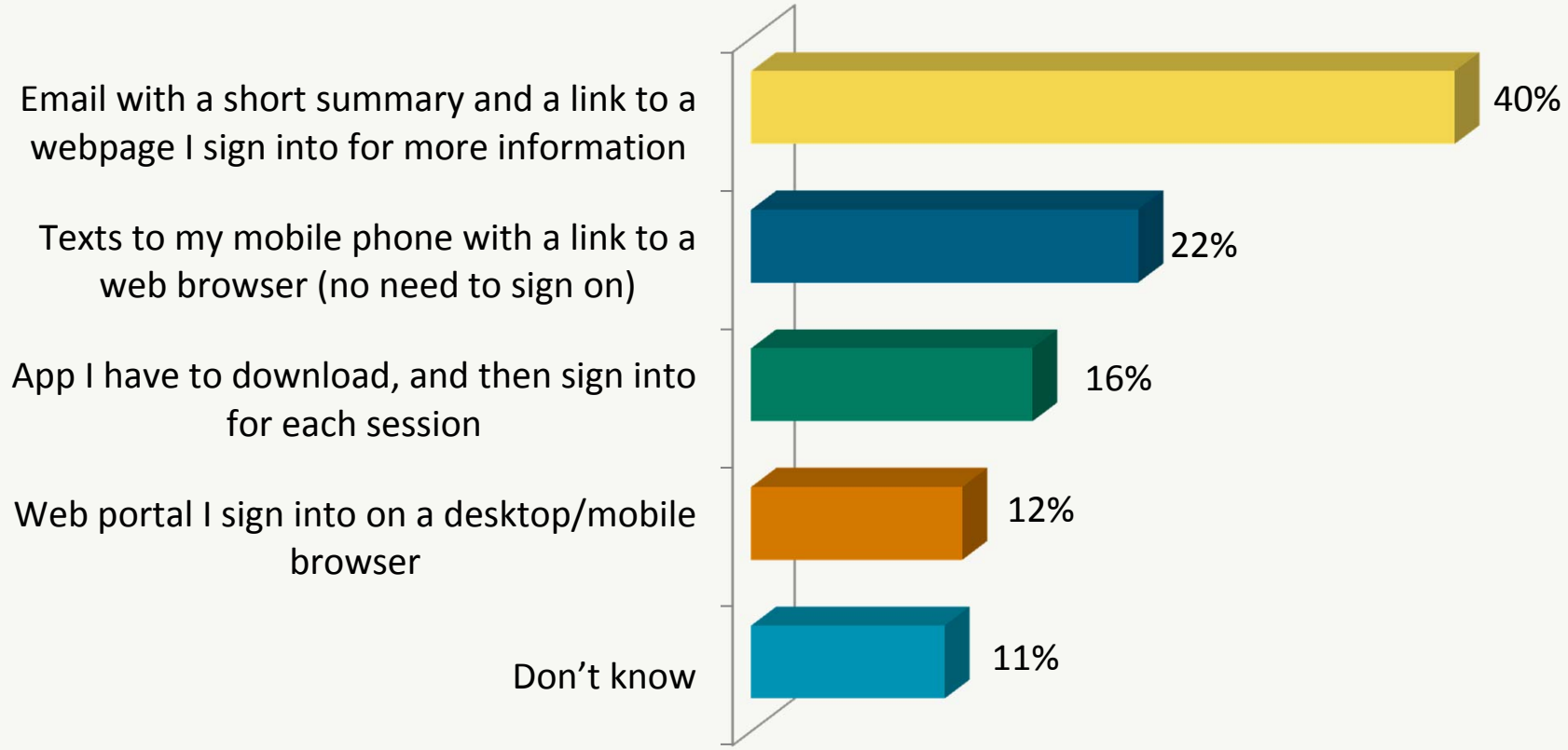
Q. How would you prefer to receive information about these new pilot programs?

Customers Had No Strong Format Preference for Detailed Information



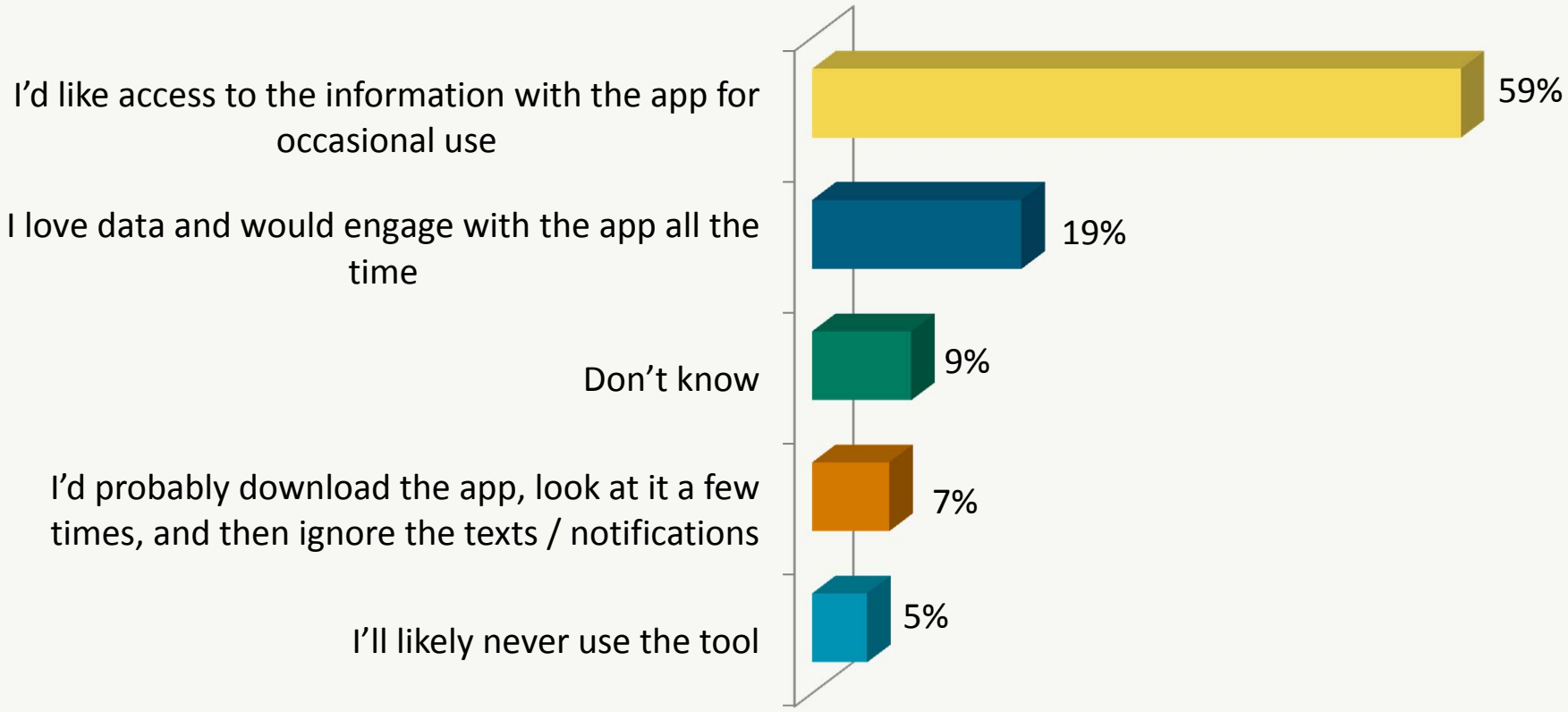
Q. With updated meters, Xcel Energy can provide customers with detailed information about their energy usage. What information would be most valuable to you, if you were on the "Peak Off-Peak" trial program? Please select all that apply

