EXH. BDJ-15
DOCKETS UE-22___/UG-22___
2022 PSE GENERAL RATE CASE
WITNESS: BIRUD D. JHAVERI

BEFORE THE
WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION, **Complainant,** **v.** **PUGET SOUND ENERGY,** **Respondent.**	**Docket UE-22____** **Docket UG-22____**

FOURTEENTH EXHIBIT (NONCONFIDENTIAL) TO THE PREFILED DIRECT TESTIMONY OF

BIRUD D. JHAVERI

ON BEHALF OF PUGET SOUND ENERGY

JANUARY 31, 2022

Guidehouse

Alternative Pricing Roadmap and Pilot Design

Phase 1 Education and Goal Setting

Prepared for:

Puget Sound Energy

PSE PUGET SOUND ENERGY

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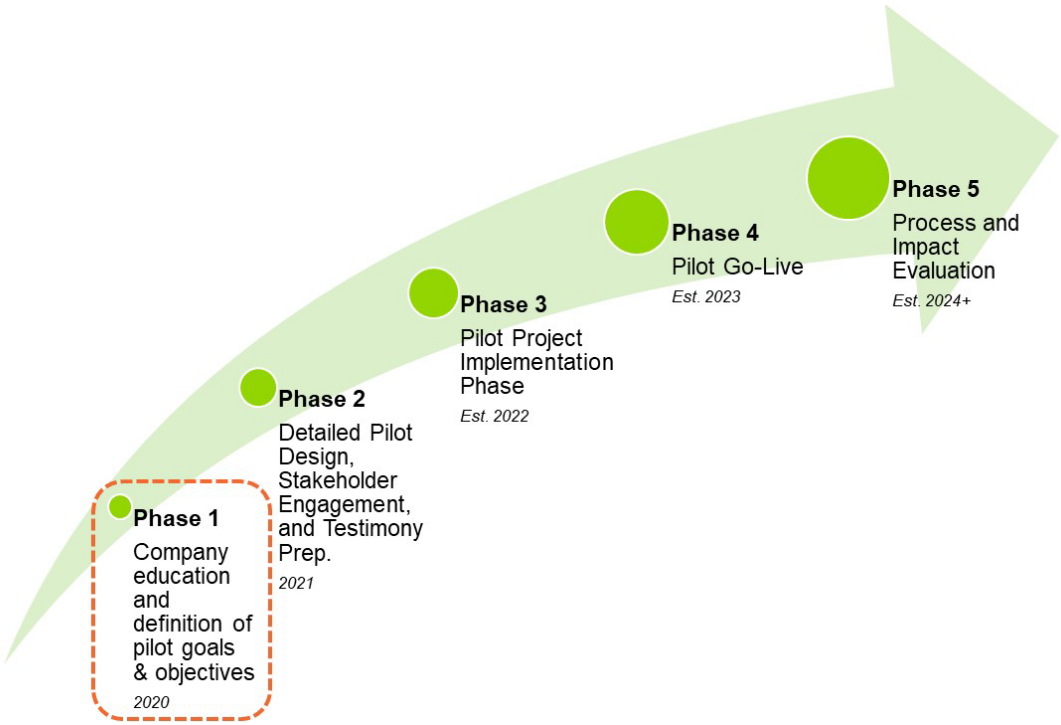
Executive Summary

Puget Sound Energy (PSE) is in the first phase of a five-phase process over the next several years to define, design, implement, and evaluate its pricing pilots and alternative rate strategy. PSE's phased approach and high-level timeline is described in Figure 1.

Figure 1. Phased Approach to Alternative Rate Design



Source: Guidehouse

In this first phase of the process, Guidehouse supported PSE to define pilot rate objectives and potential pricing pilot options suited to PSE's goals. Additionally, Guidehouse worked with PSE to develop a 10-year vision and roadmap to alternative rates. As part of the engagement, Guidehouse conducted a series of workshops with internal stakeholders to update PSE staff[1] on project activities, share key findings, and obtain feedback and buy-in on next steps. Table 1 lists the Phase 1 workshops.

[1] Workshop attendees varied based on the session topics.

Table 1. Phase 1 Workshops Conducted by Guidehouse

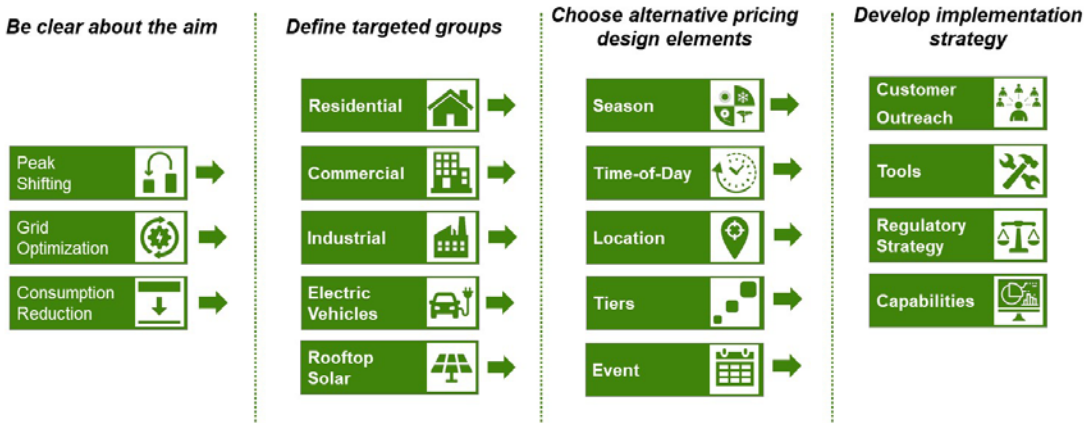
Workshop	Date	Objectives
Alternative Rates Design Principles and Trends	July 10, 2020	• Establish a common understanding of rate setting and terminology • Share insights into the drivers of changing landscape of rate design • Translate lessons learned into practical actions for PSE's initiatives
Priorities, Capabilities, and Considerations for Alternative Rates	August 18, 2020	• Share key takeaways from Guidehouse interviews • Align on alternative rate objectives and priorities • Discuss potential time-of-use (TOU) rate options that could align with priorities
Rate Design Concepts and Phase 2 Planning	September 10, 2020	• Present rate design Concepts and Phase 2 Plan
Alternative Rates Vision and Roadmap	September 29, 2020	• Present 10-year draft Alternative Rates Vision and Roadmap Framework for feedback and discussion

This report summarizes the outcomes of Guidehouse's support to PSE through the Phase 1 engagement.

Alternative Pricing Overview

The rate design process is highly data-driven and balances many issues and considerations. For example, data is used to determine when the peak rate periods will occur, what the optimal durations are for those periods, and the prices for each of those time periods. However, while data drives the design of rates, rate design is ultimately optimized with the customers in mind and will only succeed when customers are able to understand and respond to the rate.

Figure 2. Approach to Alternative Rate Design



Source: Guidehouse

Time-based rates can be an effective tool to achieve a number of objectives, including addressing distributed energy resources (DER) integration and grid cost recovery, providing

customers with more choices on rates to meet their preferences, and providing a pathway to improve economics and increase adoption of electric vehicles (EVs).

When preparing to roll out alternative rates, it is important to adequately prepare for and monitor a variety of issues including stakeholder awareness of the upcoming transition, the regulatory environment in which it is taking place, the internal capabilities of the company, and the existing availability and reach of technology.

Internal Capabilities and Considerations

Guidehouse conducted 13 interviews with groups of PSE staff across various departments and teams that would likely play a role in the design or implementation of an alternative rate. The purpose of these interviews was to better understand how these departments would be involved in alternative rate implementation and if there are department-specific considerations for planning and implementation of alternative rates that should be factored into the project plan. Through the internal panel interviews, Guidehouse did not identify significant constraints that might limit PSE's ability to offer more straightforward alternative rates, such as a basic two-period time-of-use (TOU) rate. For example, the expected presence and granularity of the advanced metering infrastructure (AMI) data can likely support a TOU rate, as can the billing system configurations and capabilities.

Guidehouse observed a general can-do attitude from internal stakeholders who were generally optimistic solutions can be found for the formidable challenges to implementing time-based rates. PSE staff have a general understanding of their customers' wants and preferences but have not yet conducted targeted customer research related to alternative rates. PSE staff also acknowledged value of thoughtful and deliberate stakeholder engagement for designing alternative rates and programs. While these interviews helped the Guidehouse team better understand how various departments would likely be involved in alternative rate design and implementation, the team did not conduct an in-depth review of PSE capabilities to confirm and validate absolute readiness to offer alternative rates.

Conceptualizing Alternative Rates

PSE's internal stakeholders support easy-to-understand pilot rates with meaningful price differences that consider PSE's objectives and priorities. Guidehouse considered PSE's objectives, priorities, and system loads and costs to develop preliminary conceptual options for alternative rate pilots for residential (Schedule 7) and small commercial (Schedule 24) customers. Options include TOU rates with various peak hours and months and a tiered pricing scheme with a critical peak pricing (CPP) or critical peak rebate (CPR) program. In concert with pilot design and implementation, PSE should conduct an evaluation over the entire pilot duration to measure and report the energy and bill impacts and the customer experience from participation in an alternative rate pilot. The evaluation should be refined to address the goals and objectives specific to the pilot being tested.

Alternative Rates Vision Framework and Phase 2 Plan

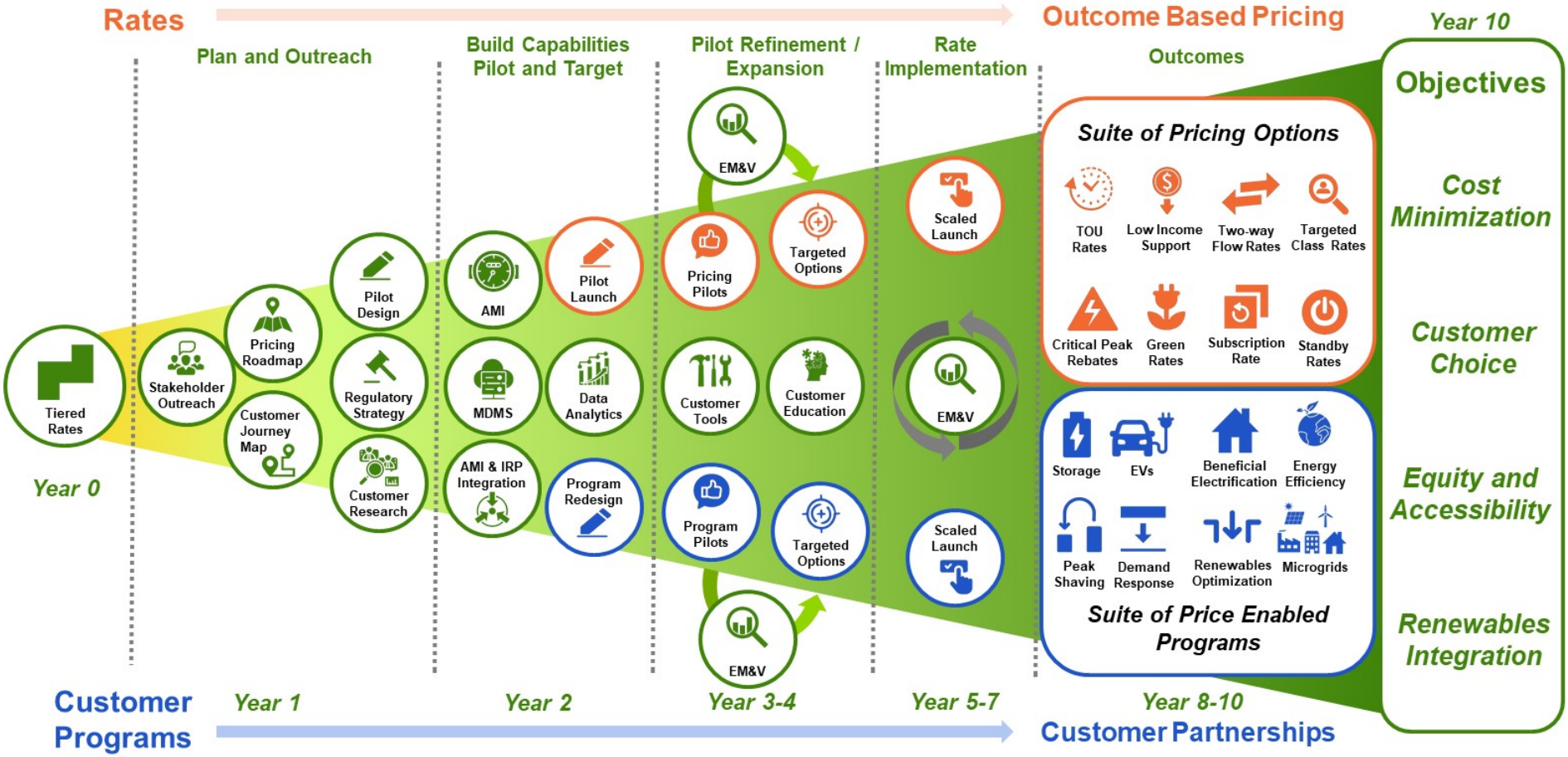
PSE's key objectives for its alternative rates vision framework include:

- **System cost minimization:** Reduce costs to serve customers by improving capacity utilization, encouraging economic conservation and peak shaving
- **Customer choice:** Offering customers options to help them manage their energy bills

- **Equity and accessibility:** Design and offer rates and programs that consider needs and effects on vulnerable populations
- **Renewables integration:** Investing in and economically integrating renewable resources to help PSE achieve its 100% carbon free goals.

Over a 10-year horizon, PSE envisions it could transition from a one-size-fits-all tiered rate to outcome-based pricing, which tailors pricing to customer's preferences while still reflecting the costs of products and services offered. To achieve outcome-based pricing, PSE will need a suite of pricing options coupled with complementary price-enabled programs. Figure 3 provides an illustrative 10-year alternative rates and programs roadmap and vision framework illustrating hypothetical pricing and programs. The figure outlines a potential path to outcome-based pricing, and PSE intends to take a gradual, iterative approach to building to more sophisticated pricing and programmatic outcomes and evolving its pricing and programmatic capabilities to facilitate a better customer experience.

Figure 3. Illustrative 10-Year Alternative Rates and Programs Roadmap and Vision Framework



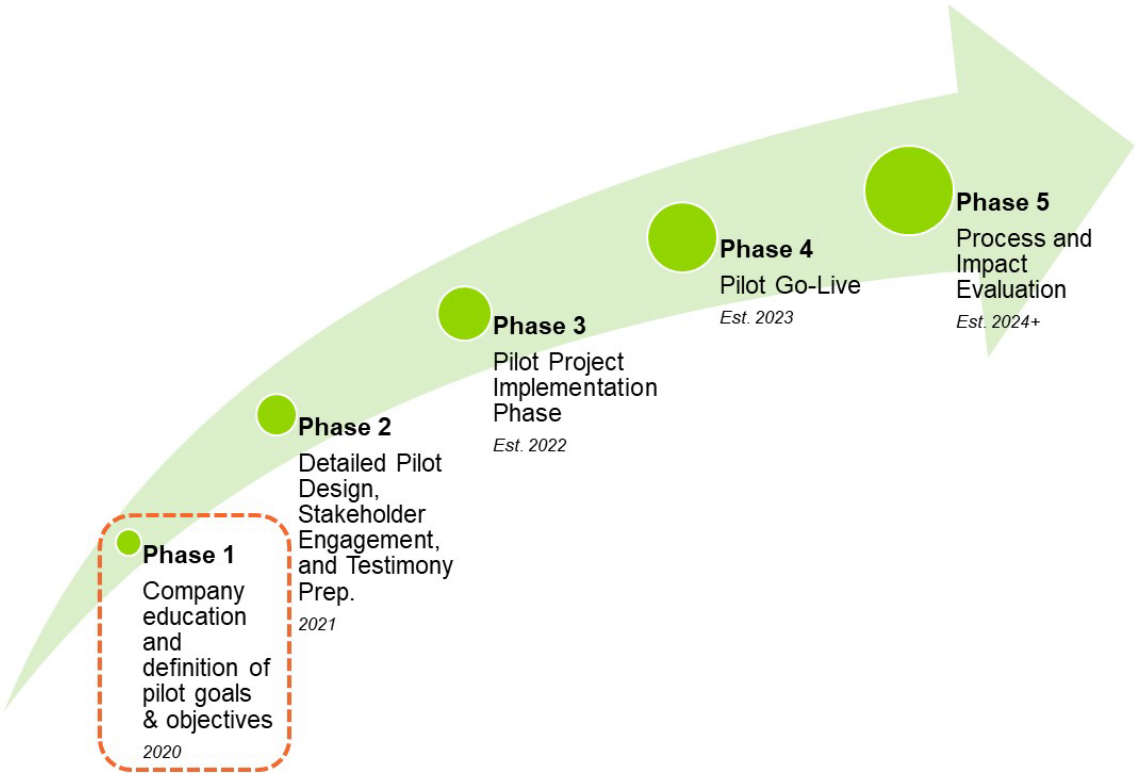
The above illustrative roadmap and vision framework identify a potential path toward pricing options and programs. PSE intends to take a gradual, iterative approach to evolving its pricing and programmatic capabilities.
Source: Guidehouse

Phase 2 would begin with initial stakeholder outreach to align goals and objectives. Then, PSE would conduct detailed data analysis of cost and load data and outline a cost allocation approach and pilot rate design. Following the pilot rate design, PSE would conduct a series of internal workshops to review the rate design, confirm feasibility, and discuss timeline and coordination among PSE's internal teams. Next, PSE would conduct an additional round of follow-up stakeholder outreach to present the rate concepts for prioritization and feedback. Finally, PSE would integrate the stakeholder feedback, develop the detailed pilot rate design, prepare an evaluation plan, develop a marketing and outreach plan, and refine the test pilot design.

1. Background

Puget Sound Energy (PSE) is in the first phase of a five-phase process over the next several years to define, design, implement, and evaluate its pricing pilots and alternative rate strategy. PSE's phased approach and high-level timeline is described in Figure 4.

Figure 4. Phased Approach to Alternative Rate Design

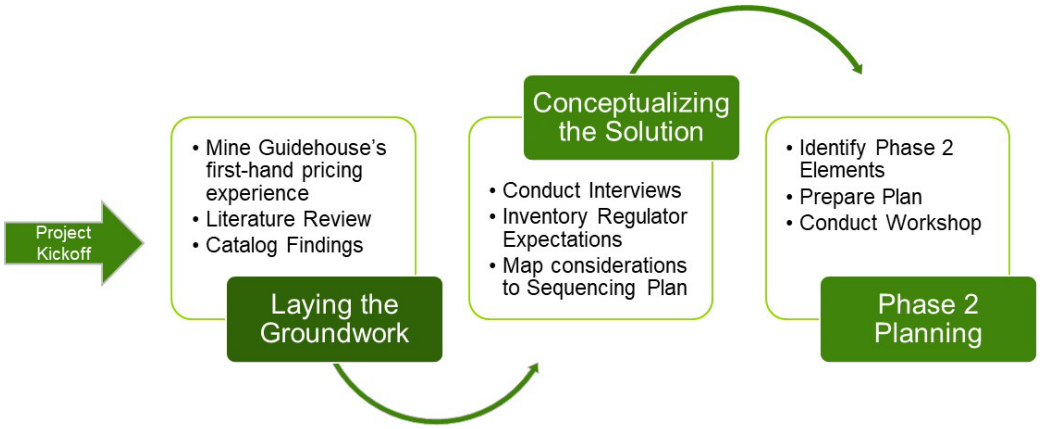


Source: Guidehouse

In the first phase of the process, Guidehouse supported PSE to define pilot rate objectives and pricing pilot options suited to PSE's goals. Furthermore, Guidehouse worked with PSE to develop a 10-year vision and roadmap to alternative rates framework. Figure 5 describes the Guidehouse approach and task structure for Phase 1. As part of this engagement, Guidehouse conducted a series of workshops with internal stakeholders to update PSE staff[2] on project activities, share key findings, and obtain feedback and buy-in on next steps. Table 2 summarizes the project workshop dates and key objectives.

[2] Workshop attendees varied based on the session topics.

Figure 5. Phase 1 Approach



Source: Guidehouse

Task 1: Laying the Groundwork – Pricing Pilots Overview

The first task focused on establishing a common understanding of project goals and priorities. Building on Guidehouse's first-hand pricing experience and a review of related literature, Guidehouse provided an overview of alternative rate design principles, described trends in alternative rate design, and shared leading practices and lessons learned. Guidehouse presented these findings in a 2-hour workshop to PSE staff on July 10, 2020, included as Appendix B and summarized in Section 2.

Task 2: Conceptualizing the Solution

The second task focused on identifying PSE's internal capabilities and constraints relating to technical, operational, customers, and stakeholder considerations for alternative rate pricing pilots. To identify these considerations, Guidehouse conducted interviews with PSE representatives to better understand their objectives, unique considerations, and technical constraints and other limitations. The list of panel interview groups and the discussion objectives are described in Appendix A.

Building on findings from the panel interviews and a review of the PSE-provided background materials and data request items, Guidehouse developed goals and objectives for alternative rates—including drivers, priorities, and considerations—and initial pricing pilot options for consideration by the PSE team. These concepts, along with key findings from the panel interviews, were presented to PSE staff for feedback and discussion in a 2-hour workshop on August 18, 2020 as Appendix C and are summarized in Section 3.

Task 3: Alternative Rates Vision and Pilot Sequencing

The final task involved the design of an Alternative Rates and Programs 10-Year Vision and Roadmap Framework. Guidehouse also worked with PSE to identify next steps for stakeholder outreach and the development of alternative rate pilots, as outlined in the Phase 2 Plan.

Guidehouse presented the Phase 2 Plan to PSE staff for feedback and discussion in a 2-hour workshop on September 10, 2020, provided as Appendix D. Guidehouse presented the 10-Year Vision Blueprint to key internal stakeholders during a series of meetings in September and October 2020 as shown in Appendix E. The updated Alternative Rates Vision summarized in Section 5 of this report incorporates PSE feedback.

Table 2. Phase 1 Workshops Conducted by Guidehouse

Workshop	Date	Objectives
Alternative Rates Design Principles and Trends	July 10, 2020	• Establish a common understanding of rate setting and terminology • Share insights into the drivers of changing landscape of rate design • Translate lessons learned into practical actions for PSE's initiatives
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Learnings from PSE's Personal Energy Management Program

PSE's experience with launching the Personal Energy Management (PEM) program provides learnings that translate to the development of alternative rates today. In 2001 PSE introduced the PEM program and cancelled it just over a year later. The primary challenge to the success of the project was a weak price differential across three periods (less than $0.01/kWh). This challenge was highlighted in articles found in a literature search critiquing this program, in particular "The Demise of PSE's TOU program imparts lessons."[3] This challenge was further confirmed through internal interviews. Unrealistic customer expectations and a lack of enabling technologies were additional factors identified in these external critique articles, as well as by Guidehouse's internal experts who reviewed the program.