Email with Webpage Link Most Preferred Method to Notify Customers about Energy Use



Q. If Xcel Energy offered a tool that notified you when major household appliances are being used and sent personalized energy reports directly to your mobile device (to let you know what's driving high bills and how you might save), what channel would you prefer to use?

The Majority of Customers Would Use App Occasionally



 Q. How frequently would you use this tool?

Case Studies from Around the Country

Sacramento Municipal Utility District

The Sacramento Municipal Utility District (SMUD) conducted a rate pilot in 2012 and 2013 that compared, among other things, opt-in vs. opt-out cost effectiveness. According to the final report prepared for the Department of energy, "Default plans are significantly more cost effective than opt-in plans…".[1] For reference SMUD labels opt-out programs "default". SMUD's assessment found that their opt-in TOU yielded a 1.19 benefit/cost ratio compared to an estimated 4.48 for an opt-out TOU.[2] SMUD also found that customers had high acceptance of their opt-out rate: "Overall, acceptance rates were extremely high, ranging from 93% to over 97%."[3] This far exceeded SMUD's pilot design assumptions, which were that 50% of customers would opt out prior to being placed on the default pricing plan."[4]

By the end of the pilot SUMD only had 55 customers drop out of their default rate out of 2,018 total customers. [5] First year demand savings for opt-out customers yielded 6.2% peak period load reduction with overall savings by the end of pilot at 5.8% load reduction.[6] SMUD's TOU rate design is in the same range as the rate Xcel is proposing. "Participants were charged an on-peak price of $0.27/kWh between the hours of 4 PM and 7 PM on weekdays, excluding holidays. For all other hours, participants were charged $0.0846/kWh for the first 700 kWh in each billing period, with any additional usage billed at $0.1660/kWh."[7]

National Grid

National Grid deployed AMI meters and new rate options for their customers in the town of Worcester, Massachusetts. Starting in January 2015, this opt-out pilot, with certain technology based opt-in choices, ran through the end of 2016. To conduct this pilot National Grid installed close to 15,000 AMI meters.[8] Customers were given a choice regarding the installation of an AMI meter which resulted in a 5% rejection rate with the top reason being they didn't see how it benefited them. [9] [10] This is

[1] SmartPricing Options Final Evaluation – SMUD Page 8
[2] SmartPricing Options Final Evaluation – SMUD Page 8
[3] SmartPricing Options Final Evaluation – SMUD Page 83
[4] SmartPricing Options Final Evaluation – SMUD Page 83
[5] SmartPricing Options Final Evaluation – SMUD Page 85
[6] SmartPricing Options Final Evaluation – SMUD Page 33
[7] SmartPricing Options Final Evaluation – SMUD Page 11
[8] National Grid Smart Energy Solutions Pilot Interim Evaluation Report – Navigant Page 66
[9] National Grid Smart Energy Solutions Pilot Final Evaluation Report – Navigant Page 2
[10] National Grid Smart Energy Solutions Pilot Final Evaluation Report – Navigant Page 137

somewhat higher than other utilities which had a 1%-3% rejection rate.[11]Customer interest in participating in the pilot aligns with Minnesota customers in that the top reasons are related to saving money and helping the environment.[12]

Baltimore Gas and Electric Company

Baltimore Gas and Electric Company (BGE) has been very successful at energy efficiency programs and behavioral demand response initiatives.[13]In July of 2013 BGE launched a 315,000-customer behavioral demand response peak time rebate pilot called Smart Energy Rewards. The pilot used behavioral demand response techniques to alert customers to peak events in which they could earn $1.25 in bill credits for every kilowatt-hour reduced from 1 p.m. to 7 p.m. compared to their typical usage. BGE saw an 82% participation rate with 5% per average reduction at peak.[14] When examining program benefits and the cost of AMI meters, the Maryland Commission found significant ratepayer benefits from Smart Energy Rewards in conjunction with other AMI derived benefits.[15] BGE would later go on to offer the PTR rate to all its residential customers.[16] [17] As of 2016 BGE realizes over 300 MW per event from this award winning behavioral demand response that has a 92% customer satisfaction rate.[18] [19]

The City of Fort Collins

The City of Fort Collins initiated a 7,200 customer opt-out TOU rate pilot in October 2015.[20] The final report was submitted in March of 2017. The pilot largely examined whether a tiered TOU rate would be better at reducing load than a standard TOU rate. After a year of data collection, the utility found that a standard TOU rate reduced overall consumption and peak demand by a statistically significant margin, 2.5% and 8% respectfully.[21] The tiered TOU treatment group did not have any statistically

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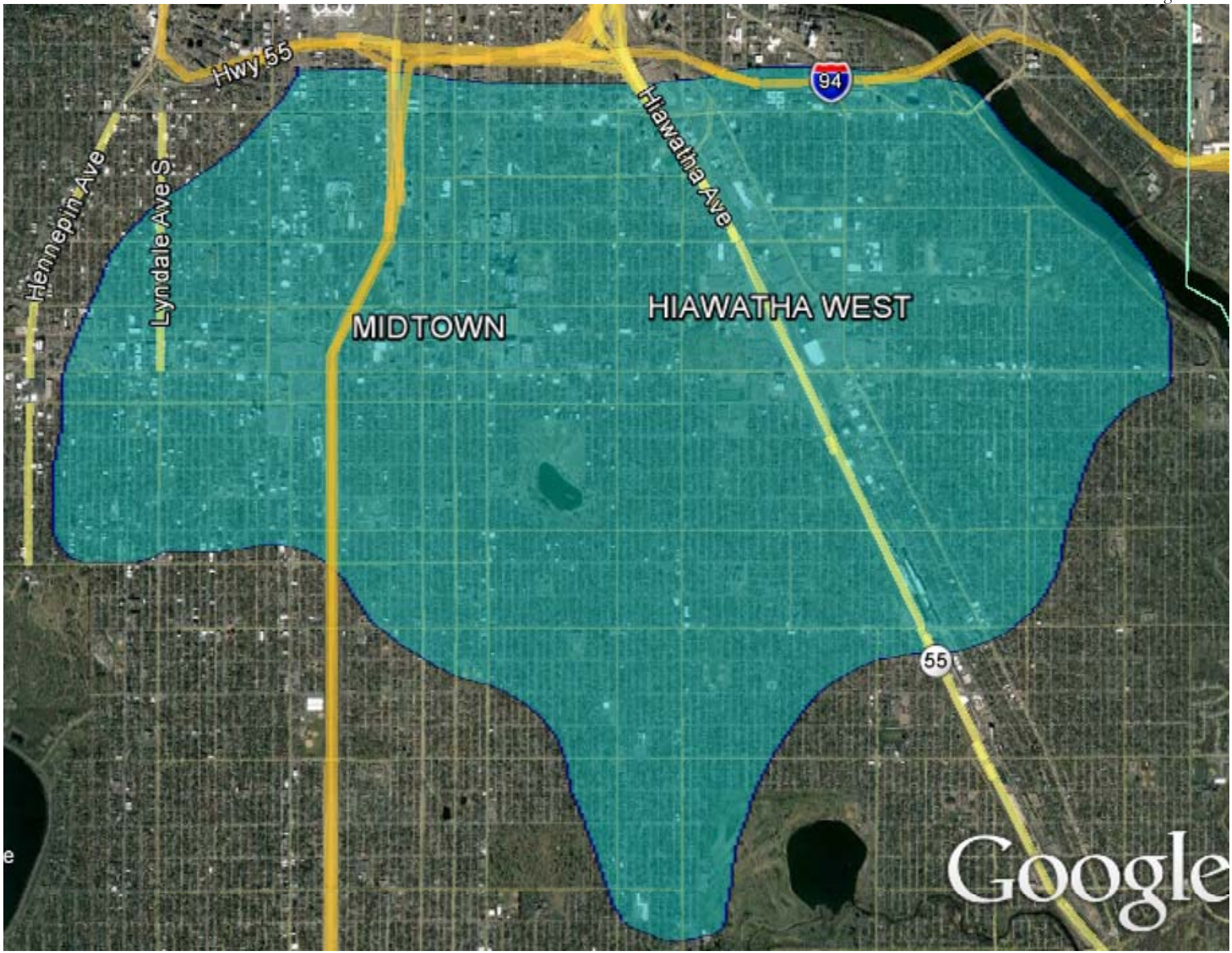
[11] National Grid Smart Energy Solutions Pilot Final Evaluation Report – Navigant Page 136
[12] National Grid Smart Energy Solutions Pilot Final Evaluation Report – Navigant Page 68
[13] https://www.bge.com/News/Pages/Press%20Releases/BGE-Customers-Achieve-Energy-Saving-Milestones.aspx
[14] http://smartgridcustomereducation.com/presentations/SGCES-AmericaLesh-BGE.pdf
[15] http://www.psc.state.md.us/wp-content/uploads/Order-No.-87591-Case-No.-9406-BGE-Rate-Case.pdf - some costs were offset by a DOE grant.
[16] https://www.oracle.com/webfolder/s/delivery_production/docs/FY16h1/doc35/LPD100585916-Demand-Response.pdf
[17] https://www.bge.com/News/Pages/Press%20Releases/20160707_BGE-to-Launch-First-Energy-Savings-Day-of-the-Summer-Tomorrow-to-Help-Customers-Save-on-Summer-Energy-Bills.aspx
[18] http://www.peakload.org/?page=Award12
[19] http://www.utilitydive.com/news/game-ifying-demand-response-how-one-utility-tries-to-keep-dr-programs-fr/415269/
[20] City of Fort Collins - Review of the Time-of-Use Electricity Rate Pilot Study - 4/25/2017
[21] City of Fort Collins - Review of the Time-of-Use Electricity Rate Pilot Study - 4/25/2017 page 6 and 7

significant results in either category. The TOU rates for the City of Fort Collins was 22.49 cent/kWh for the summer on-peak period and 6.7 cents/kWh for the off-peak period. Similar to the findings of other surveys, 67% of customers in customers in Fort Collins "want a rate design to, at least in part, take into account environmental concerns."[22]The results of the pilot were so successful for the standard TOU rate that it was the recommendation of Staff to '…make the TOU rate the default rate for the residential customer class.'[23]

[22] City of Fort Collins - Review of the Time-of-Use Electricity Rate Pilot Study - 4/25/2017 page 10
[23] City of Fort Collins - Review of the Time-of-Use Electricity Rate Pilot Study - 4/25/2017 page 21

Hiawatha Midtown



Westgate


101
Townline Rd
W 62nd St
62
Crosstown Hwy
494
61
WESTGATE
Chanhassen
Arboretum Blvd
78th St W
Eden Prairie
212
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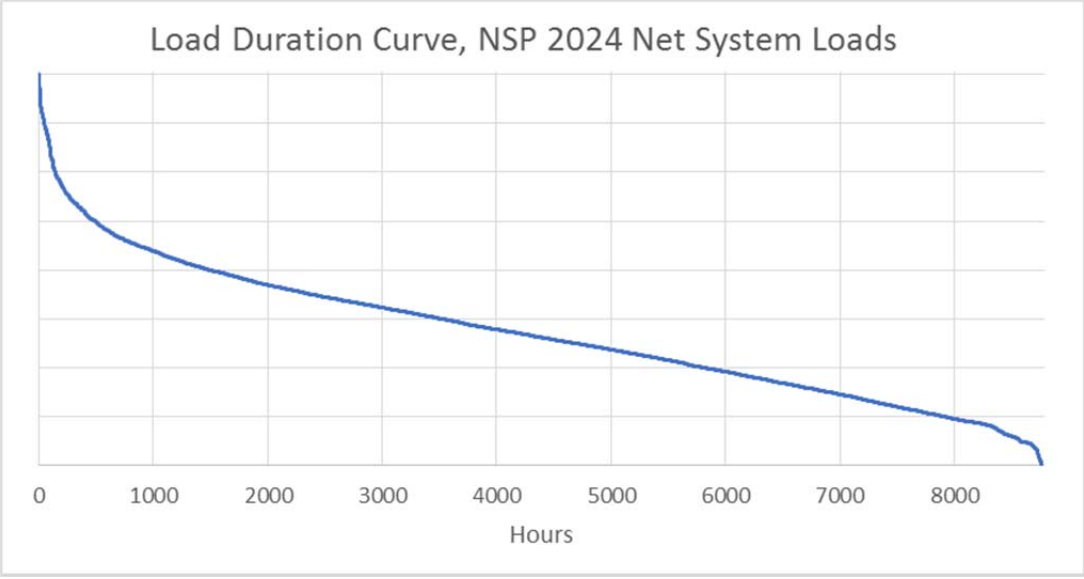
Cost Duration Method

A core principle of any rate design is to ensure the rates being charged to customers reflect cost causation. In many cases, simple annual or monthly metrics related to energy or peak demand can be used to allocate costs to customers through a single flat volumetric rate that may differ by season. With a time-of-use (TOU) rate, multiple volumetric levels must be developed for the rate design reflecting different TOU periods. As such, a methodology must be developed to ensure the costs assigned to each TOU period when developing the TOU rate are appropriate.