On the positive side, the PEM program showed that automatic meter reading (AMR) systems have capabilities beyond simple data collection and that a complex system and billing program could be realized.

Key lessons learned include the following:

- Customer education and outreach is critical to helping customers understand how and how much they can save
- While ensuring cost reflectiveness, design rate differentials that create meaningful savings for customers if they shift their energy usage
- Provide customers with education and access to technologies that will help them save energy, such as smart thermostats

[3] "Demise of PSE's TOU program imparts lessons," Faruqui, Ahmad and Dr. Stephen S. George, EL&P (Jan. 2003),

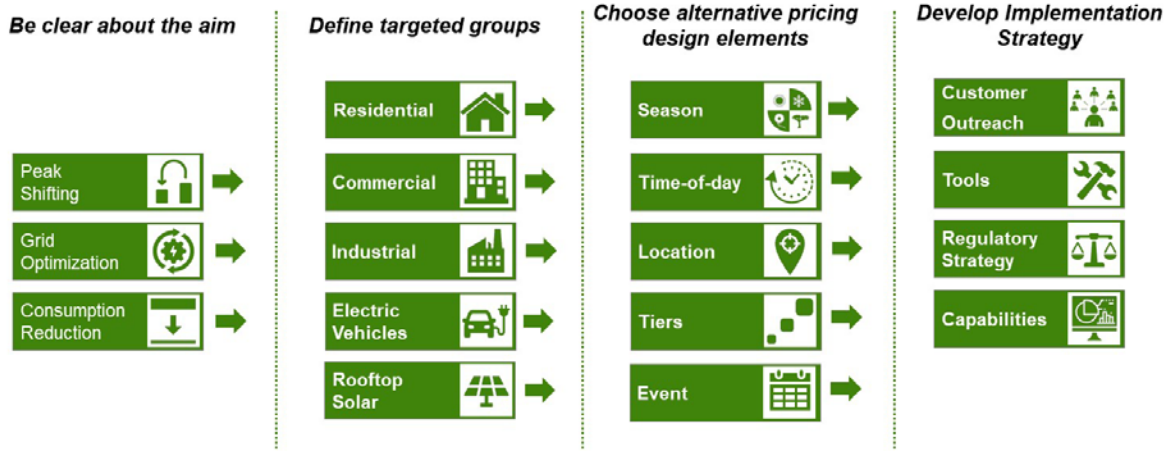
2. Alternative Pricing Overview

This section provides an overview of alternative rate design principles, describes trends in alternative rate design, and shares leading practices and lessons learned based on Guidehouse first-hand experience and a review of published research on alternative rates. This material was presented in detail to PSE staff in a 2-hour workshop on July 10, 2020 (see Appendix B).

2.1 Alternate Rate Design Principles

This section describes alternative rate design principles that reflect a collective understanding of rate setting process and terminology across the Guidehouse and PSE team. Figure 6 describes an approach to alternative rate design, emphasizing the need to establish clear objectives before making decisions about who the rates will target and with what design elements and tools. After key stakeholders have established clear objectives of the rate, they can move on to defining targeted groups (i.e., sectors, technologies). From there, the pricing pilot elements are designed, such as rate pilot seasons and times of day. Then the implementation strategy is considered, including the customer outreach strategy, tools to support understanding and success on the new rate, regulatory and stakeholder outreach strategy, and internal capabilities assessment and plan, including key groups such as IT, billing, customer care, and others deemed appropriate to the organization.

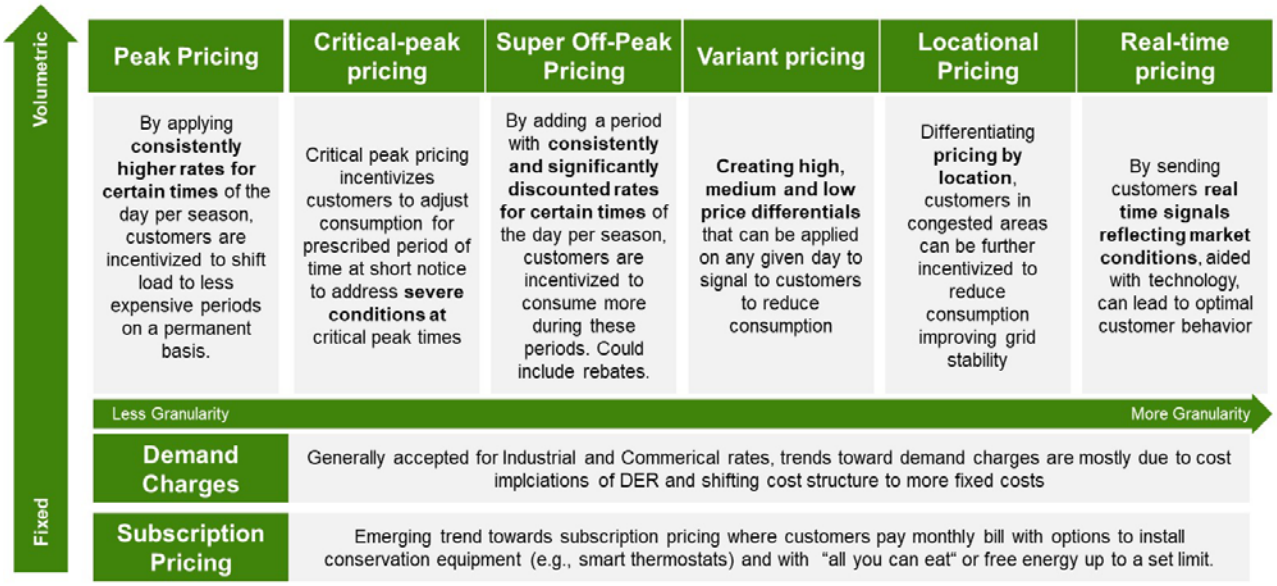
Figure 6. Approach to Alternative Rate Design



Source: Guidehouse

Figure 7 describes the continuum of alternative rate design pricing options presented with varying degrees of granularity in the rate structure in two dimensions: fixed to volumetric pricing schemes, and static to granular. Subscription rates are an example of fixed pricing, a relatively new pricing scheme where customers pay a flat monthly fee, akin to a Netflix subscription charge, up to a set monthly limit. At the other end of the spectrum, variable and volumetric pricing options such as real-time pricing provide granular pricing schemes where customers pay for the energy they use in response to real-time signals based on current market conditions. Utilities should select pricing plans along this continuum based on their internal capabilities and objectives of their alternative rate design strategy.

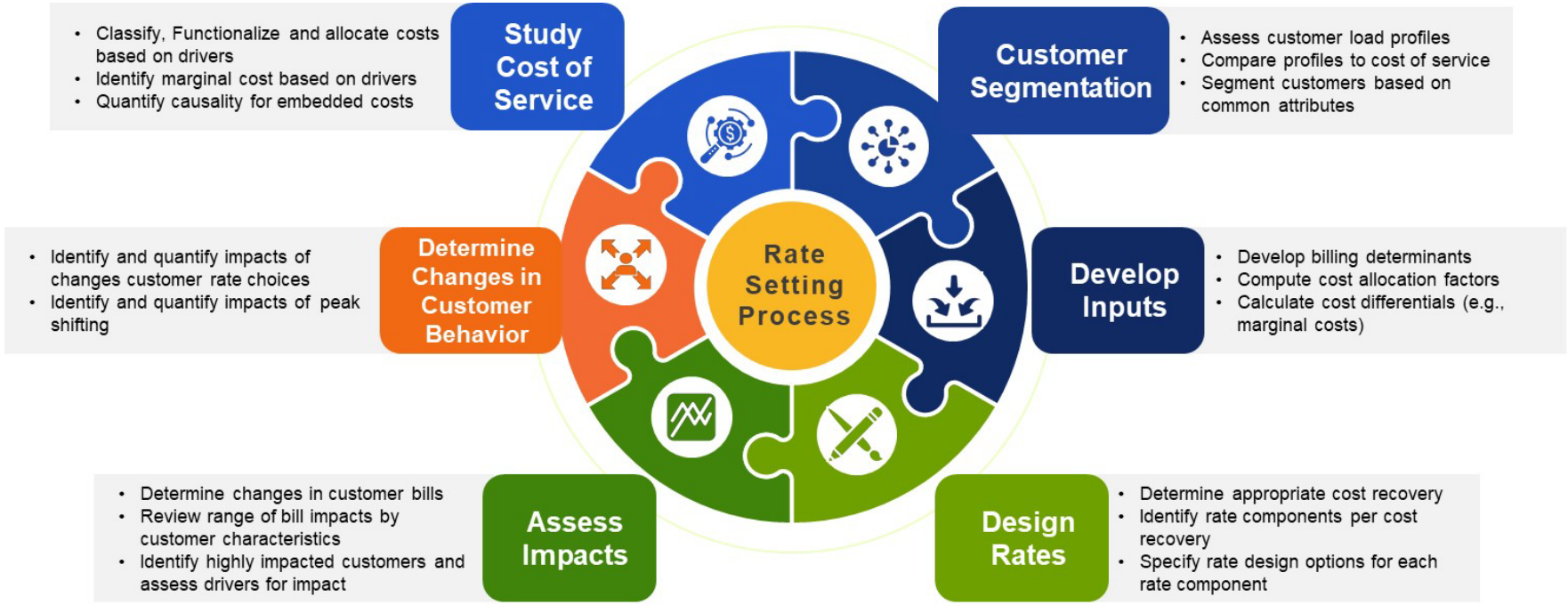
Figure 7. Choosing the Right Alternative Price Scheme to Meet Objectives



Source: Guidehouse

Figure 8 depicts the steps involved in the rate setting process and the various components that contribute to rate design, including a study of the utility's cost of service, customer segmentation based on load profiles and common attributes (e.g., EV ownership), development of billing determinants and other key inputs such as cost allocation factors and cost differentials; designing of the rate including rate components and cost recovery; and finally, an assessment of rate impacts and customer behavior change, to identify and quantify the impacts of peak shifting, customer behavior change, bill impacts, and customer impacts broadly and for key customer groups. Ideally a marginal cost analysis that looks at not only the marginal costs of generation and generation capacity but also transmission and distribution, would be helpful in designing these rate options. However, reasonable proxies can be computed by leveraging any Avoided Cost studies PSE uses for evaluating energy efficiency and demand side management programs and other hourly price allocation methods that assume a linkage between marginal costs and customer load profiles (system, net load, or customer class loads) as well as cost profiles (like customer class load times marginal costs). These methods basically create hourly weights that can then be used to develop time differentiation estimates that represent contribution to costs in those hours versus actual marginal costs. Both methods are used in the industry.

Figure 8. Elements of the Rate Setting Process

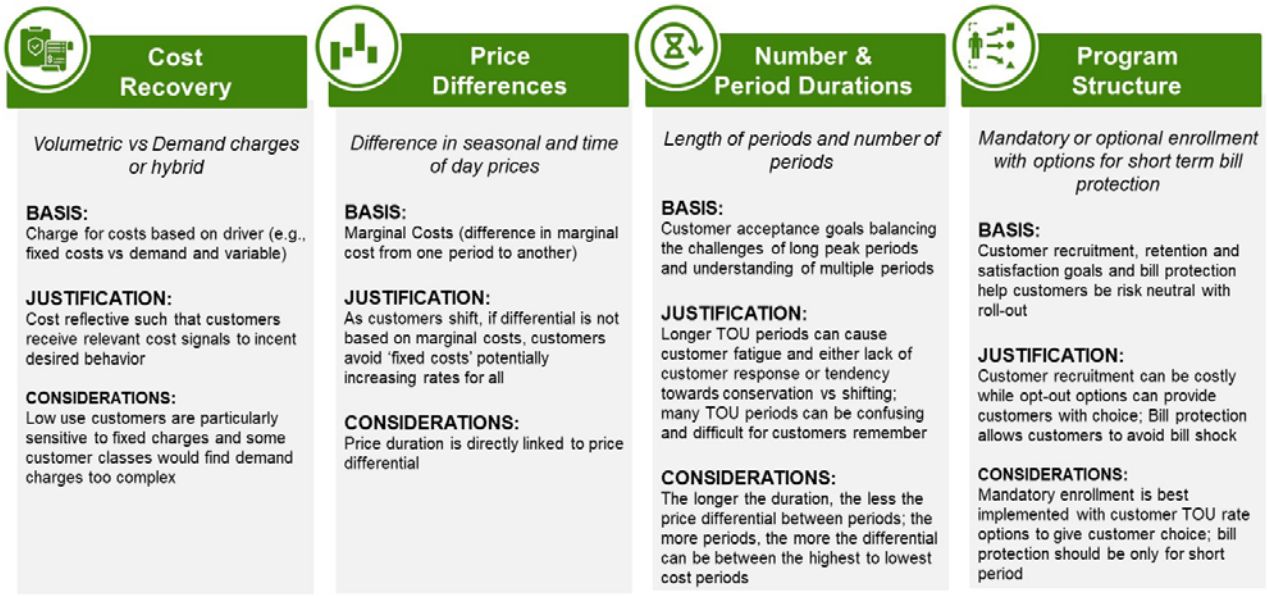


Source: Guidehouse

Figure 9 elaborates on the key design parameters for TOU rate design: cost recovery, price differences (peak/off-peak prices), number and duration of periods, and the program design structure. The graphic emphasizes that rates should be stable for long enough to allow customers to adequately adjust to the new rate structure. Later, as distributed energy resources (DER) and other disruptors change load shapes, utilities may need to adjust TOU periods to accommodate. However, to the extent possible, rates should be designed to optimize not just current costs, but future costs as well.

The rate design process is highly data-driven and balances many issues and considerations. Data is used to determine when the peak rate periods will occur, what the optimal durations for those periods are, and other facets. However, while data drives the design of rates, rate design is ultimately optimized with the customers in mind and will only succeed when customers are able to understand and respond to the rate.

Figure 9. Designing Alternative Rates: Key Design Parameters for TOU Rates



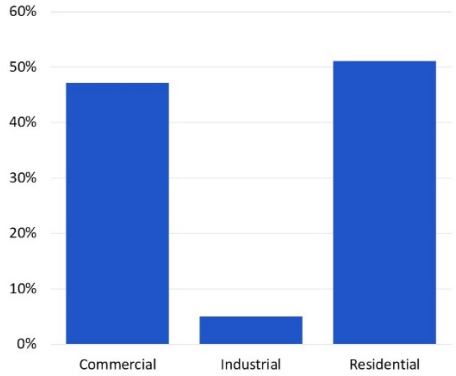
Source: Guidehouse

2.2 Trends in Alternative Rate Design

Broadly speaking, time-based rates can be an effective tool to achieve a number of objectives, including but not limited to addressing DER integration and grid cost recovery, providing customers with more choices on rates to meet their preferences, as well as providing a pathway to improve economics and increase adoption of EVs. This section provides insights into the drivers and changing landscape of rate design both in the US and globally.

A key aspect in the rate design is whether the alternative rate will be default (opt-out or mandatory) or optional (opt-in). One approach to introducing alternative rates to customers involves defaulting customers onto the rates, while providing an opportunity for customers to move to another rate, either time-based or not. Rate designs also need to consider and balance the number of tiers (i.e., giving customers access to options for when they can use energy at lower cost) without overwhelming them with complexity. It is also common to see cost differentials from grid charges included in the design. Figure 10 shows the percentage of investor-owned utilities (IOUs) with TOU pricing programs by sector and shows that TOU rates are most common in the residential sector and least prevalent in the industrial sector.

Figure 10. Percentage of IOUs with TOU Programs



Source: Guidehouse analysis of Open EI Utility Database

Implementation Strategies and Pilot Approach

It is typical and leading practice for utilities to pilot a new pricing plan prior to implementing it; this provides time to test new capabilities, gather feedback from customers, measure bill and load shifting impacts, and prepare for a broader rollout of the rate. To support customers on the new rates, utilities sometimes offer enabling technologies, such as smart thermostats, or provide customers with shadow bills and bill protection. Shadow billing is for

Diverging Trends

Flat and tiered pricing have diverged into two main rate designs for utilities: Time Variant Pricing and Subscription Pricing. With time variant pricing, customers are sent price signals designed to modify their behavior. From a grid utilization perspective, this can create access to low cost generation from renewables, and for the customers, it encourages adoption of technologies that can leverage time differences (e.g. EVs, storage).

Subscription pricing is a customer centric rate design, more in line with other pricing schemes for services (e.g. Amazon, Netflix). It encourages the adoption of technologies that could provide savings rather than relying on customer behavior changes. It also addresses shifts in cost structure as risks have migrated from market price vulnerability to fixed costs collection and increased rates as customers find alternatives to avoid paying fixed costs.

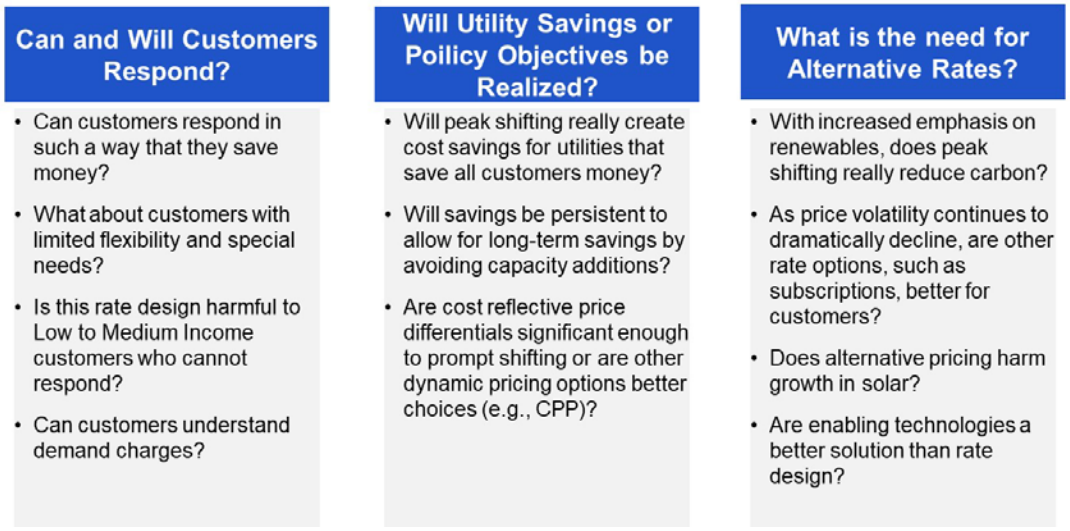
A further modification on these designs are subscription plans with Critical Peak Pricing. To date, there are no examples of these designs having been implemented.

informational purposes, allowing the customer to see what they would have paid for the same electricity usage under a different rate structure. Bill protection, on the other hand, gives the customer reassurance that if their bill is higher on the new rate than it would have been on the original rate, the customer is credited with the difference at the end of a predetermined time (e.g., after 12 months).

Addressing Skepticism

Utilities should be prepared to address a variety of potential concerns that stakeholders may have regarding the implementation and effectiveness of alternative pricing schemes. Figure 11 illustrates common areas of skepticism that a utility may encounter when designing alternative pricing schemes. Utilities should be prepared to respond to questions such as whether customers can and will respond to the rate in a way that will save them money, will the price signals be significant enough to encourage a customer response, will peak shifting lead to cost savings for the utility, and are alternative rates really the right tool to achieve objectives that might be addressed through other means. A thoughtful and deliberate internal and external stakeholder engagement process can help identify and resolve these concerns.

Figure 11. Potential Areas of Skepticism with Alternative Pricing Schemes

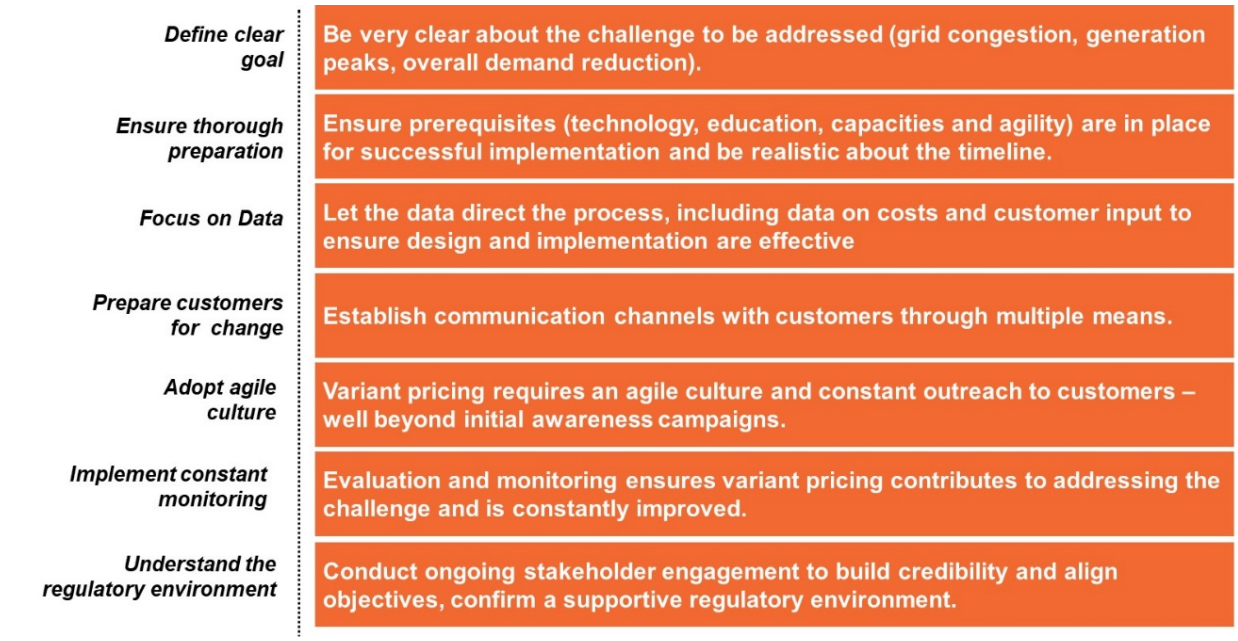


Source: Guidehouse

2.3 Industry Leading Practices and Lessons Learned

This section highlights some of the leading practices and lessons learned for designing and implementing alternative rates, based on secondary research and Guidehouse first-hand experience with design and rollout of pricing pilots. Figure 12 distills some of the key lessons learned that apply generally to the design of alternative rates.