The "cost duration method" was developed to better link the recovery of system costs to the time periods during which system assets are being utilized. In doing so, the resulting rates are intended to accomplish two goals: 1) send a time-differentiated price signal to customers to encourage peak demand reduction, 2) ensure rates for each TOU period reflect the costs of the underlying assets used to meet demand at those times (i.e. cost causation).

The load duration curve represents the MW of system demand for each hour of an entire year (8760 hours), ranked in order, and provides a time-differentiated demand profile that can be used as the basis of this methodology.



Close examination of a utility's system load duration reveals several features. For example, it's readily apparent that there are a small number of "peak" hours during

which system assets necessary to meet demand are used very infrequently. Thus, it would be appropriate to assign a significant share of costs for these peaking assets to the hours that rank highest on the load duration curve. Similarly, there is a minimum load or "baseload" demand which all hours of the year exceed. Thus, there is some portion of system costs which should be assigned equally to all 8760 hours of the year. The cost-duration method is designed to capture these features by assigning a share of system costs to each hour in a way that reflects the usage as illustrated by the load duration curve. The assignment of costs to specific hours can be further systematized through the steps outlined below.

Developing the Cost-Duration Curve

- *Step 1: Identify the costs and load duration curves to be used.*

NSP relied on its final ordered 2017 Cost of Service Study (MN CCOSS 2017) for the revenue requirements to be allocated to each TOU period. Since energy, production and transmission related revenue requirements are related to system-wide demand, the system-wide load duration curve was used to allocate those costs. Meanwhile, other costs such as distribution system costs are more closely aligned with usage of the distribution system by specific customer classes. Thus, these costs were allocated according to the load duration curve for the residential customer class. Finally, customer-related costs not recovered through the customer charge were evenly divided among all hours of the year (i.e. no-load duration curve was used).

- *Step 2: Identify the average cost of system capacity for each load duration curve*

Total system costs are divided by the peak MW of the load duration curve to find an average cost per MW of system capacity. For example, in NSP's case the total Residential Production and Transmission revenue requirement is $783 M and system peak demand is 8,509 MW, leading to a system-wide average cost of $91,998/MW.

- *Step 3: Divide the load duration curve into marginal MW blocks:*

The system load duration curve is sliced horizontally into 8760 individual MW blocks. Each block represents the incremental (marginal) MW of system capacity needed to serve the next highest hour of system demand. For example, in NSP's case the 1st ranked hour requires 157 MW of additional capacity over the 2nd ranked hour to meet its needs. The 2nd hour requires 11 MW over the 3rd hour, and so on. The lowest

ranked hour will have an incremental MW value considerably higher than others since it represents the "baseload" capacity above 0 MW.

- *Step 4: Assign costs to each marginal MW block*

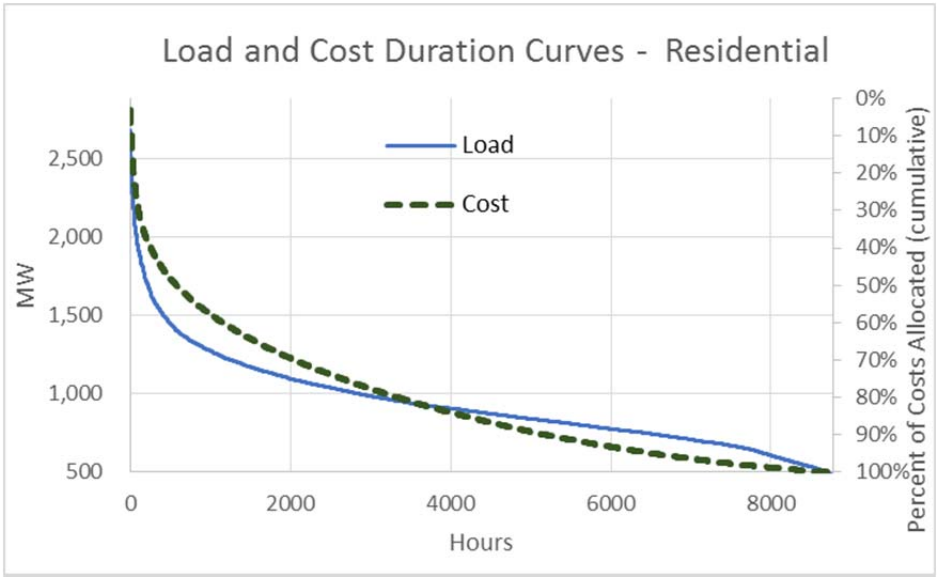
Costs are assigned to each MW block by multiplying the incremental MW value for the block by the average $/MW cost identified in step 1. Since each MW increase is not uniform, the incremental costs could vary considerably between blocks. For example, the 1st ranked MW block is assigned costs of $14.5M total (157 MW times $91,988/MW). The 2nd ranked MW block is assigned costs of $0.5M total (11 MW times $91,988/MW), and so on.

- *Step 5: Divide MW block costs between appropriate hours*

For each MW block, the assigned costs are evenly divided among the number of hours at or above that load level. For example, the 1st MW block costs are assigned solely to the 1st ranked hour. Meanwhile, the 2nd MW block costs are divided between hours 1 and 2. The 3rd MW block costs are divided between hours 1, 2 and 3, and so on.

- *Step 6: Add up the assigned MW block costs for each hour*

For each hour of demand, the assigned portion of costs from each MW block are summed. This reflects a portion of the marginal MW block costs to serve that hour, plus a portion of the MW block costs for each hour below it on the load duration curve. This ensures that the cost assigned to each hour reflects not only any incremental "peak capacity" needs but also any underlying "baseload" or "intermediate" capacity needs. The resulting cost structure will appropriately assign costs for each incremental MW to the hours when those MW of capacity are being used to serve load. As illustrated below the costs are spread to each hour in a manner that closely resembles the load duration curve and therefore reflects system use. This spread of costs to each hour is known as the "cost duration curve."



Once costs have been assigned to each hour, these hourly cost assignments can be readily used to construct a time-of-use rate. After the TOU time periods have been selected, the costs assigned to each hour within each TOU period are totaled. The TOU period costs are then divided by the billing determinant (i.e. MWh) associated with the hours of the TOU period. For example, NSP finds that using the cost duration method, a peak period selection of 3-8pm on weekdays would result in an allocation of $293 M or 37% of the total Residential Production and Transmission costs ($783 M) to the peak period. Meanwhile, residential customers consumed 1,511 GWh during the peak period. Thus, the resulting rate component would be $0.194/kWh. On-peak rate components for distribution and customer-related costs can be computed in a similar fashion, using the corresponding costs and load curves described in Step 1, resulting in rate components of $0.028/kWh and $0.017 respectively. Each of these components would then be summed to find the final on-peak rate of $0.239/kWh.

Forecast Year Basis for TOU Rate Design

A year 2024 forecast of hourly system loads and marginal energy costs was used to develop the proposed TOU rate periods and allocations for proposed rate

differentials. This time period was used to more closely represent the conditions expected when it may be feasible to extend pilot results into an optional or default rate for all residential customers. This reduces the need to change the peak hour period, thus maintaining pilot results and avoids the need to re-educate existing customers. Year 2024 results are not significantly different from the results with a current year forecast basis by indicating only an approximate one hour time shift in TOU rate periods. It also represents a reasonable balance as the influence of renewable resources on that system loads is expected to continue past 2024, making the selection of appropriate rate periods a moving target to some extent. Selecting a rate that has a high probability of staying steady throughout the entire 2020 decade, reduces customer confusion and saves on education and marketing spend.

The system forecast also included hourly forecasts of system wind and solar resources, which were subtracted from gross system load to develop hourly net system loads. Net system loads were used for the process of allocating capacity value to TOU rate period. These loads are also predominately used, supplemented by system marginal energy and market costs, to develop proposed TOU rate periods. The projected increase in renewable generation from 2017 to 2024 is significant, with increases of approximately 1100 MW for wind and 850 MW for solar over this seven year period.

The use of net system loads improves the accuracy of identifying the time and pricing for both the off-peak period to recognize available wind resources on the margin as discussed earlier and for the on-peak period that is significantly affected by the availability and hourly production profile of solar resources. This approach also helps direct customer price response incentives to reduce reliance on fossil fuel resources. This applies to both energy and capacity. Relying on gross load misses the fact that future fossil assets will be built to meet the load that is left over after renewable energy production is taken into account. For example, gross load in Hawaii or California might point to 1:00 - 2:00 PM in the afternoon, however all new fossil or storage builds are positioned to tackle ramps and the early evening peak hour later.

Comparison of Peak Hours

A key example of the indicated time shift for TOU on-peak hours is the hourly net NSP system profile for July, which is typically the highest load month of the year. The following table, based on NSP system forecast July average weekday hourly loads,

compares each hour as a percentile of the peak load hour for the forecast years of 2017 and 2024. The trend of peak hours shifting to later in the day is indicated by the 2017 to 2024 change provided in the last column of the table.

Net System Average Weekday Loads – July Forecasts
Percentile of Peak Hour

Hour Ending	TOU	**2017**	**2024**	Change
1	Off	0.621	0.637	3%
2	Off	0.583	0.603	3%
3	Off	0.563	0.582	3%
4	Off	0.555	0.572	3%
5	Off	0.570	0.585	3%
6	Off	0.617	0.632	2%
7	Mid	0.697	0.699	0%
8	Mid	0.773	0.758	-2%
9	Mid	0.828	0.802	-3%
10	Mid	0.867	0.832	-4%
11	Mid	0.916	0.884	-3%
12	Mid	0.942	0.905	-4%
13	Mid	0.965	0.933	-3%
14	Mid	0.976	0.959	-2%
15	Mid	0.984	0.972	-1%
16	On	0.993	0.974	**-2%**
17	On	0.999	0.985	**-1%**
18	On	1.000	1.000	**0%**
19	On	0.984	0.995	**1%**
20	On	0.948	0.975	**3%**
21	Mid	0.909	0.947	4%
22	Mid	0.880	0.906	3%
23	Mid	0.792	0.782	-1%
24	Mid	0.701	0.676	-4%

The preceding table is based on an August 2017 forecast of NSP system loads for the years 2107 through 2024. To help verify expected trends, especially with increased solar development, net system loads for the 2030 year from our November 2016 Integrated Resource Plan ("IRP") were also reviewed and compared below with the

preceding table. This 2030 NSP system forecast was accepted by the Commission through their IRP review proceeding.

Net System Average Weekday Loads – July Forecasts
Percentile of Peak Hour

Hr Ending	TOU	2017	2024	2030	Change 17-24	Change 17 - 30
1	Off	0.621	0.637	0.639	3%	3%
2	Off	0.583	0.603	0.612	3%	5%
3	Off	0.563	0.582	0.602	3%	7%
4	Off	0.555	0.572	0.597	3%	7%
5	Off	0.570	0.585	0.601	3%	6%
6	Off	0.617	0.632	0.641	2%	4%
7	Mid	0.697	0.699	0.698	0%	0%
8	Mid	0.773	0.758	0.759	-2%	-2%
9	Mid	0.828	0.802	0.791	-3%	-4%
10	Mid	0.867	0.832	0.809	-4%	-7%
11	Mid	0.916	0.884	0.839	-3%	-8%
12	Mid	0.942	0.905	0.850	-4%	-10%
13	Mid	0.965	0.933	0.872	-3%	-10%
14	Mid	0.976	0.959	0.890	-2%	-9%
15	Mid	0.984	0.972	0.913	-1%	-7%
16	On	0.993	0.974	0.922	**-2%**	**-7%**
17	On	0.999	0.985	0.939	**-1%**	**-6%**
18	On	1.000	1.000	0.986	**0%**	**-1%**
19	On	0.984	0.995	1.000	**1%**	**2%**
20	On	0.948	0.975	0.995	**3%**	**5%**
21	Mid	0.909	0.947	0.963	4%	6%
22	Mid	0.880	0.906	0.924	3%	5%
23	Mid	0.792	0.782	0.815	-1%	3%
24	Mid	0.701	0.676	0.710	-4%	1%

The 2030 forecast indicates a continuing trend of net system peak loads moving to later in the day, as 2030 forecast solar capacity is approximately double the 1041 MW peak solar capacity for the 2024 forecast. Although capacity from customer distributed generation is not netted from gross system load forecasts, it can indirectly influence the definition of peak hours through its effect on load forecasts.

The selection of the most appropriate period for on-peak hours involves several considerations, as discussed in our Petition. Some measures indicate an on-peak period of 2:00 to 7:00 PM in place of the proposed 3:00 to 8:00 PM time period, such as using the month of August or marginal energy costs rather than net system loads. A challenge of time of use rate design is that on-peak time periods are not sharply defined, with the additional challenge of variations by month and type of measurement. We determined that the proposed on-peak time period was most appropriate only after thoroughly reviewing forecasts using several different measurements and considering expected trends to develop a time of use design that is most likely to be suitable when its class-wide availability is feasible.

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Section No. 1
~~7th~~8th Revised Sheet No. 1

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PILOT PROGRAM DESIGN

This is an experimental rate design for the residential Time of Use Pilot Program to be applied for two years from the effective date of this rate schedule. Participating customers will have received Residential Service without electric space heating prior to the Pilot, and may elect a return to the Residential Service rate schedule following the Pilot.