Figure 12. Lessons Learned from Alternative Rate Design

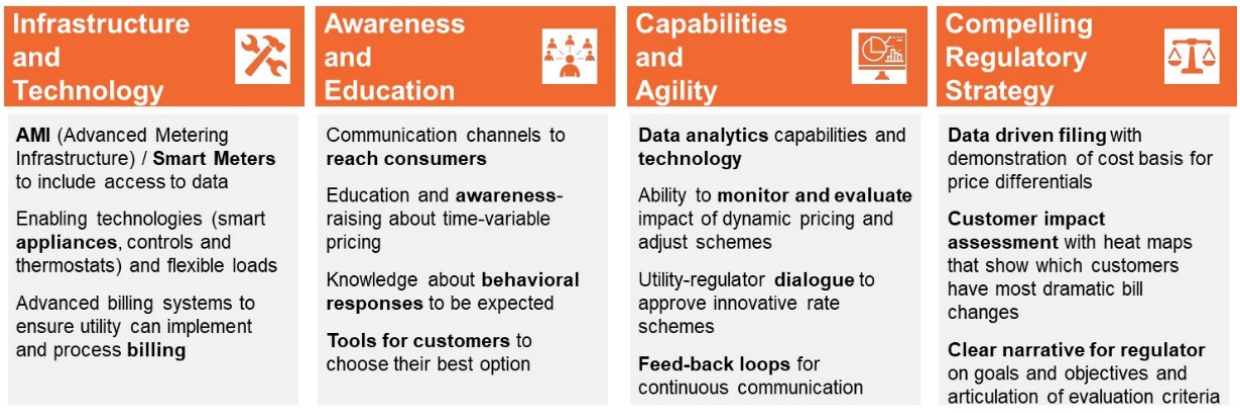


Source: Guidehouse

Preparing for Alternative Rates

When preparing to roll out alternative rates, it is important to adequately prepare for and monitor a variety of issues including stakeholder awareness of the upcoming transition, the regulatory environment in which it is taking place, the internal capabilities of the company, and the existing availability and reach of technology. Figure 13 examines each of these considerations in greater detail.

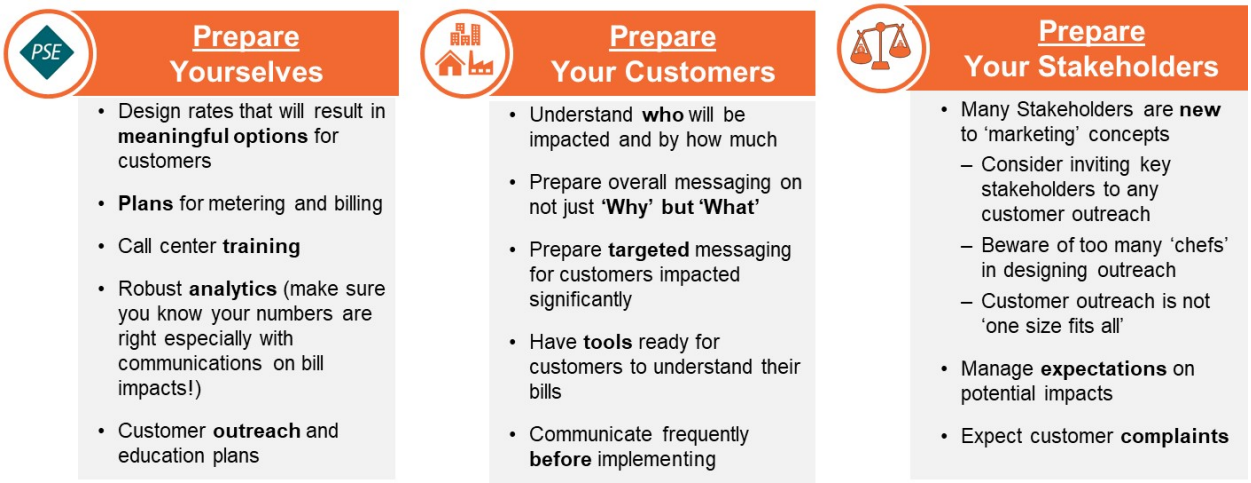
Figure 13. Considerations in Preparing for Alternative Rates



Source: Guidehouse

To adequately prepare for alternative rates, the process needs to broadly consider the utilities capabilities and constraints, the needs and preferences of its customers, and the concerns of other stakeholders. Figure 14 provides examples of preparation that should be conducted to enable a sound rate design and smooth implementation process.

Figure 14. Preparing for Alternative Rates



Source: Guidehouse

Coordinate with AMI rollout: Coordinating advanced metering infrastructure (AMI) rollouts with new pricing pilots can help avoid several issues that otherwise might occur with systems integration and customer adoption. If planned and communicated effectively, coordinating new pricing with AMI provides an opportunity to demonstrate to customers the benefits of providing access and use of their AMI data. Additionally, testing with pilots allows time to resolve any emergent meter issues prior to full-scale rollout of the alternative rates.

Build analytic capabilities: Investment in meter data management system (MDMS) provides access to data useful to rate design and customer care team. Specifically, AMI data can be used in designing and developing new rate models and developing bill impact estimation capabilities to test impacts of rate design, allowing for targeted customer outreach. To provide this invaluable information, a minimum of one year of data is ideal. Additionally, using a test group to test bill impact results can be helpful to promote quality.

Know Your Customers

Figure 15 illustrates the recommended data collection and communication steps for effective customer engagement when transitioning to a time-based rate.

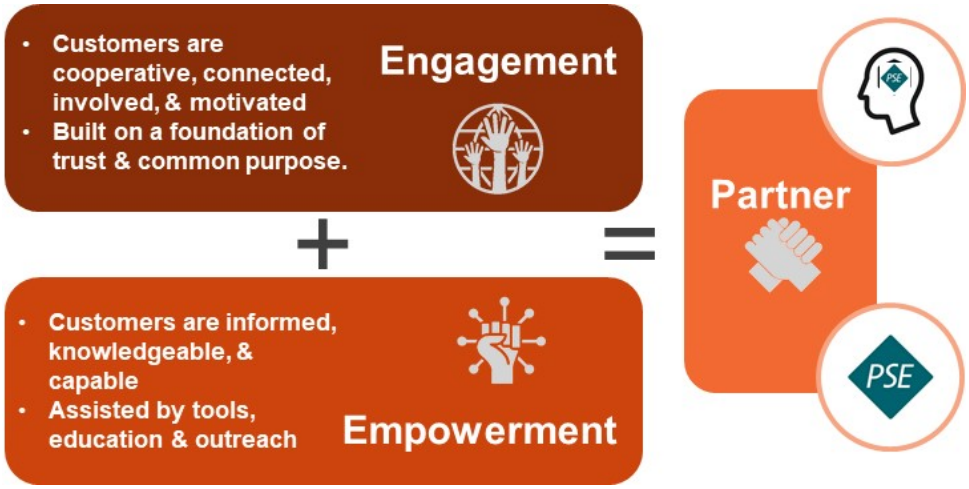
Figure 15. Data Collection and Communication Steps

Source: Guidehouse

Customer Engagement and Empowerment

Evidenced from the Xcel Colorado TOU rate pilot case, customers need ongoing education, information, or tools to help them understand which of their behaviors and enabling technologies are most effective at reducing their bill. Utilities should keep in mind that customers often have only a basic understanding of rate design. As such, messaging should focus on gradual, achievable lifestyle changes. Customers may get frustrated if their efforts are not recognized through bill savings. Figure 16 illustrates how engaging and empowering customers both play a role in establishing partnerships between customer and utility.

Figure 16. Engaging and Empowering Customers



Source: Guidehouse

Prepare and Engage Your Stakeholders

Despite making the process longer and more difficult, engaging stakeholders early in the pilot design process can improve the long-term success of alternative rates as it helps reduce friction, build credibility, and form partnerships between all parties involved. Experience from utilities such as Dominion and PG&E demonstrates how reaching out to stakeholders and including them in customer engagement activities can be an effective way to align stakeholders over time. The goals of this engagement process include aligning on objectives, determining what success looks like, and deciding how the utility will measure and report out on key metrics.

2.4 Case Studies

This section provides brief case study examples where alternative rates have been tested in other locations. The first two utilities are winter peaking (Portland General Electric and Minnesota Power) and the third (Xcel Energy) recently completed a 3-year opt-in pilot of a residential TOU rate for residential customers, with a focus on target segments including low income.

2.4.1 Portland General Electric

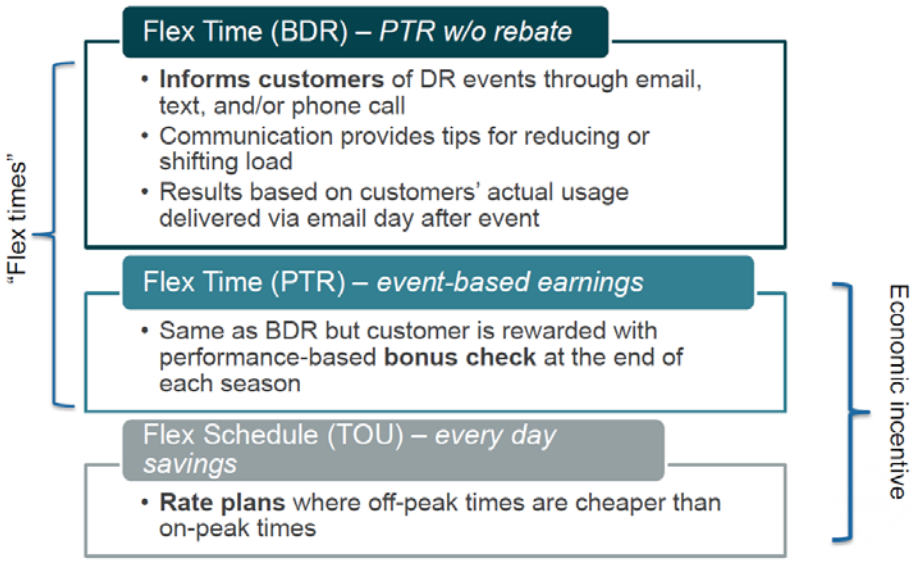
Synopsis

PGE offers a three-tier TOU rate with morning and evening winter peak periods and a single afternoon/evening summer peak period. With little customer uptake, the Company has been

piloting alternative rates to better appeal to customer interest in managing and lowering their bills while also addressing the dual summer/winter system peak:[4]

- **The 2011-13 critical peak pricing (CPP) pilot** proved to be unattractive to customers, who generally had difficulty shifting load away from peak and failed to see bill reductions. Participation fell from roughly 1,000 initially to less than 600 by the end of the 2-year pilot. Customer satisfaction with the pilot was only about 65%, leading PGE to redesign the offering for a new pilot that would target customers who were more likely to be able to reduce bills and that would offer more education and customer feedback to support customers in shifting loads.
- **The Flex 1.0 pilot** (2016-2018) tested multiple variations and combinations of TOU pricing with peak-time rebates (PTR), substituting the PTR carrot for the previous pilot's CPP stick. There was also an opt-out behavioral DR (BDR) element where customers were encouraged to reduce load during events, but no rebates or incentives were provided.

Figure 17. PGE Flex 1.0 Components



Source: "PGE Flex Pilot Review," presentation by Roch Naleway, PLMA November 14, 2017.

The TOU components of Flex 1.0 were either two- or three-tier rates, with peak to off-peak price differentials of roughly 2:1 and PTR rebates ranging from $0.80/kWh to $2.25/kWh. On-peak periods were either a) a year-round 16-hour peak period from 6 a.m. to 10 p.m., or b) a separate morning peak from 7 a.m. to 11 a.m. (winter only) and afternoon/evening peak from 3 p.m. to 8 p.m. (both winter and summer).

Participants in the Flex 1.0 pilot had a difficult time shifting load away from the winter peak and were particularly dissatisfied with the morning peak period.

[4] Sources for this case study include various regulatory filings and evaluation reports cited below, and an interview with Kathy Wagner, PGE's product development manager for the new TOU rate.

- **The Flex 2.0 pilot** (2019 ongoing) simplified the offering by limiting PTR payments to a single incentive of $1.00/kWh (since Flex 1.0 showed little difference in shifting across PTR incentive values) and eliminating the TOU rate. Participants carried over from Flex 1.0 had the option to take service under PGE's ongoing TOU rate tariff that is generally available to residential customers.

  PGE experienced a common challenge with PTR, which is that individual customers' usage baselines can be highly uncertain, especially on an event-specific basis, resulting in rebates that customers often felt were not commensurate with their efforts to shift load. This was compounded by the fact that PGE tested a more sophisticated and accurate—but less transparent—baseline calculation which proved difficult to explain to customers. PGE reverted to a simple baseline method using prior day loads with a weather adjustment.

Since at least 2019 when the Company filed a revised TOU rate that was not accepted by the Commission, PGE has been leveraging learnings from the Flex pilots to revamp the existing residential TOU rate and offer customers a more attractive package that will include a TOU rate, PTR, and technology/communications to support participants in understanding their usage, bills, and opportunities for load shifting.

Current Status

PGE expects its *revised TOU rate*—to be filed in late 2020 for intended application by mid-2021—to include the following elements:

- Three-tier TOU rate with both summer and winter peak periods.
- A shorter peak period than the Flex pilot and a higher peak to off-peak ratio.
- A mid-peak price that is less than the current Basic Service rate, allowing for bill savings even if customers can shift peak demand only to the mid-peak rather than to the off-peak period.
- Elimination of the winter morning peak period that led to customer dissatisfaction with no discernible load shifting. Instead, PGE will address winter morning loads through dispatching PTR events on an as-needed basis.
- *(Under consideration)* Postponement of PTR performance assessment and rebates until the end of the season when the performance across multiple events is more likely to average out to reflect individual customer efforts.

Current TOU Rate

For roughly the past 10 years PGE has continued to offer residential customers a three-tier TOU rate[5] with dual morning/evening winter peak periods (6 a.m.-10 a.m. and 5 p.m.-8 p.m.) and a single summer peak period (3 p.m.-8 p.m.). The rate has a roughly 3:1 peak: off-peak price ratio, with mid-peak slightly *more expensive* than the first 1,000 kWh of the default Basic Service price (Table 3). At roughly 2,200 participants, relatively few customers (less than 0.5%) have opted into the rate, which the Company initially attributed to insufficient marketing.

[5] PGE's current TOU rate is described at https://www.portlandgeneral.com/residential/power-choices/time-of-use/time-of-use-pricing.

The Flex 1.0 pilot suggested that the morning peak period is the biggest barrier to participation, as customers find it hard to shift away from the winter morning peak. Furthermore, most customers would not benefit from the rate unless they could shift more than a third of their peak usage away from the peak period.

Table 3. PGE's Existing Residential TOU Rate

Time of Use period	Time of Use price	Basic Service price
On-peak	12.380 ¢ per kWh	Up to 1000 kWh: 6.329 ¢ per kWh > 1000 kWh: 7.051 ¢ per kWh
Mid-peak	7.051 ¢ per kWh	
Off-peak	4.128 ¢ per kWh	

Summer May 1 – October 31	**Winter** November 1 – April 30
On-peak M–F 3PM–8PM Mid-peak M–F 6AM–3PM, 8PM–10PM Off-peak All 10PM–6AM *Mid-peak Saturday is 6AM–10PM **Off-peak Sunday & some holidays is 6AM–10PM	On-peak M–F 6AM–10AM, 5PM–8PM Mid-peak M–F 10AM–5PM, 8PM–10PM Off-peak All 10PM–6AM *Mid-peak Saturday is 6AM–10PM **Off-peak Sunday & some holidays is 6AM–10PM

Source: PGE Schedule 7 tariff

Lessons Learned from PGE's Rate Pilots

PGE plans significant changes to its existing TOU rate. The Company's planned late 2020 rate filing is informed by its experiences with the three major pilots that it has conducted since 2011 (described above). The discussion below captures some of major takeaways from these pilots, organized into the following categories:

- Rate structure
- Implementation
- Customer experience
- Load impacts

A more detailed discussion of evaluation findings can be found in the various regulatory filings and evaluation reports.[6]

[6] Sources: PGE 2013 IRP, https://www.portlandgeneral.com/-/media/public/our-company/energy-strategy/documents/pge-2013-irp-report.pdf?la=en; and PGE 2015 Smart Grid Report, https://edocs.puc.state.or.us/efdocs/HAQ/um1657haq103857.pdf; Flex 1.0 evaluation (see Attachment A), https://edocs.puc.state.or.us/efdocs/HAD/um1708had9400.pdf; Flex 2.0 evaluation, https://edocs.puc.state.or.us/efdocs/HAQ/um1708haq124912.pdf.

Rate Structure

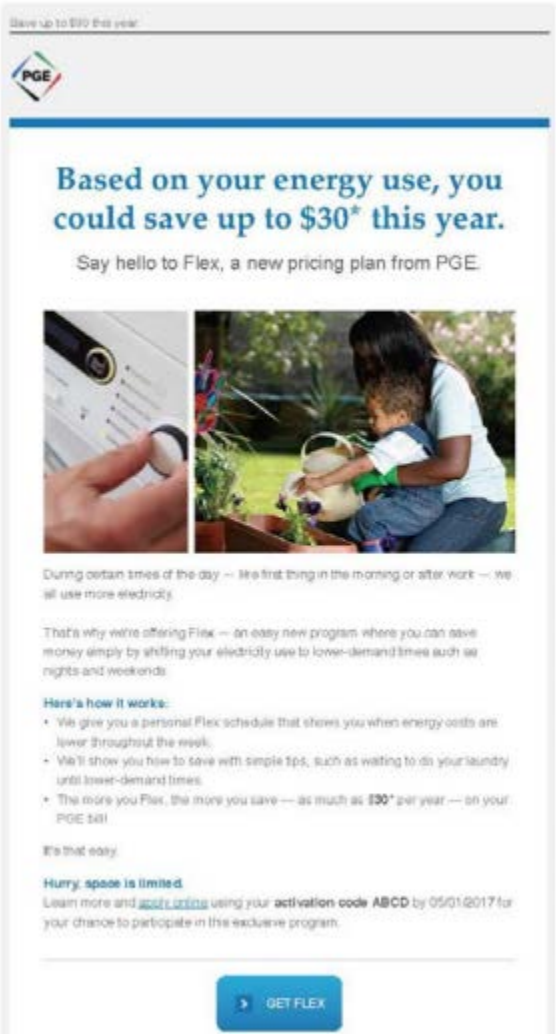
- PGE considered the original CPP rate structure to be "complex and difficult to understand" and so sought to "create several simpler rate designs to test with customers." This led to the rollout of a PTR rate in Flex 1.0, replacing the stick of CPP with the carrot of the rebate opportunity.
- Larger PTR rebate amounts did not yield larger savings per metered customer, as there was little difference in load shifting between customers receiving rebates of $0.80/kWh, $1.55/kWh, and $2.25/kWh. PGE set the PTR incentive value for Flex 2.0 at $1.00/kWh, which the Company considered a level that ultimately balanced customer satisfaction and program cost-effectiveness.

Implementation

- The CPP pilot experience suggested that PGE needed to offer more effective communication with customers both before and during the pilot.
    - PGE recognized the need for market research on residential load profiles *prior to marketing the rate* in order to target customers who could most benefit and shave peak load.
    - For Flex 1.0 the Company worked with its vendor to provide fast, relevant feedback to customer on achieved savings, as well as ongoing education on how customers could save money and energy through program participation.

For Flex 1.0:

- During the first season of Flex 1.0, PGE experienced **challenges in providing accurate and timely feedback to participants**. However, with improvements in the baseline calculation methodology (simplifying it to be based on prior day loads with a weather adjustment) and data QC procedures, PGE increased the feedback's accuracy and shortened the time required to send customers feedback to less than 48 hours after the event.
- PGE experimented with three **marketing channels** (email, postcard, and business letter) and three messaging themes (economics, control, and community) to determine which marketing strategies resulted in higher customer enrollment. The two **paper-based channels (business letter 4.5% and postcard 2.5%) had higher conversion rates than email (1.5%).**
- PGE found that **financial-focused messaging resonated more with customers** as PGE enrolled a higher percentage of customers when it emphasized the opportunity to earn bill credits or savings. In surveys, customers reported that saving money on electric bills was the top reason for enrollment (78%). The image below provides an example of PGE's financially focused marketing.



In Flex 2.0:

- PGE exceeded its 2019 goal of 55,000 participants, enrolling more than 86,000. In addition to financial messaging, **the Company's marketing used a simple three-step phrase—get notified, shift use, and earn rebates—to explain how the PTR program works** rather than the technical term *demand response (DR).*
- Technical limitations in the event dispatch software led to PGE calling fewer events than planned. In particular, PGE was not able to send same-day event notification, thereby eliminating morning events. This issue highlights the **need for utilities to specify as much as possible in advance what the software requirements will be**, especially with relatively new and evolving products such as DR and DER management systems.

Customer Experience

- Customer satisfaction with the CPP pilot was only about 65%, and participation fell from roughly 1,000 initially to less than 600 by the end of the 2-year pilot. For Flex 1.0 **PGE redesigned the offering to target customers who were more likely to be able to reduce bills** and offered more education and customer feedback to support customers in shifting loads.

- In Flex 1.0, opt-in **PTR customers were most satisfied with the pilot**, with TOU-only participants among the least satisfied. This was in part because some TOU customers reported less-than-expected bill savings and they did not have the opportunity to earn rebates.
- **TOU customer satisfaction with the pilot depended on perceived bill savings**. The relatively satisfied participants most often noted that the program delivered bill savings, while those less satisfied most often noted seeing little to no difference in their bills.
- In Flex 2.0 **many participants felt their rebates were not commensurate with their effort to save.**
    - Of respondents, 42% said rebates were lower than expected, while only 7% said rebates were higher than expected. Further, 40% of respondents agreed with the statement that "the rebates don't seem to be linked to the actions I take."
    - One lesson from these findings is the **importance of communicating a realistic magnitude of potential savings opportunities.** PGE's marketing and educational materials said customers could save $2 to $3 per event, with a footnote explaining that actual savings may vary. Yes, over five summer events, the average savings of survey respondents was just $6.56, well below the $10 to $15 that they might have expected.

Load Impacts

For TOU (Flex 1.0 only):

- The TOU rate, which defined a 16-hour on-peak period as weekdays between 6:00 a.m. and 10:00 p.m., did not result in shifting of loads from on-peak periods during Flex events.
- Other TOU rates, which defined *a shorter weekday on-peak period* from 3:00 p.m. to 8:00 p.m., resulted in summer savings from 5%–8% during peak hours. Winter on-peak savings, however, were negligible.

For PTR:

- *Opt-in* PTR treatments in Flex 1.0 produced demand savings during Flex events ranging from 17%–21% in summer and 7%–12% in winter.
- *Opt-out* PTR and behavioral DR groups reduced loads during Flex events by 7% and 2% in summer and 5% and 1% in winter, respectively.
- *Flex 2.0* achieved lower impacts, at 8% summer load reduction for opt-in participants and 4% for opt-out participants. The single winter event yielded reductions of 5% and 1%, respectively, for these participant groups.

2.4.2 Minnesota Power

Synopsis

Minnesota Power, a winter peaking utility which serves most of the northeastern region of the state, conducted a pilot in 2014-2015 to explore residential customer interest and response to time-of-day (TOD) rates with CPP. The rate structure was a three-tier TOU rate with an 8a.m. to

10p.m. year-round peak period and a roughly $0.044/kWh difference between peak and off-peak prices. There was also an event-based CPP rate of more than $0.08/kWh.

The pilot enrolled 660 residential customers during the 1-year pilot, which lasted from October 2014 to October 2015.

Key findings and takeaways include:

- **Load impacts:**
  - Load reductions of 17%-28% for the four summer CPP events (excluding a cool weather event)
  - No statistically significant reduction in demand for the winter event
  - The evaluation did not assess load shifting away from the peak TOU period (which at 14 hours long may not have produced any discernible shifting anyway)
- **Marketing and customer communications:**
  - Care for message clarity, education, and dedicated support are key to successful recruiting
  - Participant guides, communication tools, and a centralized communications preference center[7] contribute to participant success
- **Pilot operations:**
  - Billing and metering system changes may require staffing support
  - AMI meters with weak signals may cause a sequence of billing and field complications. Limiting enrollment by signal strength, employing networking solutions for hard-to-reach areas, or using a MDMS can mitigate this risk

Nearly 400 customers have remained on the TOU rate since the pilot. The Commission continues to seek an update to the TOU rate, and Minnesota Power has worked with stakeholders and the Commission to outline a future TOU rate.

Background

Under the American Recovery and Reinvestment Act of 2009, Minnesota Power was awarded a Smart Grid Investment Grant (SGIG) which partially funded the utility's two-phase project, the Consumer Behavior Study Plan, branded as the Power of One Choice Pilot. The first phase[8] began in spring 2012 and involved deployment of about 8,000 smart meters and supporting networking infrastructure. The main objectives were to explore residential customers' interest in, use of, and benefits derived from different levels of feedback on electricity consumption (monthly, daily, and hourly).

[7] Customers can indicate their communication preference by updating the **CPP Notifications Preferences form**.

[8] Minnesota Power's Advanced Metering Infrastructure Project. AMI Behavioral Research Pilot – Phase 1. Interim Results from a Consumer Enhanced Feedback Pilot

The results of that effort informed the second phase[9] of the project. This involved offering a 1-year TOD rate pilot with a CPP component to a subset of Minnesota Power customers beginning in October 2014. The objectives of the second phase included:

- Exploring customer interest and engagement in a time variable rate offering
- Evaluating participant response to price increases during CPP events
- Understanding the operational requirements and impacts to field and billing operations related to the rate offering.

Rate Structure

The rate structure involved three time-based adjustments to the utility's standard residential five-tiered rate structure: an off-peak discount, an on-peak adder, and an event-based CPP increase, illustrated in Table 4 (showing the rate period adjustments) and Table 5 (showing the resulting rates by period and tier). The TOU rates were in effect year-round, with an 8a.m. to 10 p.m. peak period and no differentiation between summer and winter.

Table 4. Minnesota Power Energy Charge Adjustments

Name	Period	Energy Charge Adjustment per kWh
Off-Peak	Mon – Fri, 10 p.m. – 8 a.m. Sat – Sun and Holidays, 24 hrs.	-$0.02990
On-Peak	Mon – Fri, 8 a.m. – 10 p.m.	$0.01415
Critical Peak Pricing	Event-based	$0.77000

Source: https://www.energy.gov/sites/prod/files/2017/01/f34/MN_Power_CBP_FinalEvaluationReport_09302016.pdf

Table 5. Residential Tiered TOU and CPP Rates

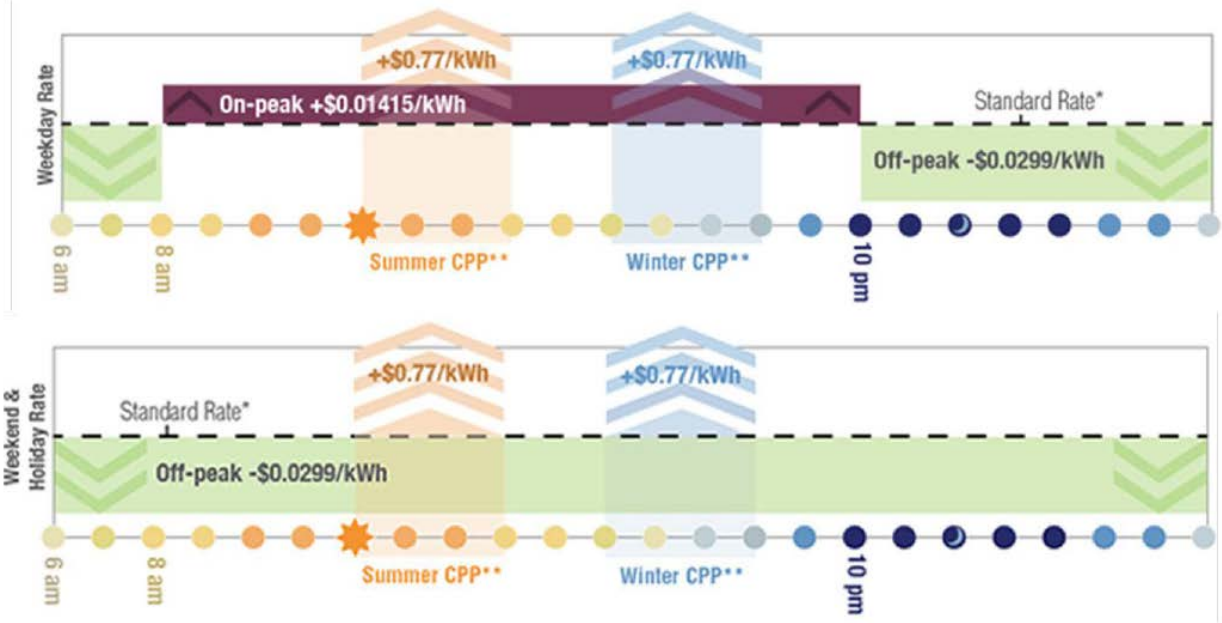
Tier	Standard Rate	Off-Peak	On-Peak	Critical Peak
0-300 kWh	$0.05098	$0.02108	$0.06513	$0.82098
301-500 kWh	$0.06735	$0.03745	$0.0815	$0.83735
501-750 kWh	$0.08168	$0.05178	$0.09583	$0.85168
751-1,000 kWh	$0.08445	$0.05455	$0.0986	$0.85445
> 1,000 kWh	$0.08937	$0.05947	$0.010352	$0.85937

Source: https://www.energy.gov/sites/prod/files/2017/01/f34/MN_Power_CBP_FinalEvaluationReport_09302016.pdf

CPP events were 3 hours long and differed between summer and winter: summer CPP events were declared between 12 p.m. and 3 p.m. and winter events between 5 p.m. and 8 p.m., illustrated in Figure 18.

[9] Minnesota Power's Advanced Metering Infrastructure Project. AMI Behavioral Research Pilot—Phase Two: Results from the Time-of-Day Rate with Critical Peak Pricing Pilot Program

Figure 18. TOU and CPP Rate Structure Illustration



Source: *https://www.energy.gov/sites/prod/files/2017/01/f34/MN_Power_CBP_FinalEvaluationReport_09302016.pdf*

The pilot gave participants access to a web portal with hourly usage information and collected contact preferences (telephone, text, or email) for day-ahead CPP event notifications. Called at Minnesota Power's discretion, events were 3 hours long and were generally for increased day-ahead regional wholesale electricity prices for increased demand for electricity among customers (such as electric heating systems during a cold winter evening) or decreased supply in the Midwest Independent System Operator market or on the utility's system (such as a plant going offline). The rate design assumed 100 hours of CPP and specified a maximum of 160 hours during the 12-month pilot.

Recruiting and Enrollment

The pilot recruited participants from three residential customer pools: participants from the study's first phase with an advanced meter (about 500), approximately 2,500 customers with existing advanced meters, and customers in the Duluth/Hermantown area (including those who would need a meter upgrade if they chose to participate in the pilot).

The pilot's eligibility requirements included the following:

- Be a residential customer located in an eligible ZIP code in the Duluth/Hermantown service area
- Agree to remain on the rate for a minimum of 12 months
- Not currently receiving a discounted rate

Minnesota Power chose an October start date with a 5-week recruitment period beginning in early August to allow enough time for recruitment lead time, follow-up, and processing before a likely CPP event. Recruitment involved several stages and channels including recruitment email, letter, informational brochure and enrollment card; TOD website with FAQs, calculator

tool for rate impact estimation/scenario testing and a survey to help customers decide if the pilot rate is right for them.

Out of more than 700 applications, 660 were ultimately enrolled: 164 were also enrolled in budget billing; roughly 70 accounts were flagged as renters; 26 accounts were on an all-electric rate; 41 accounts, or 6%, were low income (LIHEAP) customers; and 116 were also participants in Phase One of the Consumer Behavior.

The pilot accommodated approximately 16 customers who wanted to participate but were in credit or collection status by flagging their enrollment for special processing to correctly transfer arrearages before enrollment. For LIHEAP-qualified customers eligible for the utility's Customer Affordability Residential Electricity (CARE) discount, the utility helped determine the best rate option which generally was the CARE discount.

From October 2014 through January 2016 (4 months after the pilot period), the program experienced a low attrition rate: 10 participants left the rate to enroll in the discounted CARE rate, 48 customers unenrolled due to relocations, and 13 left by participant request for other reasons.

Pilot Evaluation: Demand Impacts and Customer Experience

Load shifting and demand impacts: The evaluation of demand impacts on event days found statistically significant reductions of roughly 17%-28% in participants' electricity demand during four of the six CPP events. *The analysis found no statistically significant reduction in demand for the final summer event (which was relatively cooler) or for the winter event*. For the winter event, estimations of load reduction varied with analysis method, making the estimates uncertain. The analysis found no evidence of load rebound immediately following events or of participants shifting their electricity use to non-event hours on event days. The expected impacts of an implementation with a wider pool of residential customers would likely be less than the pilot's impacts as the pilot participants skew toward single-family homeowners generally consuming 8% more electricity than typical for the residential customer population.

Customer experience: Customer surveys showed that participants had a high level of awareness of the pilot rate structure in general and of the CPP aspect of the rate, were engaged in reducing electricity during events, and were generally satisfied with the rate. In alignment with the impact evaluation, respondents reported that they saved money on the rate and were able to shift some of their electrical use to avoid paying higher prices. Four out of five participants reported that they would like to remain on the rate which is supported by a low rate of attrition after the required 12-month period. Four months after the participation requirement had ended, 589 (89%) of the 660 original participants remained on the rate, and only 13 participants had been removed by their request.

Together the evaluation findings suggest a strong interest among residential customers for time variable pricing and a willingness to change consumption behavior in response to price signals to manage their electricity costs. The utility gained valuable learnings regarding operational considerations for metering and billing which then did not have systematic solutions.

Key Learnings from the Pilot

Key learnings from the pilot rate include the following:

- **Care for message clarity, education, and dedicated support are key to successful recruiting.** To address the relative complexity of the pilot rate (TOU with CPP) and the utility's existing residential five-tiered rate structure, Minnesota Power used multiple education and recruiting strategies. Positive media coverage (local television interview and newspaper article) increased interest but also introduced some confusion as the media described the pilot as offering off-peak rates or a discount program. This required the utility to take extra steps to clarify the rate structure. And while the utility provided a well-received online calculator for customers to estimate the impact of the rate on a month from recent history, it was useful only to customers with accounts having historical hourly data. Customers without this data typically required additional telephone support, often from the project lead who would explain the rate's likely effect on their bill based on their usage patterns.

  In preparation for recruitment, the utility set up specific support to respond to customers' questions. A phone number and small group of highly trained staff were dedicated to answer questions about the pilot in addition to providing pilot details to the main call center. But the higher than expected level of interest, the complexity of the rates, and the inaccurate description from the media precipitated some challenges for customers who wanted to enroll. Some were unable to speak to a representative on their first call, some had to call multiple times before receiving a response, and average call times ranged from 5 to 25 minutes.

  As summarized in an interim report[10] on the pilot (and other SGIG projects):

  > Successful recruitment strategies typically involve a variety of success factors including the quality and persuasiveness of invitation materials, clarity of messages, thoroughness in following up and following through on customer questions and problems, and having the ability to anticipate and prevent common glitches from cascading into major problems.

- **Participant guides, communication tools, and a centralized preference center contribute to participant success.** The pilot used a variety of tools to communicate with and support participants, including the following:
  - Welcome packet that included
    - Guide describing the rate structure
    - Response card for notification preferences for Critical Peak Pricing Events
    - Refrigerator magnet with rate periods and the pilot phone number and website
  - Pilot website that included
    - Detailed information about the rate
    - FAQs
    - Resources for participants to manage their energy use

[10] Interim Report on Customer Acceptance, Retention, and Response to Time-Based Rates from the Consumer Behavior Studies: https://www.energy.gov/oe/downloads/interim-report-customer-acceptance-retention-and-response-time-based-rates-consumer

        - Message center for important pilot-related notices and reminders as well as recent and scheduled CPP event times
    - CPP reminder letters sent during the summer and winter CPP seasons

  The pilot also offered the Power of One® Choice Portal where participants could access hourly and daily usage information, set notifications for energy usage thresholds, and create energy markers to track events or activities affecting their usage. A key observation from portal use is that, without reminders to return to the website, participants may not take full advantage of its benefits. Another key finding is the importance of a centralized tool for indicating communication preferences for service offerings (a preference center). Such a center was fundamental for pilot participants to actively manage their energy consumption and bills.

- **Billing and metering system changes may require staffing support.** The pilot required billing system changes that were not automated and were labor intensive. Every participant needed a new service agreement which required the Customer Information System staff to complete a start and stop service order to change their rate. Every participant also required a new meter configuration in the customer information system (CIS), and CIS updated every meter to recognize the appropriate bucketing of usage relative to the rate.
- **AMI meters with weak signals may cause a sequence of billing and field complications.** Limiting enrollment by signal strength, employing networking solutions for hard-to-reach areas, or using a MDMS can mitigate this risk. Initially, the pilot was designed to screen out customers whose meter signal integrity (after being exchanged with a new AMI meter) was found insufficient to receive signals of anticipated CPP events. AMI uses radio frequency communication, and meters located indoors (as for some apartment buildings) or far away from a tower location can experience a weaker signal.

  Ultimately, it was decided not to limit participation by signal strength but to take measures to improve signal integrity and to report on the effectiveness of those efforts as part of the pilot. However, this precipitated a sequence of field and billing complications:

    - Weak signal caused lack of communication for those meters
    - Lacking automated meter reads for billing, these meters required visual reads
    - Approximately 500 utility truck rolls were needed to conduct visual reads
    - Some of these meters required appointments for utility personnel to gain access for the read
    - Lack of meter communication required approximately 10% of bills to be billed manually by CIS staff

  For the pilot's six CPP events, rates of successful responses to the number of meter signals sent ranged from 57% to 84% and averaged 79%. But these rates are likely higher than the rates of meters that successfully received the CPP signal but were unable to report back. This is due to the interaction of those meters' low signal strength with the way meters report consumption data. The pilot's TOD rate meter reported a large consumption data file (a tier file) every midnight. Then the network traffic of these large data files impeded the ability of the weak signal meters to report back reads.

Consequently, it is likely that some participants were billed for CPP events that they had in fact responded to by reducing electricity consumption.

At the time of the pilot, there was no cost-effective way to improve signal quality across the service territory, such as smaller radio units are designed to serve hard-to-reach meters which may be available and cost-effective today. Additionally, a MDMS that provides automated validation, editing, and estimating functions might have addressed some of the consumption data reporting errors.

Current Status

Enrollment for the pilot closed in fall 2014, but the rate structure is still in effect for participants who have not requested removal from the program although the rates have changed. In May 2017, the on-peak adder was increased from $0.01415/kWh to $0.04870/kWh and the CPP hour limit was reduced from 160 hours to 50 hours (per calendar year).[11] More recent updates include:

- In September 2015, Minnesota Power submitted an integrated resource plan for 2015-2029[12] which includes plans to expand AMI conversion and related communications infrastructure.[13] The plan also includes evaluating investment in an MDMS for efficient and automated validation, editing, and estimating to mitigate the metering and billing challenges experienced through the pilot.
- According to the August 2019 Compliance Filing,[14] as of mid-July 2019, a total of 381 customers remained on the pilot rate. Between the reporting period of May 25, 2018 and July 19, 2019 Minnesota Power called 20 CPP events, equaling 60 hours. Six events occurred during the heating season and 14 during the cooling season.
- In an August 19, 2018 meeting, the Minnesota Public Utilities Commission directed Minnesota Power to file a set of new recommendations for a time-of-date rate design by February 2019. The utility engaged a stakeholder process over four meetings to develop fundamental principles and objectives to be considered in the development of a new time variable rate design.[15] The MPUC accepted the report in August 2019 in an order requiring Minnesota Power to present a proposed timeline for full TOD deployment in 2020.
- Minnesota Power has continued the stakeholder engagement process with an additional four meetings in 2020, leading up to the compliance filing in December 2020. The plan is to move to a two-tiered inclining block rate followed by a transition to default TOD rates for residential customers. The current timeline for default TOD rates is projected to be 2025-2027.

In preparation for a system-wide rollout for a TOD rate offering, the utility has been replacing meters at the end of their operational life with AMI meters throughout its service territory at a

[11] https://www.mnpower.com/CustomerService/TODMessageCenter

[12] 2015 Integrated Resource Plan: https://www.mnpower.com/Content/Documents/Environment/2015-resource-plan.pdf

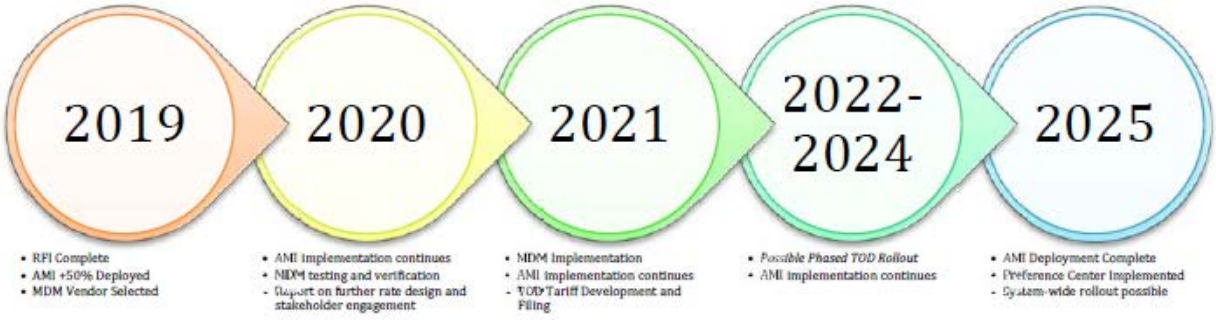
[13] https://www.mnpower.com/Content/Documents/Environment/2015-resource-plan-appendices.pdf

[14] Docket No. E015/M-12-233. 8/20/2019. Compliance Filing—2019 Time of Day Pilot Program https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&userType=public

[15] Docket No. E015/M-12-233: 2/20/2019. Compliance Filing--Smart Grid Advanced Metering Infrastructure Pilot Project Report https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&userType=public

rate of about 6%-8% per year (the rate of depreciation). The utility plans to continue exchanging meters at this pace to achieve full deployment of AMI meters by the end of 2025. Additionally, the utility has launched a project to implement an MDMS to address the billing and field issues experienced with the pilot program. The MDMS project began in 2018 with the purchase of software and plans to start integration in August 2019. Figure 19 illustrates the plan as of August 2019.

Figure 19. AMI and MDMS-Wide Rollout Plan



Source: Minnesota Power August 20, 2019 Filing. Docket No. E015/M-12-233: Compliance Filing—2019 Time of Day Pilot Program
https://www.edockets.state.mn.us/EFiling/edockets/searchDocuments.do?method=eDocketsResult&userType=public

Since the February 2019 report, the directive has been expanded due to stakeholder concerns arising out of the 2019 general rate case. In that rate case, Minnesota Power proposed to move toward a flat residential rate, with an interim step of a two-tiered inclining block rate. As part of a settlement to withdraw the rate case, Minnesota Power proposed combining the discussions of the current inclining block residential rate and future TOD residential rates into the current TOD pilot docket. In the Commission's June 30, 2020 Order approving the resolution of Minnesota Power's pending rate case it agreed with this proposal, directing the utility to: "Address issues of residential rate design issues in Docket No. E-015/M-12-233." A report is expected in this docket in December 2020 with a broad residential rate design proposal incorporating default TOD as the end goal.

In accordance with the Commission's August 2019 and June 2020 orders (and the utility's July 2020 extension variance request[16]), the utility began to develop the following for a December 1, 2020 report filing:

- A proposal for one or more preferred TOD rate options
- A discussion of other options presented by stakeholders, including consideration of higher on-peak to super-off-peak ratios and potential future implementation of dynamic pricing and dynamic time periods
- A proposed implementation timeline, including discussion of a proposal to phase in TOD rates as soon as Minnesota Power's new MDMS is implemented

[16] Docket No. E-015/M-12-233. 7/2/2020. Extension Variance Request

2.4.3 Xcel Energy Colorado

As part of a settlement agreement in 2016, Xcel Energy agreed to test two new voluntary residential time-varying rate schedules in Colorado: a residential time-of use (RE-TOU, or TOU) and time-differentiated demand (RD-TDR, or TDR) rate. The intent of the settlement was to provide an opportunity for: (1) adequate educational materials to be prepared; (2) testing the impact of the TOU rate differentials and pricing time periods; and (3) testing the TOU rate with existing and new demand side management or energy efficiency tools.