AVAILABILITY

A maximum of 10,000 customers will be selected to receive service with this rate schedule. The Company will determine pilot participants that receive service through the Hiawatha West, Midtown, or Westgate substations. Pilot participants will not include customers that are on net metering service or have other interconnected distributed generation on their premise, or customers that also receive Energy Controlled (Non-Demand Metered) Service, Residential Electric Vehicle Service, or Limited Off-Peak Service. Pilot participants may elect to opt out of participation in this Pilot for a specific premise.

DETERMINATION OF CUSTOMER BILLS

Customer bills shall reflect energy charges (if applicable) based on customer's kWh usage, plus a customer charge (if applicable), plus demand charges (if applicable) based on customer's kW billing demand as defined below. Bills may be subject to a minimum charge based on the monthly customer charge and / or certain monthly or annual demand charges. Bills also include applicable riders, adjustments, surcharges, voltage discounts, and energy credits. Bill Protection may also apply. Details regarding the specific charges applicable to this service and Bill Protection are listed below.

RATE

Customer Charge per Month	
Overhead (A72)	$8.00
Underground (A74)	$10.00
Energy Charge per kWh	
June – September	
On-Peak Period	$0.23094
Mid-Peak Period	$0.09270
Off-Peak Period	$0.02913
Other Months	
On-Peak Period	$0.19675
Mid-Peak Period	$0.07720
Off-Peak Period	$0.02913

In addition, customer bills under this rate are subject to the following adjustments and/or charges.

FUEL CLAUSE

Bills are subject to the adjustments provided for in the Fuel Clause Rider.

(Continued on Sheet No. 5-4.2)

RESOURCE ADJUSTMENT
Bills are subject to the adjustments provided for in the Conservation Improvement Program Adjustment Rider, the State Energy Policy Rate Rider, the Renewable Development Fund Rider, the Transmission Cost Recovery Rider, the Renewable Energy Standard Rider and the Mercury Cost Recovery Rider.

ENVIRONMENTAL IMPROVEMENT RIDER
Bills are subject to the adjustments provided for in the Environmental Improvement Rider.

MONTHLY MINIMUM CHARGE
Customer Charge.

SURCHARGE
In certain communities, bills are subject to surcharges provided for in a Surcharge Rider.

LOW INCOME ENERGY DISCOUNT RIDER
Bills are subject to the adjustment provided for in the Low Income Energy Discount Rider.

REVENUE DECOUPLING MECHANISM RIDER
Bills are subject to the adjustments provided for in the Revenue Decoupling Mechanism Rider.

The following are terms and conditions for service under this tariff.

LATE PAYMENT CHARGE
Any unpaid balance over $10.00 is subject to a 1.5% late payment charge or $1.00, whichever is greater, after the date due. The charge may be assessed as provided for in the General Rules and Regulations, Section 3.5.

LOW INCOME ENERGY DISCOUNT
Energy discount is available to qualified low income customers under this schedule subject to the provisions contained in the Low Income Energy Discount Rider.

BILL PROTECTION
Billing charges considered for bill protection will include customer and energy charges, fuel cost charges and if applicable, the Residential Controlled Air Conditioning and Water Heating Rider discounts. Bill protection will be considered only for customers that have been pilot participants at the same residential location for 12 months from the effective date of this rate schedule, based on the first 12 months of participation in the pilot program. Any Pilot program billing charge in excess of 10 percent of the corresponding billing charge that would have been applied had the customer not been a pilot participant will be credited to the customer's account, including any applicable taxes. Customers that have received a Low Income Energy Discount Rider discount within the 12 months prior to participation in the pilot program will have bill protection determined on a monthly basis. Following the first 12 months of pilot participation, bill protection will continue to be provided on an annual basis for each consecutive 12 months of pilot participation.

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(Continued on Sheet No. 5-4.3)

DEFINITION OF PEAK PERIODS

The On-Peak period is defined as those hours between 3:00 p.m. and 8:00 p.m. Monday through Friday, except the following holidays: New Year's Day, Good Friday, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, and Christmas Day. When a designated holiday occurs on Saturday, the preceding Friday will be designated a holiday. When a designated holiday occurs on Sunday, the following Monday will be designated a holiday. The Mid-Peak period is defined as all hours not defined as On-Peak or Off-Peak periods. The Off-Peak period is defined as those hours between midnight (12:00 a.m.) and 6:00 a.m. every day.

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RESIDENTIAL CONTROLLED AIR CONDITIONING AND WATER HEATING RIDER

Customers that received service with the Residential Controlled Air Conditioning and Water Heating Rider in combination with Residential Service prior to participation in the pilot will have a revised discount for Company controlled central air conditioning or electric water heating that is specific to the pilot program. The controlled air conditioning discount is a monthly $10 credit applied during the billing months of June through September. The controlled electric water heating discount is a monthly $2 credit during each billing month. Pilot customers will receive these revised credits in place of percent discounts and are subject to all other terms of the Residential Controlled Air Conditioning and Water Heating Rider.

TERMS AND CONDITIONS OF SERVICE

1. This schedule is also subject to provisions contained in Rules for Application of Residential Rates.

N

1. The Residential Service~~,~~ and Residential Time of Day Service and Residential Time of Use Pilot Program are the only rates available to residential customers for domestic purposes in a single private residence. Energy Controlled Service (Non-Demand Metered), Limited Off Peak Service, and Automatic Protective Lighting Service rate schedules are also available to qualifying residential customers. N

2. Normal service under the Residential Service~~,~~ and Residential Time of Day Service and Residential Time of Use Pilot Program rate schedules is single phase service rendered through one meter. Three phase service or service through more than one meter will be provided upon a one-time payment of an amount to reimburse Company for the additional investment. If customer is served through more than one meter, each meter will be separately billed. N N

3. Electric space heating charges are applicable only when customer's electric space heating equipment is used as customer's primary heating source.

4. Underground service charges will apply where the underground facilities are owned by Company, and Company has not been fully reimbursed for the added cost of such underground facilities.

5. Standby and Supplementary Service is available for any residential customer subject to the provisions in the General Rules and Regulations, Section 2.4. The Company's meter will be ratcheted to measure the flow of power and energy from Company to customer only.

6. A customer using electric service for domestic and non-domestic purposes jointly may combine such use through one meter on such rates as are available to general service customers.

7. The Residential Service and Residential Time of Day Service rate schedules are available to farm installations which were served on the separate Farm Service rate schedule prior to its cancellation on November 1, 1988. Residential Service and Residential Time of Day Service to these qualifying farm customers is limited to 120/240 volts single phase service rendered through one meter. Motors and other equipment which interfere with service to neighboring customers and all transformer type welding machines larger than 25 kilovolt-amperes are not permitted as part of this service.