The TOU and demand rate pilots were designed for customers who volunteer to enroll (i.e., opt-in) and receive a bridge meter that allows for measurement and billing of customers' monthly electric usage on a 15-minute basis. Voluntary participants have the right to withdraw (or opt out) from the rate through the end of their sixth billing cycle. Low income customers are included in the trial but are subject to a hold harmless provision where participants pay the lower of their monthly bills determined under the Schedule Residential rate (R rate) or the applicable trial rate. This summary focuses on key learnings from the TOU pilot, which include the following highlights:

- **Implications of transitioning from an inclining block rate to TOU.** Participants on RE-TOU transitioned from an inclining block rate during the summer (Tier I and Tier II) and a flat rate in the winter to a time-varying rate year-round with seasonal differences. Key to this transition is how a customer's level of consumption is related to the RE-TOU bill impact during the summer. It is difficult for customers with less than 500 kWh of monthly consumption to save money on RE-TOU during the summer since only the off-peak period has a price lower than the first 500 kWh of consumption on the R rate ($0.08 versus $0.10 per kWh). A customer's ability to reduce their bill during the summer on RE-TOU increases when they have more consumption that would have been more than 500 kWh on R and billed at the higher block's rate on R.
- **Customers' perceptions or beliefs that the TOU rate plan provides them with more control over their usage and bill** may be at least as important as actual savings (which customers did not have readily available tools to evaluate) in determining their level of satisfaction and decision to stay enrolled in the rate plan. For many customers, an important motivation to enroll was their interest in having near-real-time energy consumption data, a benefit that they associated with more control over their energy use and bill. Once enrolled, most customers experienced only small increases or decreases in the cost of their monthly bill.
- Nearly all participants reported changing their patterns of energy use in some way following their enrollment; however, some of the highest impact behaviors associated with air conditioner (AC) use were not among those that were most prioritized by customers. According to survey data, customers were most likely to avoid the use of appliances such as dishwashers and laundry equipment during peak. However, participants seemed to encounter more challenges in changing their air conditioning practices.

Rate Structure

Table 6 presents the rate structure for RE-TOU, including the pricing periods, applicable prices during each period, and fixed charges. The prices under this rate are based on three periods and are referred to as off-peak, shoulder, and on-peak. The prices vary between summer and

winter seasons,[17] but the hours for each period remain the same all year. This contrasts with the original tiered rate structure where summer is an inclining block structure (first 500 kWh of consumption is $0.10/kWh and $0.14/kWh for consumption over 500 kWh) and a flat rate during the winter ($0.10/kWh).

Table 6. RE-TOU Rate Structure

RE-TOU	Off-Peak	Shoulder	On-Peak	Service and Facility Charge
Hours	9 p.m.-9 a.m.	9 a.m.-2 p.m., 6 p.m.-9 p.m. on weekdays, 9 a.m.-9 p.m. on weekends	2 p.m.-6 p.m. on weekdays	
Summer	$0.08/kWh	$0.13/kWh	$0.18/kWh	$5.41
Winter	$0.08/kWh	$0.10/kWh	$0.14/kWh	$5.41

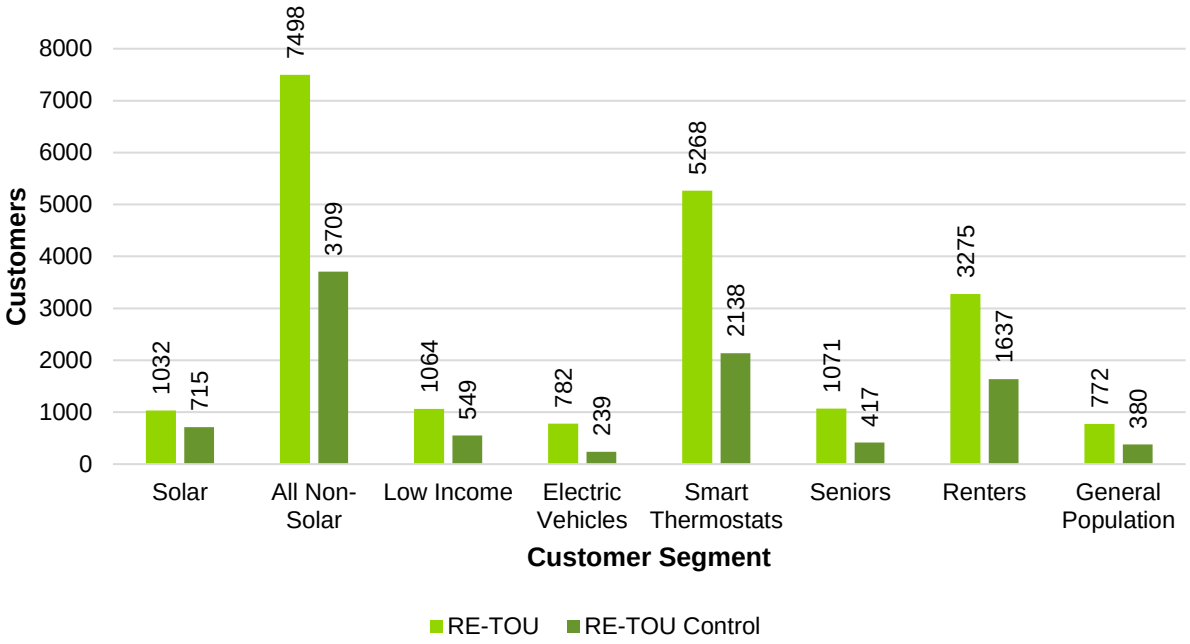
Source: Residential Energy Time-of-Use (RE-TOU) – Final Evaluation Report

Enrollment and Segment Participation

Recruitment for the RE-TOU trial began in March 2017 and concluded in September 2019. Public Service implemented a variety of marketing tactics to increase awareness and enrollment in the trial, including (but not limited to) direct mail, email, digital advertising, bill inserts, new mover outreach, and social media. Public Service tested numerous tactics and compared outcomes against industry and utility benchmarks to identify effective strategies for increasing enrollment. Throughout the trial, over 12,000 customers had enrolled, participated in the trial for any amount of time, and were included in the evaluation of the trial—including the one-third of enrollees who were randomly assigned to be in a control group. There was a total of 8,530 participants over the course of the trial. Figure 20 shows the number of participants and control group customers by customer segment that participated over the course of the trial.

[17] Costs are rounded and included appropriate adjustments. The summer season includes June, July, August, and September. The winter season includes January, February, March, April, May, October, November, and December.

Figure 20. RE-TOU Participation



Source: Residential Energy Time-of-Use (RE-TOU) – Final Evaluation Report

Table 7. RE-TOU Customer Segment Definitions

Customer Segment	Qualifying Criteria
Solar	Customers with rooftop solar.
Low Income	Customers participating in the Low-Income Energy Assistance Program or self-reporting an annual household income less than $30,000 in the enrollment survey.
Electric Vehicles	Customers self-reporting the ownership of one or more EVs in the enrollment survey.
Smart Thermostats	Customers self-reporting that their HVAC system is controlled by a Wi-Fi-enabled or programmable thermostat in the enrollment survey.
Seniors	Customers self-reporting that at least one person in the household is over 62 years old in the enrollment survey.
Renters	Customers self-reporting that they rent their home in the enrollment survey.
General Population	Customers that do not meet the criteria for any other segment.

Source: Residential Energy Time-of-Use (RE-TOU) – Final Evaluation Report

Evaluation Findings and Customer Feedback

Guidehouse estimated energy consumption, peak demand, and participant bill impacts for the RE-TOU and RD-TDR pilots.[18] In addition, Guidehouse conducted customer research to assess

[18] TOU Final Report: 17M-0204E Xcel Energy RE-TOU Evaluation Report 2 Final November 2019 11/27/2019
Demand Rate Final Report: 17M-0204E Xcel Energy RD-TDR Evaluation Report 2 Final November 2019 12/13/2019

participant engagement, experience, and satisfaction; participant behaviors and change in behaviors; and participant understanding and change in understanding throughout their participation in the rate.

Across both seasons during both years, TOU participants appear to be reducing consumption during the morning shoulder and on-peak hours while increasing consumption during the evening shoulder, weekend shoulder, and off-peak hours. Changes in annual energy consumption were virtually non-existent in both years, decreasing 0.2% in Year 1 and increasing by 0.6% in Year 2. Key findings from the impact analysis include the following:

- **Bill impact variations by season and year**. Participants experienced higher bills during the summer and lower bills during the winter. Due to the inclusion of EV owners that experienced greater bill savings than the average non-solar customer, there is an annual bill savings in Year 1. When EV owners are excluded in Year 2, there is an annual bill increase for non-solar non-EV customers.
- **Rate structure change**. Customers with higher usage are more likely to benefit from the transition from the inclining block rate of the R rate to the RE-TOU rate structure. This is due to higher usage customers previously having more usage billed on the higher tier of the R rate than lower usage customers, meaning they would have paid a higher average price per kWh on R. By moving to the RE-TOU rate, these high usage customers are more likely to see bill reductions even in the absence of any changes in usage patterns.
- **Change in usage patterns/behavior**. Changes in the time of day that a customer uses energy have an impact on the bill, depending on the magnitude of the changes across the various rate periods. By decreasing usage during the on-peak and shoulder periods or shifting usage to the off-peak period, RE-TOU participants contributed to reducing their bill. Similarly, any reduction in total usage—even with the same relative usage patterns over time—will reduce the customer's bill.

Segment-specific impact findings of interest include the following:

- EV owners have larger on-peak consumption reductions than participants that do not own an EV (presumed from EV charging).
- Solar participants reduced on-peak consumption and increased/shifted to off-peak hours, possibly due to higher level of EV ownership.
- Seniors and customers with smart thermostats reduced on-peak consumption in summer and winter seasons.
- Low income customers have the smallest impact estimates during the summer and are the only segment without a statistically significant reduction in on-peak consumption during either season, possibly a result of small sample sizes.

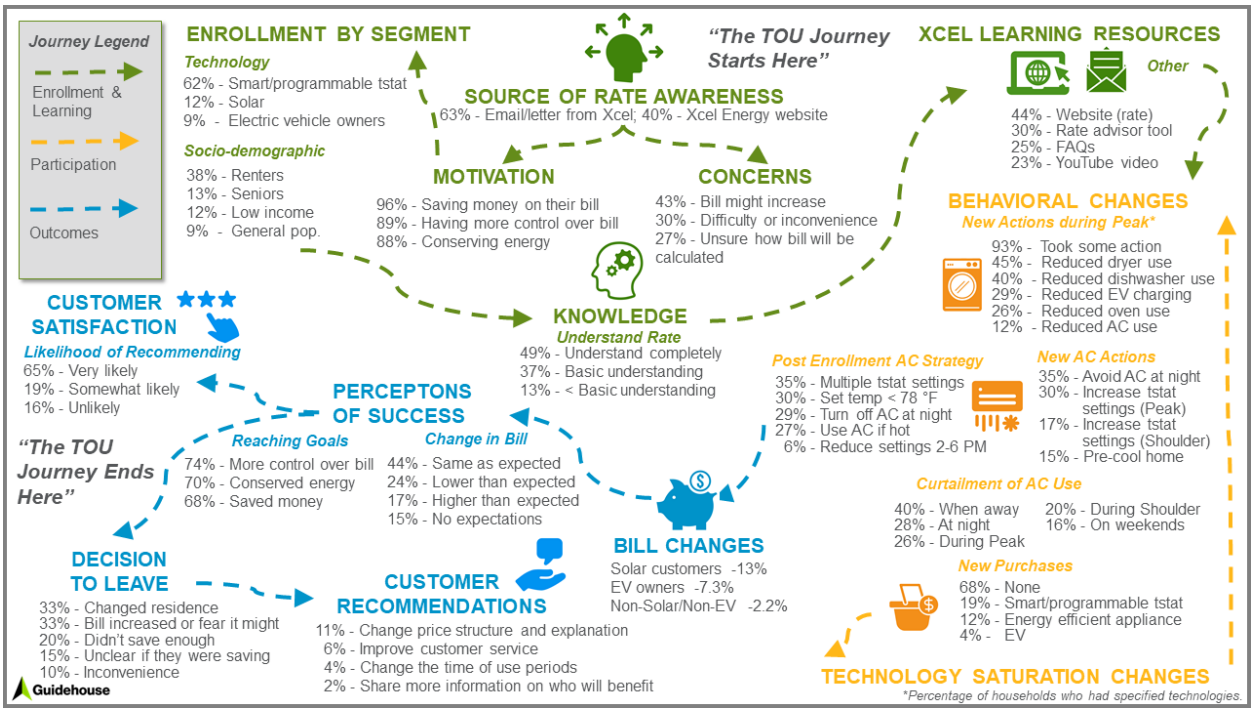
Customer research was performed throughout the TOU trial providing a wealth of insights about those customers who chose to enroll in the trial and their motivations for enrolling, participants' knowledge, preferences, and experiences, and customers' reasons for leaving the trial. Many of these insights are captured in the customer journey map presented in Figure 21, which highlights the collective customer journey beginning with customer awareness of the rate and progressing through the customer's likelihood to recommend the rate or switch to a different residential rate. Key findings include the following:

- **Customers who enrolled in the TOU rate appear to be moderately knowledgeable and engaged**, a characteristic that may reflect some self-selection bias associated with

an opt-in rate design. Enrollment in an opt-in pilot or trial is likely to introduce self-selection bias to the study when customers with a heightened level of interest enroll at a higher rate than other customers. Survey data found that nearly half of all customers indicated that they had at least a basic knowledge of the rate while roughly one-third of customers were highly knowledgeable. Customers' self-assessments are supported by more objective measures of knowledge. Customer engagement can be described as broad but limited in-depth. Customers spent more time reviewing their bill shortly after enrolling (although attention appears to taper later in the trial) and more than 90% of customers reported taking at least one new action to reduce peak consumption following their enrollment.

- **A customer's ability to discern savings or increases in their bill is limited because most customers experienced relatively small increases or decreases in their monthly bills**. For most people, the small rate-related changes experienced by most TOU participants are largely indistinguishable from weather-related variations or those associated with changes in technology use. In addition, customers faced the additional complexity associated with moving from a tiered rate where the cost of energy was tied to the amount of use. The complexity of the assessment combined with the small changes in monthly bills and the lack of a comparison tool, left most participants unsure about their bill savings.
- **Customers struggle to shift their use of AC during peak periods**. Although more than 90% of customers reported taking action to reduce peak energy use, only one-quarter of customers indicated that they had reduced their use of AC during peak. Approximately 22% of customers reported that they continued to use AC frequently during peak, and only one-third of customers said that they rarely or never use AC during peak hours. By August 2019, approximately 70% of TOU participants had a smart or programmable thermostat that they could use to manage their use of AC during peak; however, 40% of customers reported that they typically set a consistent temperature throughout the day. Moreover, average peak period temperature settings were 75.5 degrees and the difference in average thermostat settings during peak (as compared to shoulder periods) was less than 1-degree Fahrenheit. These results suggest an opportunity for enhancing peak energy savings by gaining a better understanding of customers' perceptions and preferences as well as their constraints and challenges and by providing customers with relevant information, strategies, and tools to help them shift their AC use.
- **Customers value frequent communications, appreciate diverse communications resources, and tend to prefer electronic forms of communications**. Many customers indicated that they prefer getting information by email and on MyAccount, but a significant proportion also value the information provided in the stickers created by Public Service to illustrate TOU rate periods. Other customers were more likely to rely on the Public Service website as a source of information. When asked about the frequency of communications from Public Service, most customers were satisfied; however, one-quarter of customers indicated that they would prefer more frequent communications. These results suggest that a more targeted and tailored approach to communications would likely enhance efforts to share both rate-related information and information about customer performance and possibly increase customer engagement.

Figure 21. TOU Participant Customer Journey Map



Current Status

Xcel Energy submitted an Advice Letter on December 2, 2019 asking the Commission to approve modifications to the structure and rate, make TOU the default rate for residential customers, and delay the effective date to January 2021 to align with the deployment of AMI meters. Proposed changes include changing the TOU rate from year-round to summer only (June-September), changing the on-peak/off-peak price ratio from 2.4:1 to 2:1, changing the peak, shoulder, and off-peak periods, removing the low income hold harmless provision, among other changes. On an annual basis the rate is expected to be revenue neutral with no bill impact for the average residential customer.

A unanimous settlement[19] was reached and approved by the Colorado Public Utility Commission on September 11, 2020. The agreement specifies that the Modified Schedule RE-TOU rate will be the default rate with an opt-out provision.[20] Customers who opt out of the TOU rate will be placed on a new, seasonally differentiated flat rate (Schedule R-OO). The Schedule R-OO rate has "a winter flat rate (October through May) equal to the prevailing Tier 1/winter rate from Schedule R and a summer flat rate that is designed to be revenue neutral to Schedule R." The original, tiered Schedule R rate will no longer be available after the transition date.

[19] Decision No. R20-0642. September 11, 2020. https://www.xcelenergy.com/staticfiles/xe-responsive/Company/Rates%20&%20Regulations/Regulatory%20Filings/TOU/CO-Time-of-Use-Decision-19AL-0687E.pdf. Additional information available on Xcel Energy's website: https://www.xcelenergy.com/company/rates_and_regulations/rates/colorado_residential_time_of_use_rate

[20] The settlement agreement Modified TOU rate peak/off-peak ratio is 2.7:1 in summer and 1.7:1 in winter. The peak period is year-round from 3-7pm weekdays excluding holidays; the shoulder period is 1-3pm weekdays excluding holidays, with all other hours classified as off-peak hours.

Xcel Energy will gradually transition customers onto the default TOU rate in either the spring or fall, anywhere from 4 to 9 months after installation of the customer's advanced meter. To support the transition, the settlement agreement specifies that, at a minimum, the communication plan will include the following.

- Interval usage data on customer bills and MyAccount portal beginning with receipt of the advanced meter.
- Hypothetical bill impact data for generic customer examples comparing a no action scenario to an energy savings action scenario via an appropriate communication pathway.
- Customer tips on managing energy usage during the TOU periods.
- Tailored communications approaches . . . based on [Xcel Energy's] data-driven segmentation analysis of the residential customer class, including specific education and outreach targeted to low income customers.
- A stakeholder engagement process that will "develop and improve programs and tools that utilize advanced meter data to engage with its customers for increased energy savings, peak demand reduction, and help customers manage their bills and energy use under a TOU rate through ongoing or new Demand Side Management products, measures, or pilots."

3. Internal Capabilities and Considerations

This section describes PSE's operational and technical capabilities as well as customer and other external considerations and priorities, as observed through interviews with key PSE internal stakeholders and a review of PSE data. It is important that PSE factor these capabilities and considerations into the development and rollout of successful pricing pilots.

3.1 Internal Interview Findings

Guidehouse conducted 13 interviews with groups of PSE staff across various departments and teams that would likely play a role in the design or implementation of an alternative rate. The purpose of these interviews was to better understand how these departments would be involved in alternative rate implementation, and if there are department-specific considerations for planning and implementation of alternative rates that should be factored into the project plan.[21] The interview topic discussion guides are provided as Appendix A and the key interview findings are summarized in Table 8.

Table 8. Panel Interview Findings

PSE Internal Group	Key Interview Findings
Billing	• Large ***bill redesign project*** 4 years ago, next redesign planned in 2022 • ***Get to Zero*** initiative focused on customer self-service and online options • Meter reads come through ***AMI → MDMS → SAP*** monthly for billing • Tracks revenues by ***decoupling mechanisms*** and accounts • ***Bill presentation*** approved through corporate communications
Customer Communications	• Often required to ***communicate rate changes*** with bill inserts, post changes to website, newspaper ads • All ***call center staff*** are expected to have general knowledge to speak to rate questions • More complicated rates require more ***customer friendly tools and information*** • Occasionally invite ***Commission Staff or Public Council*** to review customer communication as a courtesy • Bill inserts created by ***DCG ONE***, Wayne Clark facilitates with ***KUBRA*** who puts it all together
IT	• Alternate rate implementation would likely be considered a ***capital project and a major initiative*** because of impact across the enterprise • Currently ***planning for 2022*** projects • Plans can shift with ***change in priorities***

[21] While these interviews helped the Guidehouse team better understand how various departments would likely be involved in alternative rate design and implementation, Guidehouse did not conduct an in-depth review of PSE capabilities to confirm and validate absolute readiness to offer alternative rates.

PSE Internal Group	Key Interview Findings
AMI	• This is a ***5-year program,*** to be complete in 2023 • Customers may choose PSE's Optional Non-Communicating Meter ('NCM') Service (Schedule 171), at a premium cost, if they do not want to be served with an AMI meter • Rollout is geographic, ***40% complete*** to date
Customer Solutions	• For new rates, want to be able to share: – How the bill is ***calculated*** – How the ***rate design works*** • Tips/information to help customers ***save*** • Actively involved in AMI transition, focused on building ***tools*** to help customers better manage their energy usage in new ways • Customers already have access to ***budget billing***, similar to subscription rate design
Accounting	• ***Decoupling*** in place for load variation • Systematic billing of TOU rates would occur through ***SAP*** • Need to confirm that PSE receives accurate meter data for ***unbilled revenue***; may add complexity to alternate rates • Unbilled revenue accounting occurs ***monthly*** • Accounting responsible for incorporating rate changes ***after the changes occur*** not before or during
Process and Organizational Change	• Training, organizational change management, process improvement work together to address the people side of change. • Goal is to confirm end users are engaged and prepared for changes to daily roles and responsibilities • Business lead help identify stakeholders, assess the change and develop overall change strategy • Key Questions to Consider: – How is PSE going to have to change its business processes? – How do the changes impact roles and responsibilities in the organization? – Do we have the skills and knowledge to support a different rate? – How do all the different stakeholder groups within PSE have to adapt? – What changes need to be made as an organization to support the pricing pilot?

PSE Internal Group	Key Interview Findings
Clean Energy Strategy	• Focused on PSE's implementation of Clean Energy Law requiring ***100% clean energy by 2045*** • Solution includes ***DER, equity requirements*** • The next Integrated Resource Plan (***IRP)*** will help determine targets for renewable generation and storage • Moving to renewables reduces marginal costs, ***increasing fixed costs*** in the future • Considerations: – Design for the ***future*** peak and future generation mix in 5-10 years not only the current peak. High renewable energy penetration may change the definition of desirable customer behavior. – Consider an ***equitable distribution*** of benefits and costs
Energy Efficiency/DR	• ***No DR programs*** right now • Looking at small ***pilots*** and larger system-wide programs next year • Interested in ***fast frequency response*** options • Looking to ***this process*** to help inform DR rates
Customer Renewables	• PSE has ***not yet hit the cap*** for net energy metered (NEM) solar; after the NEM cap is reached, value of customer generated energy will be reassessed • Customers want rates to support ***integration of renewables*** with ***price signals*** that allow them to take advantage of renewable technologies • Customers want ***cleaner energy choices*** with their rates
Electric Vehicles	• Customers are ***tech-savvy,*** interested in saving money, but have ***low understanding*** of rates • ***Needs vary*** by customer class, and sometimes by customer (Tesla vs. Amazon) • Prefer ***incentives*** to penalties • Current ***low income structure*** creates challenges for low income-specific EV rates and programs • Unable to ***identify EV customers*** • Demand charges create ***barriers for public charging***
Business Services	• Increasing interest in TOU from customers ***looking to electrify their fleets*** • Looking for ***more rate options***, currently only two rates with not much flexibility • ***Large customers*** understand demand charges • Some participate in regulatory proceeds (e.g., AWEC, Kroger, FEA, Walmart) • ***Reliability*** is the priority • Interest in ***conjunctive demand***, ***DR***, ***EV charging*** • Increasingly seeking ***green strategies*** and options

3.2 Capabilities and Considerations

Through the internal panel interviews, Guidehouse did not identify significant constraints that might limit PSE's ability to offer more straightforward alternative rates, such as a basic two-

period TOU rate. For example, the expected presence and granularity of the AMI data can likely support a TOU rate, as can the billing system configurations and capabilities, but more complex options such as dynamic pricing would require significant effort and modifications to existing systems. Guidehouse observed a general can-do attitude from internal stakeholders who were generally optimistic solutions can be found for the formidable challenges to implementing time-based rates. PSE staff have a general understanding of their customers' wants and preferences but have not yet conducted targeted customer research related to alternative rates. PSE staff also acknowledged value of thoughtful and deliberate stakeholder engagement for designing alternative rates and programs. Guidehouse captured capabilities, constraints, and considerations that should be noted or addressed in the design of alternative rates, summarized in Table 9.

Table 9. PSE Capabilities, Constraints, and Considerations

PSE Internal Group	Capabilities	Constraints and Considerations
Billing	• Winter and summer season billing schemes exist • The Get to Zero initiative that began in 2015 has been successful at giving customers more tools to solve problems online through self-service online capabilities; this initiative could be a model for preparing customers for alternative rates in advance of the rollout • MDMS can be configured, validation is end-of-day • Billing system captures data for decoupling. A report is pulled monthly with revenue by category • Customers will have more options for bill pay as of Fall 2020 (e.g., Venmo, PayPal) due to new payment processor • Shadow billing is a possibility	• Dynamic pricing would require additional configurations and significant effort • May be constraints on bill real estate to explain the rate and the charges • Billing exceptions and EMMA cases in SAP need to be considered • Billing redesign is planned for 2022, which may create opportunities for alignment with an upcoming pricing pilot • Rider changes take 2-3 weeks, rate design changes take 2-3 months • Bill presentation needs to be approved through Corporate Communications • Customers currently do not have a good understanding of their bills. Rates need to be easy to understand • Need to confirm data quality from meter reads is sufficient for TOU rates
Customer Communications	• The logistics of rate change communication is often dictated by regulatory requirements (e.g., PSE needs to provide at least 30-day notice for rate changes, purchase advertising space in the local newspaper, hold speaking opportunities with media) • However, there is also flexibility to design customer support tools	• Consider how to inform and support customers who lack internet access • Developing more complicated bill calculators will take time, never been done before • Customers need robust tools and support to promote understanding

PSE Internal Group	Capabilities	Constraints and Considerations
	and processes to support customer communication of alternative rates. • Customers can learn about rates on the PSE website. There is a process in place to address rate questions from customers via the Call Center	of new rates. Self-serve online tools are preferred. • Ideal to involve Corporate Communications in what is presented on the customer bill
IT	• IT projects are planned on an annual cycle beginning more than 1 year in advance. However, there is some flexibility to accommodate new projects that are high priority and initiatives that may be uncertain if they are contingent on regulatory approval. The schedule would need to be coordinated with the IT team	• Pilots are difficult because the same level of effort is needed for a pilot as for a full rollout (i.e., the cost of implementing an IT solution does not differ much for 500 customers or 100,000 customers) • Amount of AMI data puts a lot of upgrading processing strain on the CIS system • Combining rates and programs may require enhancements to MDMS and CIS system • IT timeline and requirements require more detailed scenarios (follow-up action[22])
AMI	• AMI provides 15-minute interval data on a 1-day lag for validation • Meters are bidirectional with respect to the premise (DER capabilities) • Current capabilities support meter reads every 6 hours	• Challenging to do anything that is real-time or intra-day • Customers have option to opt out of AMI meters • Billing scheme could be orders of magnitude difference in cost depending on the solution • Moving from 15-minute to 5-minute intervals on a widespread basis would be challenging • PSE could support near-real-time meter reads with network and data limitations to be considered
Customer Solutions	• Customers have access to PDF of their bill on the website, more flexibility to update than paper bill	• Customer Solutions should be involved in anything that would impact a customer's bill and the

[22] The IT team will need more information about the rate design (e.g., the granularity of the time periods, peak times, seasonality, expected customer volume) before they can scope the project.

PSE Internal Group	Capabilities	Constraints and Considerations
		presentation of the amount due and how the bill was calculated • Enable positive customer experiences • Rates need to be easily explained and easily understood
Accounting	• Likely no issues implementing a basic TOU rate from an accounting perspective	• CPP rates could likely be accommodated but need to be explored further

4. Conceptualizing Alternative Rates

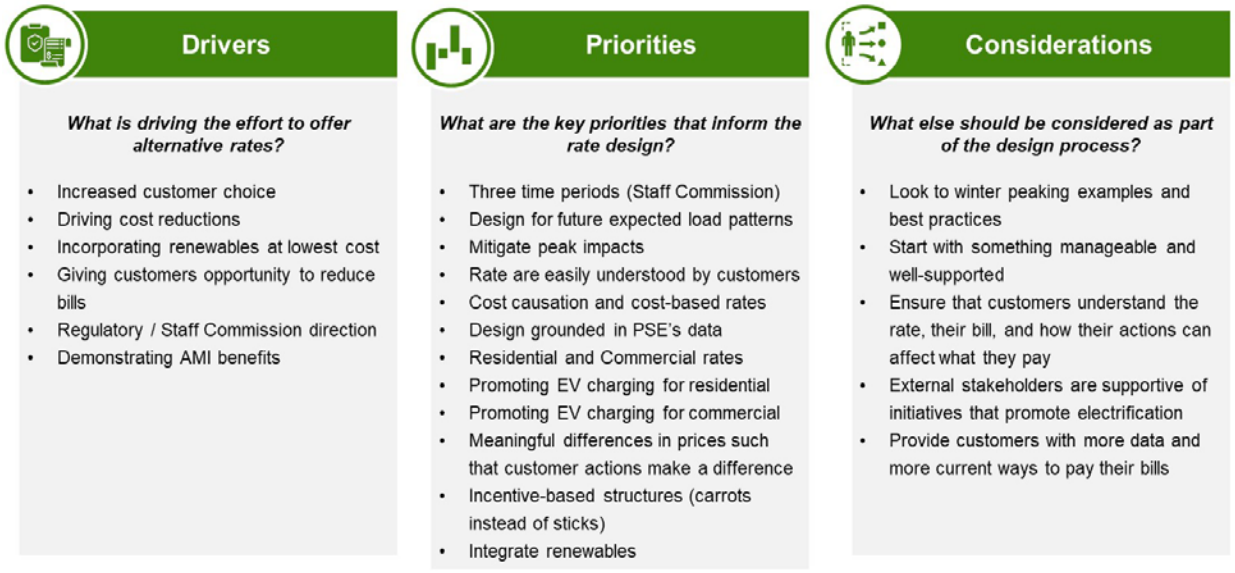
This section begins with a summary of PSE's priorities, drivers, and considerations for alternative rates, then presents the results of Guidehouse's preliminary analysis of potential rate options that could align with these objectives. The three rate options include a two-period TOU rate, CPP rate, and a PTR program. At a high level, these options emerged based on several key consideration, including the following:

- **Executable design:** Rate design that has a proven track record in other, similar, jurisdictions and utility profiles (e.g., winter peaking) and that can be implemented with limited risks.
- **Regulatory emphasis:** Address perspective noted in other regulatory documents, such as testimony from Washington Utilities and Telecommunications Commission Staff, on the types of designs that may be appropriate and beneficial for the jurisdiction.
- **Enable renewables integration:** Create options that continue to support PSE's long-term renewable portfolio objectives and stated clean energy goals.

4.1 Priorities, Drivers, and Considerations

Guidehouse distilled the feedback from internal stakeholder interviews into a summary of drivers, priorities, and additional factors that should be considered as part of the process to design and offer alternative rate pilots. This feedback is summarized in Figure 22. As part of the third internal stakeholder workshop, PSE staff had the opportunity to review this graphic and identify their top three priorities for the design of alternative rates. In summary, the feedback revealed that PSE's internal stakeholders consistently want *easy-to-understand pilot rates with meaningful price differences* so customers understand and have the opportunity to save money on their bills if they make changes in their behavior in response to the rate.

Figure 22. Drivers, Priorities, and Considerations for Alternative Rate Pilots



4.2 System Load and Costs

Figure 23 provides a visual heat map of PSE's weekday system load for 2018 and 2019 and Figure 24 shows the weekday system cost for the same year. The black boxes indicate the months and times of day with highest load and cost, which are primarily December through February in the morning and the later afternoon/evening, indicating that PSE is a winter peaking utility with a dual peak. Therefore, TOU rates should generally align with these times periods.

Figure 23. PSE Weekday System Load Heat Map, 2018 and 2019

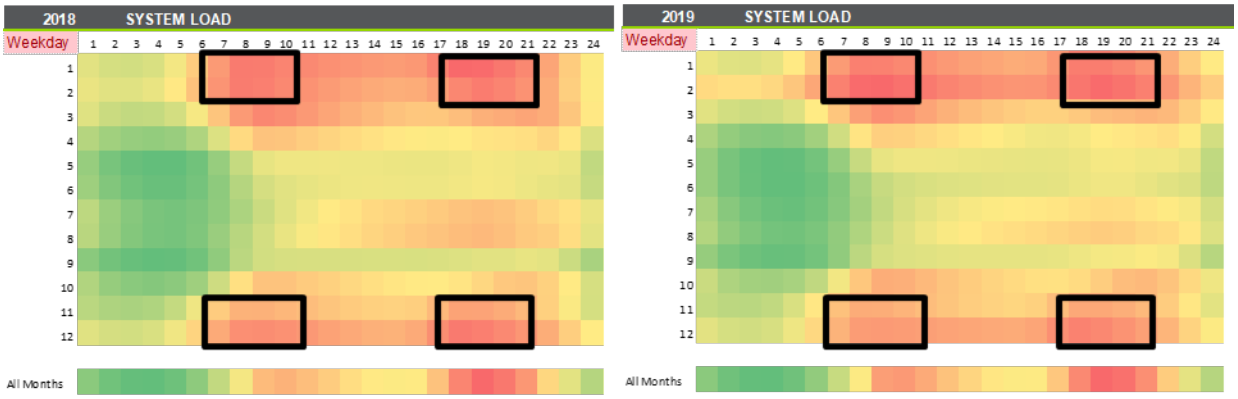
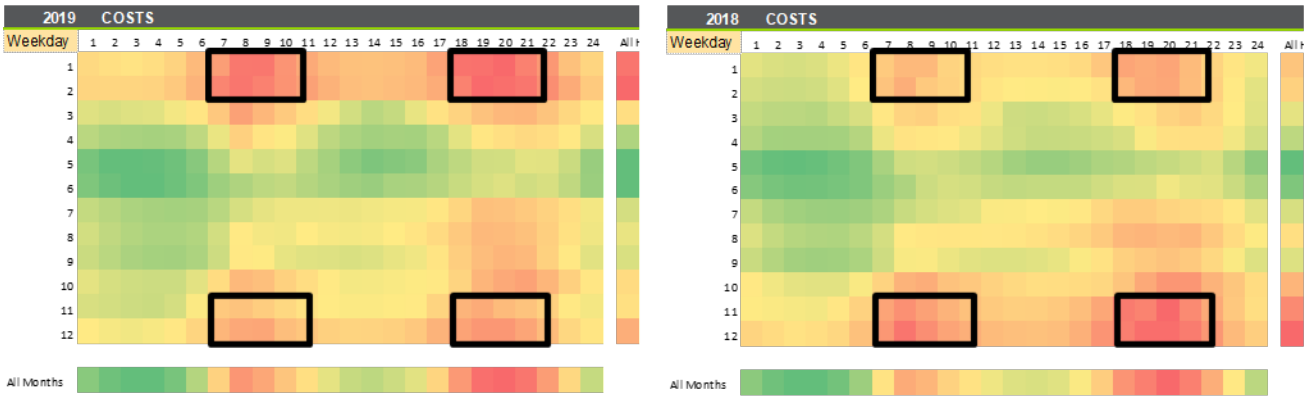


Figure 24. PSE Weekday System Cost Heat Map, 2018 and 2019



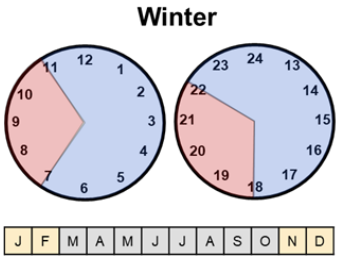
4.3 Conceptual Rate Options

Guidehouse considered PSE's objectives, priorities, and system loads and costs to develop preliminary, conceptual options for alternative rate pilots for residential (Schedule 7) and small commercial (Schedule 24) customers. Options include TOU rates with various peak hours and months, and a tiered pricing scheme with a critical peak rebate (CPR) program. These rate options should be considered illustrative; they help to illustrate the rate design options and how changes to the design might impact customer prices for the different time periods. The rates were designed with PSE's goals in mind (i.e., easy to understand with meaningful price differentials).

Option 1: Winter Peaking TOU Rate A

The first potential TOU pilot option is a winter peaking TOU rate with the highest price hours from 7a.m.-11a.m. and 6p.m.-10p.m. during peak months from November through February. This rate structure yields a peak/off-peak differential of $0.064/kWh for residential and $0.086/kWh for commercial customers.

Figure 25. TOU with Winter Season (November – February)



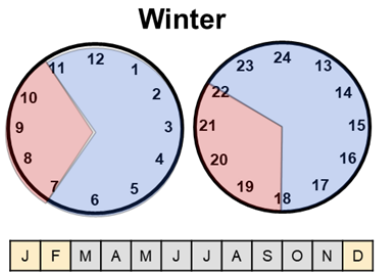
	2018		2019	
	SC 7	SC 24	SC 7	SC 24
Monthly	$ 7.55	$ 6.06	$ 7.55	$ 6.06
Peak	$ 0.1708	$ 0.1783	$ 0.1530	$ 0.1646
Off-Peak	$ 0.0870	$ 0.0775	$ 0.0889	$ 0.0791
Differential	$ 0.0838	$ 0.1007	$ 0.0641	$ 0.0855

Source: Guidehouse

Option 2: Winter Peaking TOU Rate B

The second TOU pilot option is a winter peaking TOU rate that is the same as Option 1 but with a shorter winter season from December through February. The change to a shorter peak winter season yields a higher peak/off-peak differential of $0.079/kWh for residential and $0.105/kWh for commercial customers.

Figure 26. TOU with Shorter Winter Season (December – February)



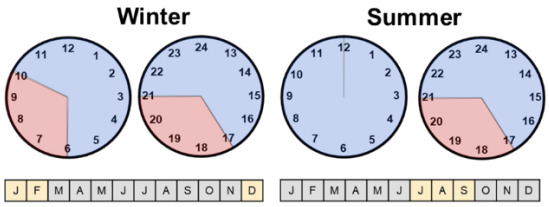
	2018		2019	
	SC 7	SC 24	SC 7	SC 24
Monthly	$ 7.55	$ 6.06	$ 7.55	$ 6.06
Peak	$ 0.1821	$ 0.1924	$ 0.1684	$ 0.1841
Off-Peak	$ 0.0883	$ 0.0789	$ 0.0892	$ 0.0795
Differential	$ 0.0939	$ 0.1135	$ 0.0792	$ 0.1045

Source: Guidehouse

Option 3: Winter and Summer Peaking TOU Rate

The third TOU pilot option is a winter and summer peaking TOU rate with peak months from December through February and July through September. The rate is still winter peaking with highest priced hours 1 hour earlier than the prior two rate options, between 6a.m.-10a.m. and 5p.m.-9p.m.. The summer peak is from 5p.m.-9p.m., with no morning peak hours. This rate leads to a residential peak/off-peak differential of $0.080 in winter and $0.019 in summer, and a commercial differential of $0.106 in winter and $0.027 in summer.

Figure 27. TOU with Winter and Summer Peak



	2018		2019	
	SC 7	SC 24	SC 7	SC 24
Monthly	$ 7.55	$ 6.06	$ 7.55	$ 6.06
Peak	$ 0.1821	$ 0.1924	$ 0.1684	$ 0.1841
Off-Peak	$ 0.0874	$ 0.0778	$ 0.0883	$ 0.0784
Summer Peak	$ 0.1047	$ 0.0999	$ 0.1068	$ 0.1051
Differential Winter	$ 0.0947	$ 0.1146	$ 0.0801	$ 0.1057
Differential Summer	$ 0.0173	$ 0.0221	$ 0.0185	$ 0.0267

Source: Guidehouse

Option 4: Critical Peak Rebate

The final example option is a critical peak rate with a PTR structure. CPP incentivizes customers to adjust consumption for prescribed period at short notice to address severe conditions at critical peak times. The analysis of 2018 data shows the average price was $0.0258/kWh. The proposed design is incremental to the current tiered rate and considers two factors: the number of critical peak events and the duration of the event. In this design, a critical peak event can occur on any day of the year and for any contiguous period equal to the prescribed duration. The peak rebate is calculated based on savings within the calendar year, thus based only on avoided energy costs, and do not include avoided capacity costs. Figure 28 shows three potential illustrative scenarios for the CPR program, given a number of events per year and hour duration for those events. Scenarios show that savings are greatest for fewer events with shorter durations, to capture the highest priced hours on average.

Figure 28. Critical Peak Rebate Scenarios

Option 1	
Events per Year	15
Duration of Event	4
CPR per kWh	$ 0.03413
Percent Discount to all Rates	99%

Option 2	
Events per Year	10
Duration of Event	4
CPR per kWh	$ 0.03494
Percent Discount to all Rates	99%

Option 3	
Events per Year	10
Duration of Event	6
CPR per kWh	$0.03035
Percent Discount to all Rates	99%

Source: Guidehouse

Rate Option Considerations

The four rate options are preliminary, conceptual designs for alternative rate pilots that consider PSE's objectives, priorities, and system loads. Options include three TOU rates with various peak hours, durations, and seasons, and a tiered pricing scheme with a CPR program. For the TOU options, there are considerations and tradeoffs in the design aspects such as the number, duration, and seasonality of the peak periods, and the price differential between peak and off-peak times. These rate options help to illustrate the rate design options and how changes to the design might impact customer prices for the different time periods. Table 10 provides a summary of the considerations and tradeoffs for various rate design choices.

Table 10. TOU Rate Design Considerations

TOU Design Element	Example Design Options	Considerations
Number of Periods, Seasonality	• Three season, two periods each in Winter, summer and shoulder months • Two seasons, two periods in winter, one period all other months • Three seasons, two-period winter, two-period shoulder and one period summer • Three seasons, two periods each season	• Fewer peak periods may reflect a simpler rate design that may be easier for customers to understand • The number and duration of peak periods impacts the price differential
Winter Periods	• Two peak periods, morning and evening • One peak period, morning only • One peak period, evening only	• The number/duration of peak periods may impact the resulting peak price/differential • Customers may have more flexibility to shift behavior in the morning or the evening, depending on preferences
Period Duration	• 3 hours • 4 hours • 5 hours • 6 hours • More than six	• A longer peak period may lower the resulting peak price/differential, reducing the financial impact on customers, but also may reduce customer's ability to shift their behavior outside of the peak period.
Price Differential	• $0.10 (2:1) • $0.08 • $0.06 • $0.04 • $0.02	• A higher price differential creates stronger incentives for customers to shift their consumption such that actions lead to meaningful bill reductions.
Price-based Rates vs. Rebate-based Rates	• CPP rate • CPR	• Rebate-based designs reward customers for shifting consumption away from critical peak events • For CPR designs, PSE scenarios show that savings are greatest for less events and shorter duration to capture the highest priced hours, on average.

Source: Guidehouse

4.4 Pilot Rate Evaluation Considerations

This section provides an outline of the evaluation elements that should be considered in order to measure and report the energy and bill impacts and the customer experience from participation in an alternative rate pilot. The items below are illustrative and should be refined to address the goals and objectives specific to the pilot being tested. Evaluations should be conducted over the

entire pilot duration, with interim reporting on an annual basis, concluding with a final evaluation report at the end of the pilot.

Table 11. Potential Pilot Evaluation Elements

Evaluation Report Section	Contents
Pilot and Evaluation Overview and Methodology	• Program description and rate structure • Customer education and outreach approach • Evaluation goals and objectives • Enrollment overview • Methodology overview – Assumptions for design, application, analysis of pricing pilots – Data collection needs and methods • Study refinements/changes during the pilot operation
Impact Analysis Findings	• Peak impacts (on-peak impacts and system coincident peak consumption impacts) – Impacts by rate period – Impacts by segment – Impacts by climate, geographic boundaries (rural/non-rural) • Energy consumption impacts – Impacts by rate period – Impacts by segment – Impacts by climate, geographic boundaries (rural/non-rural) • Bill impacts, overall and by segment
Customer Research Findings	• Awareness, knowledge, and resources – Understanding of the rate – Awareness of the rate and motivations to enroll – Informational resources • Early pilot experience – Engagement and shifts in energy usage patterns – Changes in behaviors and technologies – Uncertainty over energy and bill savings – Customer-suggested changes to the pilot rate • Later pilot experience – Customer satisfaction and perceived benefits of the pricing plan – Participant dropout analysis – Reasons for customer dropout – Role of information and behavior change – Customer feedback – Attrition analysis
Program Costs and Benefits	• Summary of program costs and benefits • Comparison of costs and benefits • Program costs and benefits, including software and physical integration requirements and costs

Evaluation Report Section	Contents
Considerations for Rate Expansion	• Discussion of capabilities and constraints for broader rate expansion • Discussion of evaluation applicability to broader population • Cost-effectiveness considerations • Discussion of effect on vulnerable populations and recommended mitigation strategies (low income approach) • Existing capabilities of required operating systems, limitations, and potential barriers to expansion • Customer education, outreach, and support needs and capabilities • Effects, if any, on long-term planning requirements
Key Findings and Recommendations	• Key study findings • Recommendations for pilot rate and program design

Source: Guidehouse

5. PSE's Alternative Rates Vision Blueprint

This section describes Guidehouse's future rates vision and 10-year roadmap to alternative rates for PSE. This section then outlines next steps and key activities for Phase 2, such as additional in-depth analysis and stakeholder engagement.