RATE SCHEDULES BY SERVICE CATEGORY

Residential
Residential (A00, A01, A03)
Residential TOD (A02, A04)
Residential TOU Pilot Program (A72, A74)
Energy Controlled (A05)
Limited Off-Peak (A06)
Residential Electric Vehicle (A08)

Commercial and Industrial Non-Demand
Energy Controlled (A05)
Limited Off Peak (A06)
Small General (A09, A10, A11, A13)
Small General TOD (A12, A16, A18, A22)
Small Municipal Pumping (A40)
Fire and Civil Defense Siren (A42)

Commercial and Industrial Demand – Non-TOD
General (A14)
Peak Controlled (A23)
Municipal Pumping (A41) N
~~Municipal Pumping (A41)~~ ~~N~~

Commercial and Industrial Demand – TOD
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Peak Controlled TOD (A24)
Tier 1 Energy Controlled Rider (A27)
Real Time Pricing (A62, A63)
Light Rail Line (A29)

Outdoor Lighting
Automatic Protective (A07)
Street Lighting System (A30)
Street Lighting Energy (Closed) (A32)
Street Lighting Energy – Metered (A34)
Street Lighting - City of St. Paul (A37)

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Limited Off Peak (A06)
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Small General TOD (A12, A16, A18, A22)
Small Municipal Pumping (A40)
Fire and Civil Defense Siren (A42)

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General (A14)
Peak Controlled (A23)
Municipal Pumping (A41)

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Peak Controlled TOD (A24)
Tier 1 Energy Controlled Rider (A27)
Real Time Pricing (A62, A63)
Light Rail Line (A29)

Outdoor Lighting
Automatic Protective (A07)
Street Lighting System (A30)
Street Lighting Energy (Closed) (A32)
Street Lighting Energy – Metered (A34)
Street Lighting - City of St. Paul (A37)

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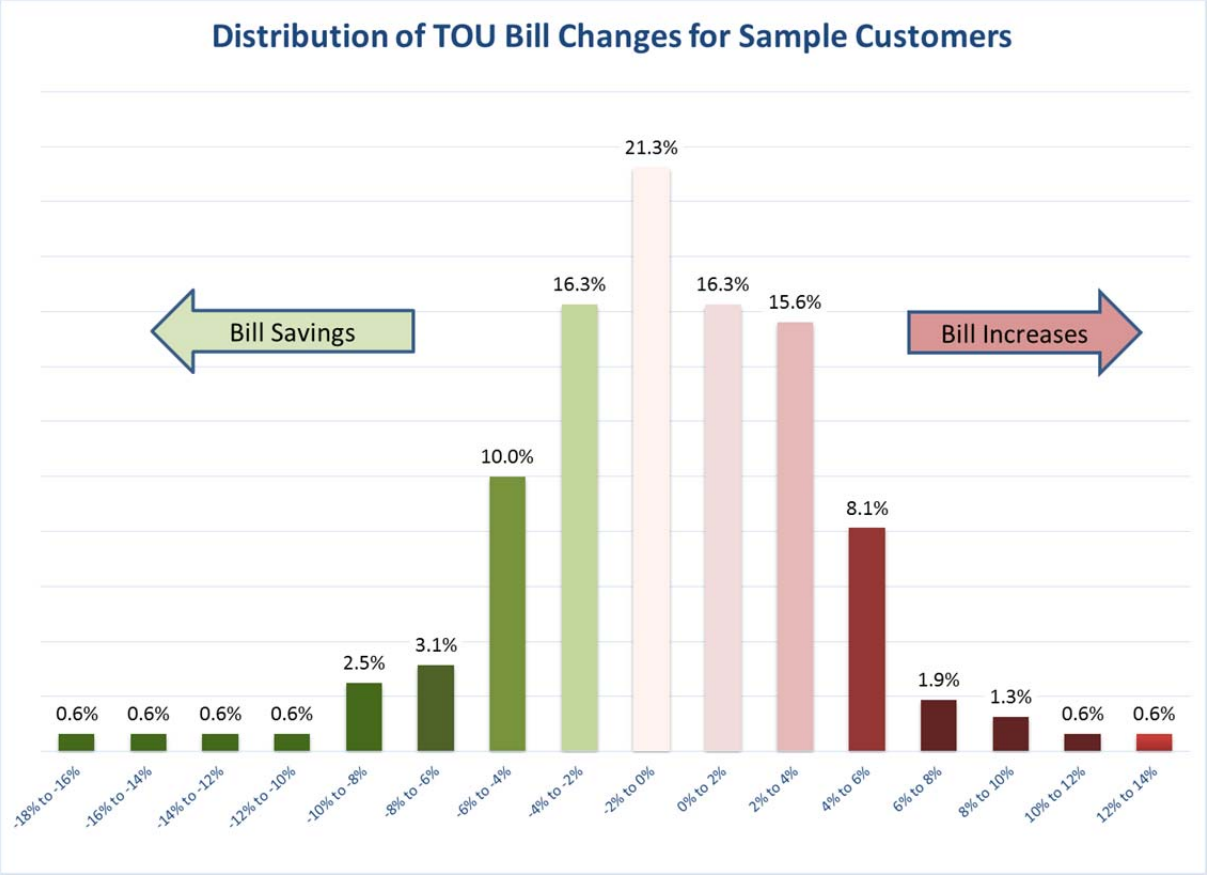
Bill Impact Analysis



This sample is based on the single 2016 actual year but is reasonably representative of more normalized results. For example, while the proposed TOU rates were designed to produce the same energy revenue as the flat rate based on a normalized forecast of hourly loads for all residential customers without electric space heating – to provide revenue neutrality assuming no TOU price response – the composite population weighted rate impact for all sample customers was a 0.5 percent rate decrease.

The sample energy usage was billed on standard flat energy rates, which represents a static case of no customer response to TOU price signals. In this static case, a reasonable range of bill impacts is a necessary result of designing TOU rate differentials that are sufficient enough to provide the benefits associated with TOU pricing.

As pilot customers respond to the usage incentives provided by TOU price signals, bill savings will increase and bill increases will decrease, as compared to the static case of no TOU price response.

Additional information on sample customer bill comparisons relative to customer energy usage is provided in the following table.

Annual KWH Range	Population Weighting	Average TOU Bill Change
0 - 2,999	22.687%	-2.5%
3,000 - 6,999	38.149%	-0.2%
7,000 - 10,999	21.485%	0.6%
11,000 - 16,999	12.587%	1.0%
17,000 - 199,999	5.091%	-1.5%
200,000 +	0.001%	-3.3%
Population Weighted	100.0%	-0.5%

NORTHERN STATES POWER COMPANY

MAILING ADDRESS	ACCOUNT NUMBER		DUE DATE
J. SMITH 5555 MAIN STREET CITY MN 55XXX-XXXX	XX-XXXXXXX-X		05/18/2017
	STATEMENT NUMBER	STATEMENT DATE	AMOUNT DUE
	XXXXXXXXX	4/09/2017	$121.50

DAILY AVERAGES	Last Year	This Year
Temperature	32° F	32° F
Electricity kWh	32.3	41.9
Electricity Cost	$3.61	$3.92

QUESTIONS ABOUT YOUR BILL?