5.1 Alternative Rates and Programs 10-Year Vision

The final task of Guidehouse's Phase 1 support involved the design of an alternative rates and 10-year vision and pilot sequencing framework. Guidehouse presented the 10-year vison to key internal stakeholders during a series of meetings in September and October 2020.

The overall vision for alternative rates for PSE starts with the following clearly defined objectives:

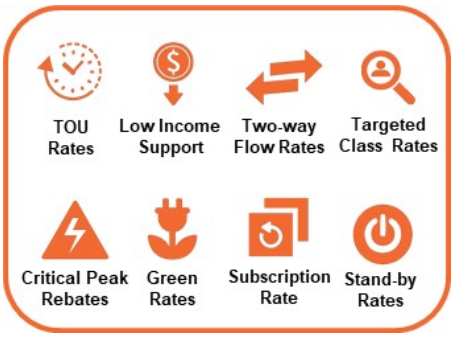
- **System cost minimization:** Reduce costs to serve customers by improving capacity utilization, encouraging economic conservation and peak shaving
- **Customer choice:** Offering customers options to help them manage their energy bills
- **Equity and accessibility:** Design and offer rates and programs that consider needs and effects on vulnerable populations
- **Renewables integration:** Investing in and economically integrating renewable resources to help PSE achieve its 100% carbon free goals.[23]

Outcome-Based Pricing

Over a 10-year horizon, PSE envisions it could transition from a one-size-fits-all tiered rate to outcome-based pricing. Outcome-based pricing focuses on the creating rate designs that encourage changes in customer behaviors that benefit both the utility and customers. Further, outcome-based pricing tailors pricing to customer's preferences, while still reflecting the costs of products and services offered, such that the result is not only rates that provide meaningful and actionable prices signals but are also easy for customer to understand thus improving the probability that customers will change their behaviors and the outcomes desired are achieved. To achieve outcome-based pricing, PSE will need a suite of pricing options. Variations of these options are currently available to most utilities today, but many are not offered. Some options are trends in the industry in pricing (e.g., subscription rate). All options are cost based and provide customers with clear price signals. However, these options do not encompass all pricing options that could be considered, but generally represent the types of options that should be considered in a pricing roadmap based on PSE's goals and objectives. Figure 29 provides the suite of pricing options, and Table 12 provides brief descriptions for each of these options.

[23] The Clean Energy Transformation Act (CETA) applies to all electric utilities serving retail customers in Washington and sets specific milestones to reach the required 100% clean electricity supply. The first milestone is in 2022, when each utility must prepare and publish a clean energy implementation plan with its own targets for energy efficiency and renewable energy. By 2025, utilities must eliminate coal-fired electricity from their state portfolios. The first 100% clean standard applies in 2030. The 2030 standard is greenhouse gas neutral, which means utilities have flexibility to use limited amounts of electricity from natural gas if it is offset by other actions. By 2045, utilities must supply Washington customers with electricity that is 100% renewable or non-emitting, with no provision for offsets. Source: https://www.commerce.wa.gov/wp-content/uploads/2020/02/CETA-Overview.pdf

Figure 29. Suite of Pricing Options



Source: Guidehouse

Table 12. Description of Pricing Options

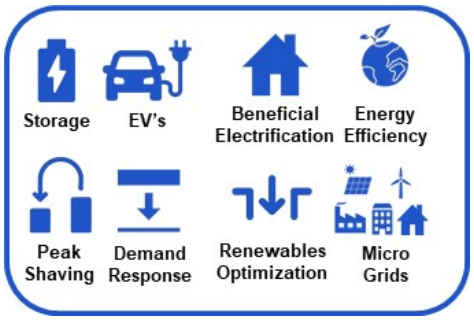
Pricing Option	Description
TOU Rate	A TOU rate structure sets prices for predetermined time periods (i.e., dates and times of day)
Low Income Support	Rates for targeted customers identified as low income
Two-way Flow Rates	Rates that account for electricity that flows back and forth from the customer, for example from solar PV, battery, or EVs
Targeted Class Rates	Rates designed for a specific rate class, such as large commercial and industrial (C&I) customers
Critical Peak Rebates	A structure that incentivizes customers to adjust consumption for prescribed period of time at short notice to address severe conditions at critical peak times
Green Rates	Rates that provide customers with access to electricity generated in part or fully from renewables
Subscription Rate	Customers pay a fixed monthly bill for a rate subscription giving them access to free electricity up to a predefined set limits, akin to a Netflix subscription
Standby Rate	Standby rates are designed for accounts with generators that interconnect to and operate in parallel with a utility's electric system. The rate provides backup electric service when the generator(s) is partially or completely shut down.

Source: Guidehouse

Customer Partnerships

In parallel to the transition to outcome-based pricing, PSE aims to transition from customer programs to customer *partnerships* that leverage pricing design to enhance or enable customer programs, provide customers with energy management options, promote technology adoption, and facilitate integration of new resources. To achieve customer partnerships, a suite of price-enabled programs needs to be considered. These programs couple traditional demand side management programs with pricing options (e.g., price discounts for energy efficiency measures). These programs also focus on incenting early technology adoption and use rate design to complement and enhance the program. Similar to the pricing options, the program options described in Figure 30 are not all the options available and many are already in effect or being designed and tested, but generally represent the suite of options available.

Figure 30. Suite of Price-Enabled Programs



Step 1: Plan and Outreach

The first step toward achieving these goals and outcomes is to prepare, plan, and engage. As part of this step, PSE should take the following actions:

- ***Prepare internally*** for potential changes by identifying and engaging key internal stakeholder and establishing objectives and goals and outcomes (Phase 1 of PSE's current plan).
- ***Plan for the future state***, which includes a pricing roadmap, a customer journey map, and a regulatory strategy. The pricing roadmap outlines the pricing options to pursue and the timing of those pursuits, and the customer journey map is creating a path to engage customers and create programs that address emerging needs while achieving PSE's goals.

- ***Develop regulatory strategy*** that outlines the sequence of filings and asks to achieve the two end-state suites (rates and programs).
- ***Engage stakeholders and customers*** by creating forums to reach out to regulators, customer advocates and special interest groups to understand their objectives and goals. Conduct customer research to understand customer's needs. This step is already underway with PSE's internal stakeholder engagement efforts. Other activities should be completed by the end of next year.

Step 2: Build Capabilities, Pilot and Target

The next step is to assess and build capabilities, including the following:

- Implementation of AMI meters and capture of AMI data in MDMS
- Enhance data analytics capabilities to allow for understanding cost structures and implications of alternative rate designs
- Create tools for analysts to quickly review impacts of customer pricing options, such as bill comparisons
- Develop and launch pilot options or redesign customer programs that incorporate pricing to enhance or enable program success

This stage is also underway at PSE with AMI and MDMS implementation. Other activities should be completed by end of Year 2.

Step 3: Pilot Refinement/Expansion and Evaluation

PSE should pilot pricing options and programs to obtain feedback from customers on design and implementation, and to test the effectiveness of internal processes and capabilities. This step should include the following elements:

- ***Targeted options*:** This stage provides opportunity for targeting specific customer groups for immediate implementation of options, such as small groups of customers who have the potential to benefit from options while providing value to PSE. Pilots allow for the creation of options for specialized customer groups that do not require mass-market rollout.
- ***Evaluation, measurement, and verification:*** Planned and thoughtful evaluation efforts should be included in this stage to provide structured feedback on pilots and programs based on stated goals and objectives.
- ***Customer tools*:** Building tools to help customers understand their options and educate customers on the actions they can take to better manage their energy bills is a critical activity in this stage.

This stage normally lasts about two years, depending on pilot/program complexity and the evaluation timeline.

Step 4: Rate and Program Implementation

The final stage is rolling out pricing and program offerings that become part of the suite of options. Rate options incorporate marketing and outreach plans as part of implementation, as outreach is integral to these scaled launches to inform customers of options. Figure 31 provides an example of suggested pilot sequencing that stages the planning, piloting, evaluation, and launch of each pricing option within the suite of options presented in Figure 29. The sequencing helps to enable testing and evaluations of key functionalities and pilot design elements prior to the large-scale rollout at a cadence that is manageable to PSE.

Figure 31. Example Pilot Sequencing Plan

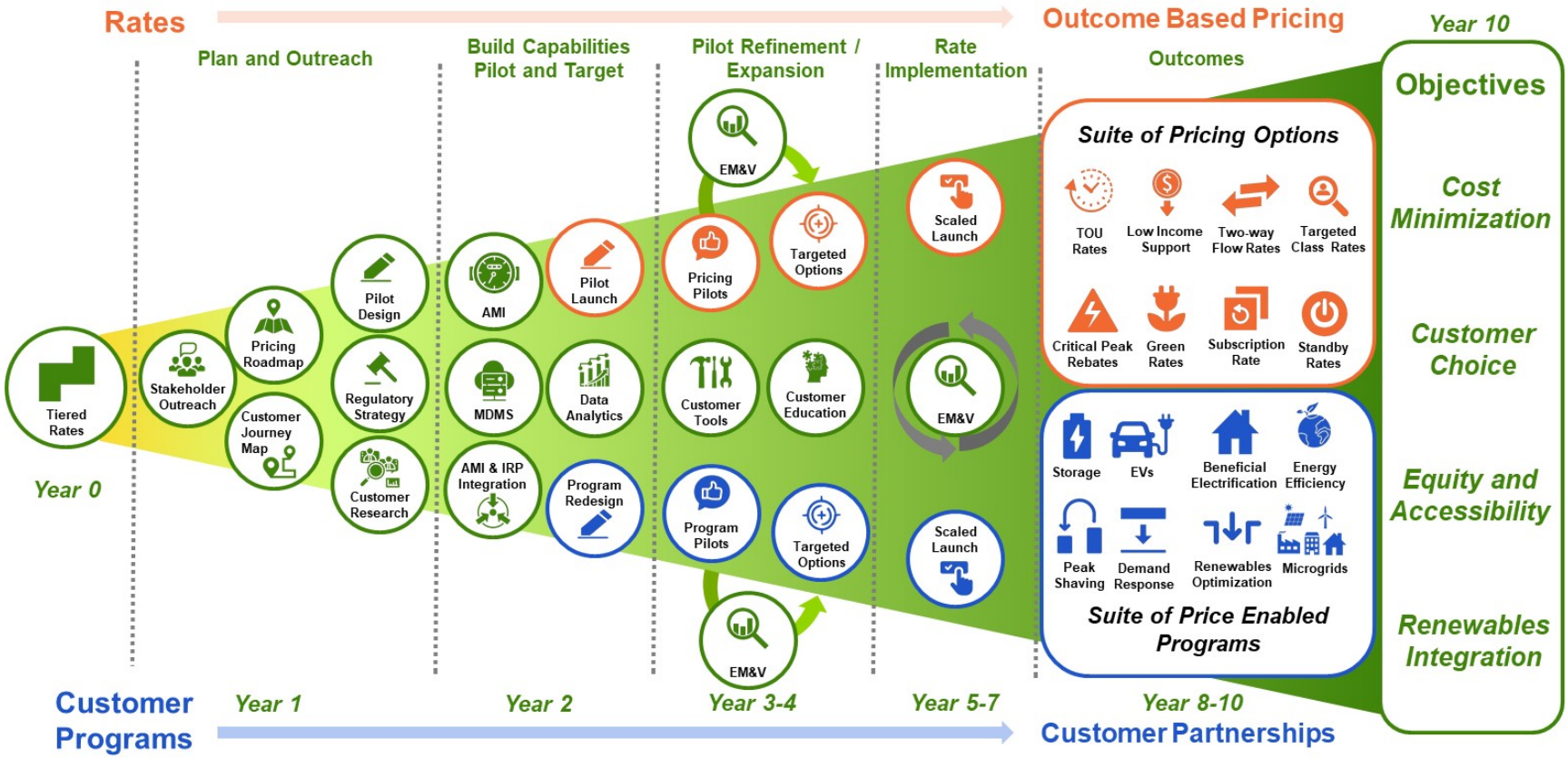
Rates	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Alternative Rate 1	Plan	Plan	Pilot	Pilot	Evaluate	Implement	Implement	Implement	Implement	Implement
Alternative Rate 2		Plan	Plan	Pilot	Pilot	Evaluate	Implement	Implement	Implement	Implement
Alternative Rate 3			Plan	Pilot	Pilot	Evaluate	Implement	Implement	Implement	Implement
Alternative Rate 4			Plan	Plan	Pilot	Pilot	Evaluate	Implement	Implement	Implement
Alternative Rate 5				Plan	Plan	Pilot	Evaluate	Implement	Implement	Implement
Alternative Rate 6					Plan	Pilot	Evaluate	Implement	Implement	Implement
Alternative Rate 7						Plan	Pilot	Pilot	Evaluate	Implement

Source: Guidehouse

As PSE transitions from pilots to programs, evaluation becomes an integral and embedded part of implementation and monitoring efforts. Evaluation provides invaluable feedback and enables refinement and development of new offerings.

Figure 32 provides the complete 10-year alternative rates and programs roadmap and vision.

Figure 32. Illustrative 10-Year Alternative Rates and Programs Roadmap and Vision

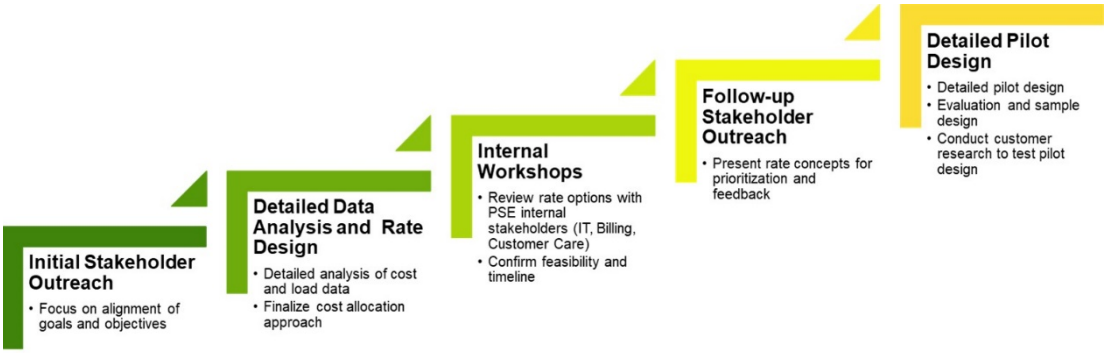


The above illustrative roadmap and vision framework identify a potential path toward pricing options and programs. PSE intends to take a gradual, iterative approach to evolving its pricing and programmatic capabilities.
Source: Guidehouse

Phase 2 Next Steps

Figure 33 describes an approach to pilot design for Phase 2, which would begin with initial stakeholder outreach to focus on alignment of goals and objectives. Then, PSE would conduct detailed data analysis of cost and load data and finalize the cost allocation approach and pilot rate design. Following the pilot rate design, PSE would conduct a series of internal workshops with PSE stakeholders to review the rate design, confirm feasibility, and discuss timeline and coordination among PSE's internal teams. Next, PSE would conduct an additional round of follow-up stakeholder outreach to present the rate concepts for prioritization and feedback. Finally, PSE would integrate the stakeholder feedback, develop the detailed pilot rate design, prepare an evaluation plan, develop a marketing and outreach plan, and conduct customer research to test and refine the test pilot design. Guidehouse presented the Phase 2 Plan to PSE staff for feedback and discussion in a 2-hour workshop on September 10, 2020 (Appendix D).

Figure 33. Approach to Phase 2 Pilot Design



Source: Guidehouse

Appendix A. PSE Internal Interview Discussion Themes

Panel	Discussion Themes/Objectives
Directors	• What strategic goals are tied to creating alternative pricing options? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained? • What is PSE's position on carbon reduction from lower energy use? What changes are needed to align clean energy products to rates? • What is PSE's procurement process for clean energy resources? How will the cost structure of the portfolio change with these plans? • How can changes in customer behavior help in managing PSE's clean energy strategy (conservation vs peak shaving vs peak DR)?
Accounting/ Revenue Accounting	• What is their process for managing revenue smoothing with rate changes? • What financial and regulatory mechanisms are in place to protect against deviations in revenues versus costs? • How are current revenue forecasts created? • How often are they reviewed (monthly, quarterly or annually?) • Does PSE use balancing accounts or other such mechanisms and how are they set up and managed? How are they impacted by rate changes? • How often are rates changed and what drives those changes? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained?
Operations/ Information Technology	• What key IT systems are impacted by rate design (billing systems, accounting systems)? • What are the processes in place to make adjustments to financial systems with the introduction of new rates or changes to rate designs? What inputs are needed (e.g., rate components or rate levels)? • What are PSE's plans for a master MDMS? What will be the data management and cleaning protocols? How will corrected data be handled? How will data be made accessible by data analytics teams? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained?

Panel	Discussion Themes/Objectives
Metering/AMI	• What are the AMI capabilities that are planned to be activated? What will be metering frequency (15min, 30min or 60 min – will it vary by customer class?) • What is the timing of the rollout of AMI? Will it vary by customer class or regionally? • Has there been any pilot rollout (e.g., sample rollout for developing processes for handing meter installation challenges and customer reactions)? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained?
Billing	• What are the roles and responsibilities of your department with respect to rate design? • Please describe PSE's billing system and interactions with other systems (e.g., financial) • What is the process for updating or changing rates? What is the normal duration of such processes? • When was the customer bill last updated? What were the key lessons learned from that process? • How are rate inputs structured (e.g., how granular are rates segmented – distribution etc.)? • How are billing determinants developed (within the system or derived from an upstream system such as MDMS)? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained?

Panel	Discussion Themes/Objectives
Customer Solutions	• What are the roles and responsibilities of your department with respect to rate design? • What strategic goals are tied to creating alternative pricing options? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • Has there been any AMI pilot rollout (e.g., sample rollout for developing processes for handing meter installation challenges and customer reactions)? What are PSE's plans for handling customer reactions to AMI data installations (call center training, etc.)? • What is customer solutions involvement in rate design development and implementation? • What are your processes for preparing customers for rate changes or rate design changes? When was the last time there was a rate design change implementation (which classes etc.)? What were the key lessons learned from that transition? • When was the bill representation last updated? What were the key lessons from that process with respect to how your customer use the billing information? • How do you plan for customer outreach for rate changes and rate design changes? Are they different? What tools do you rely on to help customers adapt to changes? What tools are available to your customers (online etc.)? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained?
Clean Products	• What are the roles and responsibilities of your department with respect to rate design? • What strategic goals are tied to creating alternative pricing options? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • What is PSE's position on carbon reduction from lower energy use? What changes are needed to align clean energy products to rates? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained? • How are some of the key technologies going to be considered in rate design and implementation (DER, EV, smart thermostat)? • How can rates play a role in enhancing energy efficiency efforts? What about DR?

Panel	Discussion Themes/Objectives
Customer Communications	• What are the roles and responsibilities of your department with respect to rate design? • How do you plan for customer outreach for rate changes and rate design changes? Are they different? • What tools do you rely on to help customers adapt to changes? What tools are available to your customers (online etc.)? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained? • How do you approach call center training, especially with respect to rates? What about C&I Major Account Rep training? • How can TOU rates be useful for large C&I customers? What about small C&I?
Process	• What are the roles and responsibilities of your department with respect to rate design? • How do you plan for a rate change or rate design change? When was the last change you planned for and what were the lessons learned? • What are the roles and responsibilities of your department with respect to AMI rollout? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained?
Rates/Tariffs/Load Research	• What are the roles and responsibilities of your department with respect to rate design? • What strategic goals are tied to creating alternative pricing options? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained?
Clean Energy Strategy	• What are the roles and responsibilities of your department with respect to rate design? • What strategic goals are tied to creating alternative pricing options? • What are the critical challenges facing PSE with respect to current rate designs? • What are the key rate or cost related challenges facing PSE over the next 5 years? • What is PSE's procurement process for clean energy resources? How will the cost structure of the portfolio change with these plans? How can changes in customer behavior help in managing PSE's clean energy strategy (conservation vs peak shaving vs peak DR)? • What critical resources are needed to effectively address the rate changes and are those resources in place and trained?

Appendix B. Alternative Rate Design Workshops

B.1 Workshop: Alternative Rates Design Principles and Trends

Guidehouse

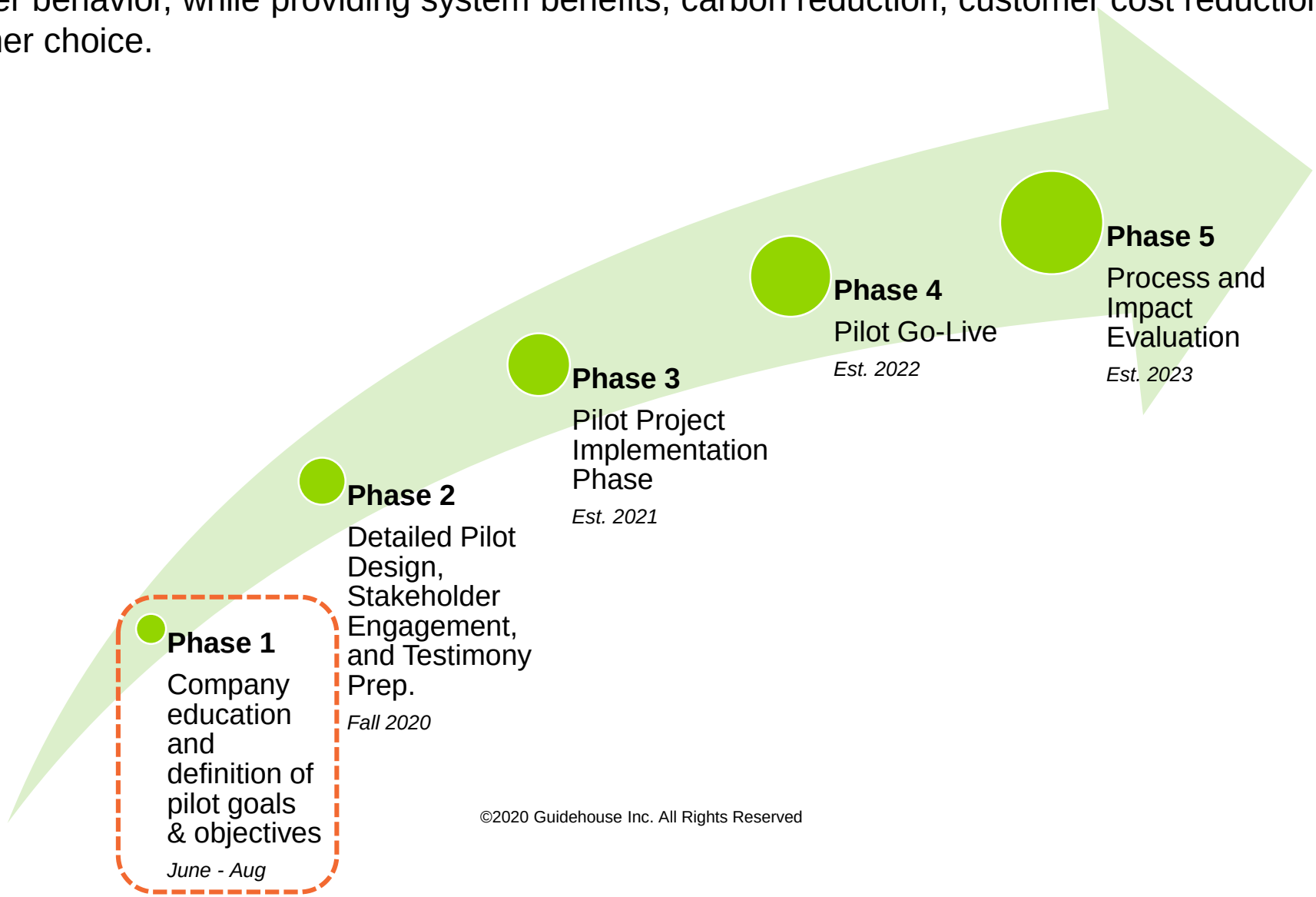
Alternative Pricing Roadmap and Pilot Design

Workshop #1 –
Alternative Rate Design Principles and Trends

July 10, 2020

Programmatic Goals – Phased Approach

The overarching goals of the pricing pilots are to explore the efficacy of time-of-use and/or dynamic pricing designs to influence customer behavior, while providing system benefits, carbon reduction, customer cost reduction, and increased customer choice.