See our website: xcelenergy.com
Email us at: Customerservice@xcelenergy.com

Call 24 hours a day, 7 days a week

Please Call: 1-800-895-4999
Hearing Impaired: 1-800-895-4949
Español: 1-800-687-8778

Or write us at: XCEL ENERGY
PO BOX 8
EAU CLAIRE WI 54702-0008

SUMMARY OF CURRENT CHARGES (detailed charges begin on page 2)

Electricity Service	03/08/17 - 04/08/17	1000 kWh	$121.50
Current Charges			**$121.50**

ACCOUNT BALANCE

Previous Balance	As of 03/08	$110.10
Payment Received	Check 03/29	-$110.10 **CR**
Balance Forward		**$0.00**
Current Charges		$121.50
Amount Due		**$121.50**

INFORMATION ABOUT YOUR BILL

Thank you for your payment.

RETURN BOTTOM PORTION WITH YOUR PAYMENT • **PLEASE DO NOT USE STAPLES, TAPE OR PAPER CLIPS**

ACCOUNT NUMBER	DUE DATE	AMOUNT DUE	AMOUNT ENCLOSED
XX-XXXXXXX-X	05/18/2017	$121.50	

To avoid a late pay charge of 1% of the unpaid balance, payment of total amount must be received by due date.
Make your check payable to XCEL ENERGY

MAY

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

------ manifest line ---------

J. SMITH
5555 MAIN STREET
CITY MN 55XXX-XXXX

XCEL ENERGY
P.O. BOX 9477
MPLS MN 55484-9477

Xcel Energy®

MAILING ADDRESS	ACCOUNT NUMBER		DUE DATE
J. SMITH 5555 MAIN STREET CITY MN 55XXX-XXXX	XX-XXXXXXX-X		05/18/2017
	STATEMENT NUMBER	STATEMENT DATE	AMOUNT DUE
	XXXXXXXXX	04/09/2017	$121.50

SERVICE ADDRESS: **5555 MAIN STREET CITY MN 55XXX-XXXX**
NEXT READ DATE: 05/08/17

ELECTRICITY SERVICE DETAILS

PREMISES NUMBER: 123456789
INVOICE NUMBER: XXXXXXXXXX

METER READING INFORMATION

METER 12345678 Read Dates: 03/08/17 - 04/08/17

DESCRIPTION	CURRENT READING	PREVIOUS READING	USAGE
Total Energy	35000 Actual	34000 Actual	1000 kWh
On Pk Energy	9200 Actual	9000 Actual	200 kWh
Mid Peak Energy	19600 Actual	19000 Actual	600 kWh
Off Pk Energy	6200 Actual	6000 Actual	200 kWh

ELECTRICITY CHARGES — RATE: Res TOU Pilot Service

DESCRIPTION	USAGE UNITS	RATE	CHARGE
Basic Service Chg			$ 8.00
On-Pk Energy Chg Winter	200 kWh	$0.19675	$ 39.35
Mid-Pk Energy Chg Winter	600 kWh	$0.07720	$ 46.32
Off-Pk Energy Chg	200 kWh	$0.02913	$ 5.83
Fuel Cost Charge	1000 kWh	$0.03000	$ 30.00
Total			**$121.50**

Cost Estimates for Offering Pilot with AMI vs. Upgrading Current Technology

AMI

Cost Item	17,500 Meters	Capital	O&M
FAN - Mesh*	$533,197	$503,177	$30,020
Metering	$4,111,852	$3,858,191	$253,661
AMI Software Licenses	$252,000	$252,000	$0
AMI Software Maintenance and Support**	$120,000	$0	$120,000
Head End	$2,449,409	$2,382,693	$66,716
CRS	$946,400	$922,740	$23,660
Strategen Consultant	$100,000	$0	$100,000
Program Management Labor	$675,000	$0	$675,000
Marketing Communications	$420,000	$0	$420,000
M&V Consultant	$1,200,000	$0	$1,200,000
Customer Data Presentment	$145,000	$141,375	$3,625
TOTAL:	**$10,952,858**	**$8,060,176**	**$2,892,682**

*FAN Wimax is being installed as part of base capital.
**Maintenance and support would be required for 10 years. The $120,000 only includes two years of these payments to represent the pilot. Total 10 year cost would be approximately $600,000.

Current Technology with Needed Upgrades

Cost Item	17,500 Meters	Capital	O&M
Meters	$5,908,837	$5,209,869	$698,968
MRAS**	$100,000	$100,000	$0
IEE**	$150,000	$150,000	$0
MDMS**	$50,000	$50,000	$0
Landis+Gyr	$0	$0	$0
CRS	$946,400	$922,740	$23,660
Strategen Consultant	$100,000	$0	$100,000
Program Management Labor	$675,000	$0	$675,000
Marketing Communications	$420,000	$0	$420,000
M&V Consultant	$1,200,000	$0	$1,200,000
Data Integration	$100,000	$100,000	$0
Customer Data Presentment	$145,000	$141,375	$3,625
TOTAL:	**$9,795,237**	**$6,673,984**	**$3,121,253**

*Assumes we are installing the same 1-way meters
**Assumptions:

1) There are no minimal changes to MDMS
2) We would use an existing meter
3) We will not change existing data feeds from L&G

CERTIFICATE OF SERVICE

I, Carl Cronin, hereby certify that I have this day served copies of the foregoing document on the attached list of persons.

xx by depositing a true and correct copy thereof, properly enveloped with postage paid in the United States mail at Minneapolis, Minnesota

xx electronic filing

Docket Nos. **E002/M-17-775**
E002/M-15-662
Xcel Energy's Miscellaneous Electric Service List

Dated this 1st day of November 2017

/s/

Carl Cronin
Regulatory Administrator

First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
Christopher	Anderson	canderson@allete.com	Minnesota Power	30 W Superior St Duluth, MN 558022191	Electronic Service	No	OFF_SL_15-662_Official
Julia	Anderson	Julia.Anderson@ag.state.mn.us	Office of the Attorney General-DOC	1800 BRM Tower 445 Minnesota St St. Paul, MN 551012134	Electronic Service	Yes	OFF_SL_15-662_Official
Alison C	Archer	aarcher@misoenergy.org	MISO	2985 Ames Crossing Rd Eagan, MN 55121	Electronic Service	No	OFF_SL_15-662_Official
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First Name	Last Name	Email	Company Name	Address	Delivery Method	View Trade Secret	Service List Name
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Daniel P	Wolf	dan.wolf@state.mn.us	Public Utilities Commission	121 7th Place East Suite 350 St. Paul, MN 551012147	Electronic Service	No	GEN_SL_Northern States Power Company dba Xcel Energy-Elec_Xcel Miscl Electric
Patrick	Zomer	Patrick.Zomer@lawmoss.com	Moss & Barnett a Professional Association	150 S. 5th Street, #1200 Minneapolis, MN 55402	Electronic Service	No	GEN_SL_Northern States Power Company dba Xcel Energy-Elec_Xcel Miscl Electric