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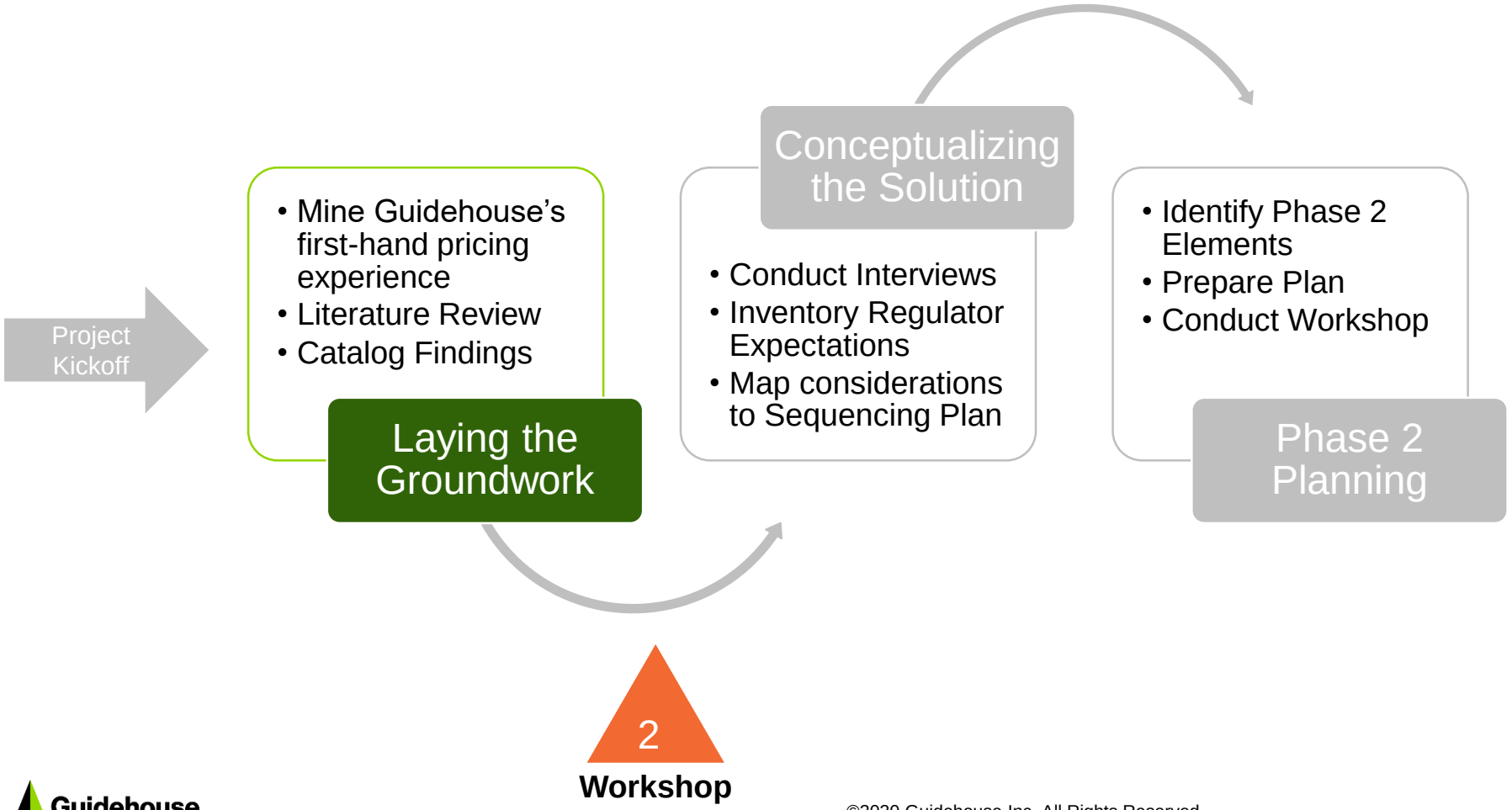
Phase 1 Task 2 Objectives

Laying the Groundwork



Task 2:

- Mine Guidehouse **first-hand pricing pilot experience**
- Conduct pricing pilot **literature review**
- Compile findings, lessons learned, and **best practice**
- Share **research results**
- Present initial **goals, objectives and metrics** to PSE for discussion and refinement

Workshop Objectives and Agenda

	Objective	Start Time	End Time
Alternative Rate Design Principles	Common understanding of rate setting process and terminology	1:00	1:30
Trends in Alternative Rate Design	Insights into the drivers of changing landscape of rate design both in the US and globally	1:30	1:45
Best Practice and Lessons Learned	Translate Guidehouse experience into practical actions for PSE's rates initiatives	1:45	2:45
Discussion and Next Steps	Discuss PSE's reactions to today's topics. Set expectations for future workshops and Guidehouse activities	2:45	3:00

Alternative Rate Design Principles

Alternative Rate Design Principles

Be clear about the aim

- Peak Shifting
- Grid Optimization
- Consumption Reduction

Define targeted groups

- Residential
- Commercial
- Industrial
- Electric Vehicles
- Rooftop Solar

Choose alternative pricing design elements

- Season
- Time-of-day
- Location
- Tiers
- Event

Develop Implementation Strategy

- Customer Outreach
- Tools
- Regulatory Strategy
- Capabilities

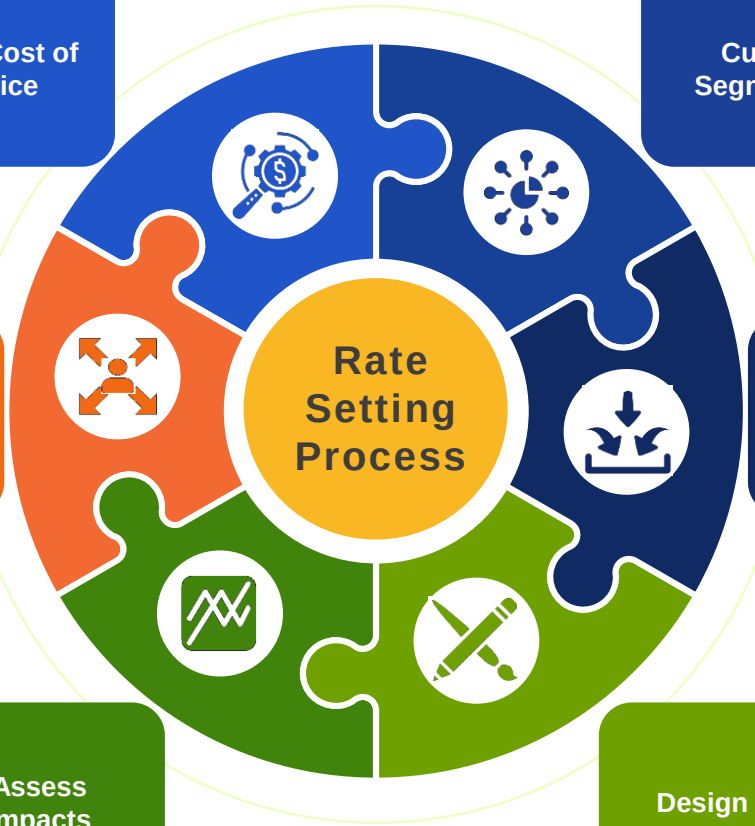
Understanding the Rate Setting Process

Study Cost of Service

- Classify, Functionalize and allocate costs based on drivers
- Identify marginal cost based on drivers
- Quantify causality for embedded costs

Customer Segmentation

- Assess customer load profiles
- Compare profiles to cost of service
- Segment customers based on common attributes



Determine Changes in Customer Behavior

- Identify and quantify impacts of changes customer rate choices
- Identify and quantify impacts of peak shifting

Develop Inputs

- Develop billing determinants
- Compute cost allocation factors
- Calculate cost differentials (e.g., marginal costs)

Assess Impacts

- Determine changes in customer bills
- Review range of bill impacts by customer characteristics
- Identify highly impacted customers and assess drivers for impact

Design Rates

- Determine appropriate cost recovery
- Identify rate components per cost recovery
- Specify rate design options for each rate component

Choosing the Right Alternative Price Scheme to Meet Objectives

Volumetric

Fixed

Peak Pricing	Critical-peak pricing	Super Off-Peak Pricing	Variant pricing	Locational Pricing	Real-time pricing
By applying **consistently higher rates for certain times** of the day per season, customers are incentivized to shift load to less expensive periods on a permanent basis.	Critical peak pricing incentivizes customers to adjust consumption for prescribed period of time at short notice to address **severe conditions at** critical peak times	By adding a period with **consistently and significantly discounted rates for certain times** of the day per season, customers are incentivized to consume more during these periods. Could include rebates.	**Creating high, medium and low price differentials** that can be applied on any given day to signal to customers to reduce consumption	Differentiating **pricing by location**, customers in congested areas can be further incentivized to reduce consumption improving grid stability	By sending customers **real time signals reflecting market conditions**, aided with technology, can lead to optimal customer behavior

Granularity

Demand Charges	Generally accepted for Industrial and Commerical rates, trends toward demand charges are mostly due to cost implciations of DER and shifting cost structure to more fixed costs
Subscription Pricing	Emerging trend towards subscription pricing where customers pay monthly bill with options to install conservation equipment (e.g., smart thermostats) and with “all you can eat“ or free energy up to a set limit.

Guidehouse

Designing Alternative Rates: Key Design Parameters for TOU Rates

Cost Recovery

Volumetric vs Demand charges or hybrid

BASIS:
Charge for costs based on driver (e.g., fixed costs vs demand and variable)

JUSTIFICATION:
Cost reflective such that customers receive relevant cost signals to incent desired behavior

CONSIDERATIONS:
Low use customers are particularly sensitive to fixed charges and some customer classes would find demand charges too complex

Price Differences

Difference in seasonal and time of day prices

BASIS:
Marginal Costs (difference in marginal cost from one period to another)

JUSTIFICATION:
As customers shift, if differential is not based on marginal costs, customers avoid 'fixed costs' potentially increasing rates for all

CONSIDERATIONS:
Price duration is directly linked to price differential

Number & Period Durations

Length of periods and number of periods

BASIS:
Customer acceptance goals balancing the challenges of long peak periods and understanding of multiple periods

JUSTIFICATION:
Longer TOU periods can cause customer fatigue and either lack of customer response or tendency towards conservation vs shifting; many TOU periods can be confusing and difficult for customers remember

CONSIDERATIONS:
The longer the duration, the less the price differential between periods; the more periods, the more the differential can be between the highest to lowest cost periods

Program Structure

Mandatory or optional enrollment with options for short term bill protection

BASIS:
Customer recruitment, retention and satisfaction goals and bill protection help customers be risk neutral with roll-out

JUSTIFICATION:
Customer recruitment can be costly while opt-out options can provide customers with choice; Bill protection allows customers to avoid bill shock

CONSIDERATIONS:
Mandatory enrollment is best implemented with customer TOU rate options to give customer choice; bill protection should be only for short period

Additional considerations

Rates design should be stable for a sufficient period of time that allows customers to get used to the rate structure	• As DERs and other disruptors change load shapes, time of use periods may need to change • Rates should be designed to optimize not just to current costs but future cost shapes
Rates design is a highly data driven process that balances many issues	• Data is used to determine periods, optimal durations etc. • Data drives the ultimate design but optimized with customer

Questions for Discussion

- ***What are the main drivers for establishing this roadmap?***
- ***What is your starting vision for alternative rates?***
- ***Which groups will you target?***
- ***How should we consider advanced technologies?***
- ***What more information do you need to narrow your focus?***

Trends in Alternative Rate Design

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Trends are Diverging

- Send customers price signals designed to modify behavior
- Create access to low cost generation from renewables
- Encourage technologies that can leverage time differences (EVs and Storage)
- Normalize pricing for behind the meter generation to wholesale power prices

- Hybrid to bring best of both options
- No examples of implementation as yet

- Customer centric rate design consistent with other pricing schemes for services (e.g., Amazon, Netflix)
- Encourage implementation of technologies that encourage savings rather than relying on customer behavior changes
- Addresses shift in cost structure as risks have migrated from market price vulnerability to fixed costs collection and increased rates as customers find alternatives to avoid paying fixed costs

Which direction are you leaning?

Overcoming Skepticism of Alternative Pricing Schemes

Can and Will Customers Respond?

- Can customers respond in such a way that they save money?
- What about customers with limited flexibility and special needs?
- Isn't this rate design harmful to Low to Medium Income customers who cannot respond?
- Can customers understand demand charges?

Will Utility Savings be Realized?

- Will peak shifting really create cost savings for utilities that save all customers?
- Will savings be persistent to allow for real savings by avoiding capacity additions?
- Are cost reflective price differentials significant enough to prompt shifting or are other dynamic pricing options better choices (e.g., CPP)?

What is the need for Alternative Rates?

- With increased emphasis on renewables, does peak shifting really reduce carbon?
- As price volatility continues to dramatically decline, aren't other rate options, such as subscriptions, better for customers?
- Doesn't alternative pricing harm growth in solar?
- Are enabling technologies a better solution than rate design?

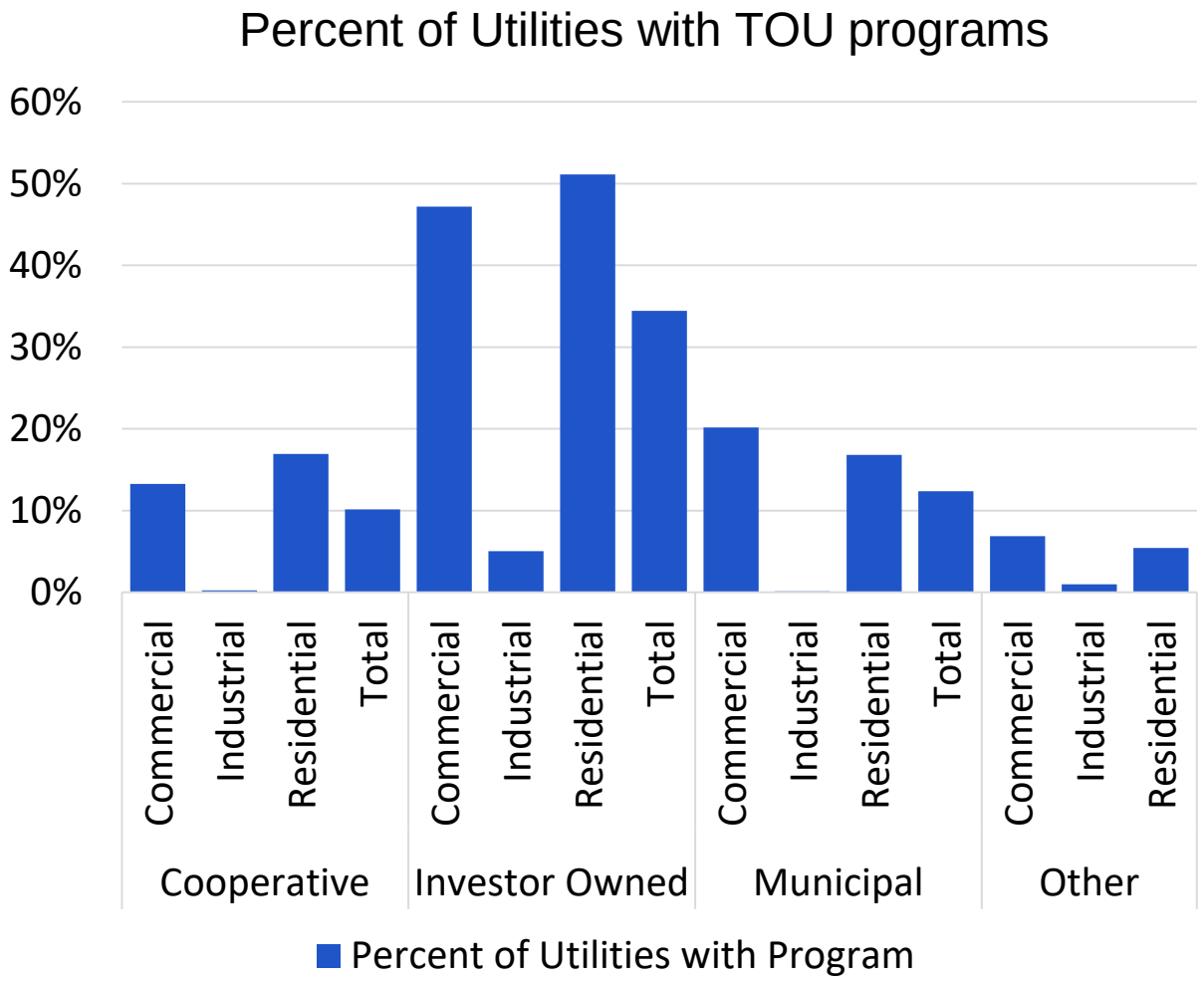
What are your stakeholders concerns?

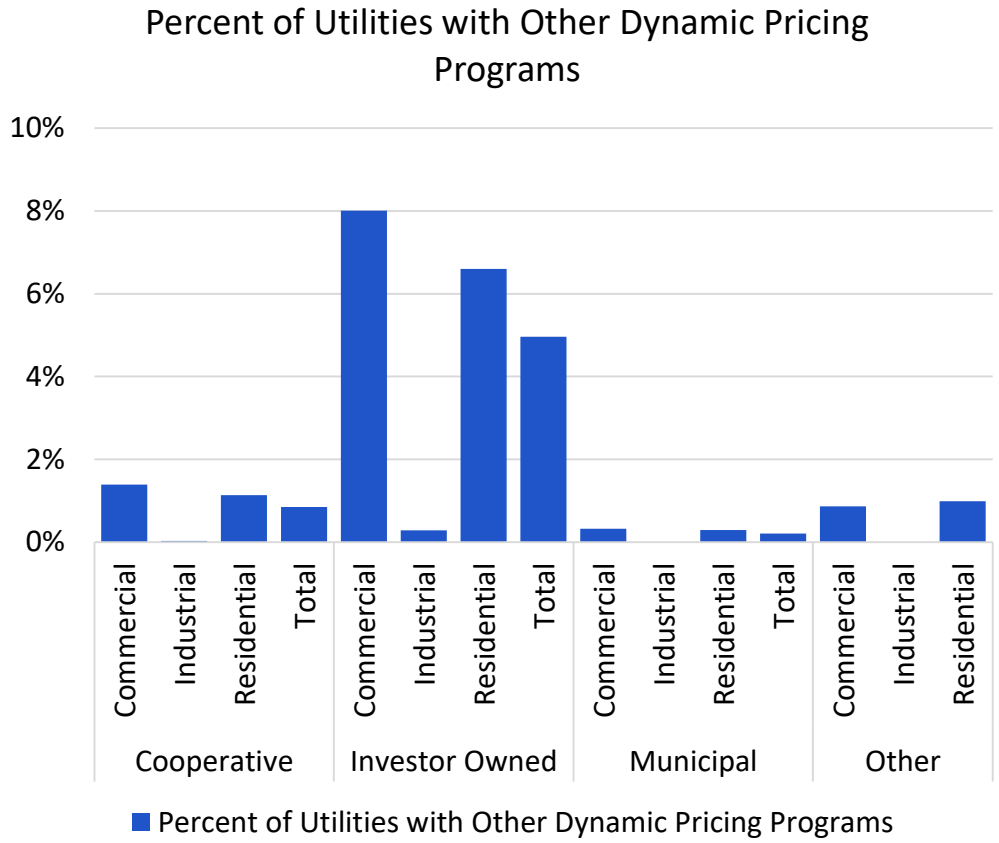
Trends in Time Based Rate Design

Why are alternative rates being pursued?	• Address PV integration challenges • Grid cost recovery • Improve economics of EV charging
What structures are most popular?	• Mandatory with Opt-Out • Include cost differentials from grid charges • Balance number of tiers to give customers access to low cost options without overwhelming them with complexity
What implementation strategies are prominent?	• Pilot first, implement later (learn your customer needs) • Include access to enabling technologies • Prepare customers with shadow bills & bill protection

What is driving PSE's approach?

Popularity of 'Dynamic' Pricing Designs





Assessing the Impact of Time-variable Rates: California

Context

2005-2008 - AMI rollout opens the door for mass adoption of Time-Variable Rates

2010-2014 - Small, medium, large customers face mandatory/opt-out Time-Variable Rates

2016 – State mandates TOU rates for residential customers

2018 – Utilitys look to modify time of use periods in response to ‘Duck Curve‘

2019-2020 – Utilities implement residential Opt Out TOU

Results

2016 - 2017 Statewide <u>Opt-in</u> Time-of-Use Pilot

- PG&E, SCE and SDG&E tested 9 TOU rates with >50,000 customers
- Peak periods ranged from 2pm – 8pm and 4pm – 9pm, with peak impacts spanning 1.4% to 6.1%

2018 PG&E <u>Opt-out</u> Time-of-Use Pilot

- Tested 3 TOU rates with >160,000 customers across 8 segments including solar, low-income, hot vs. moderate vs. cool climates
- Average impacts for 4pm – 9pm peak period ranged from 0.5% - 5.6%

2019-2020 Mandatory Time-of-Use with Opt-out

- Staged roll-out with SDG&E implementing earlier due to planned billing system changes

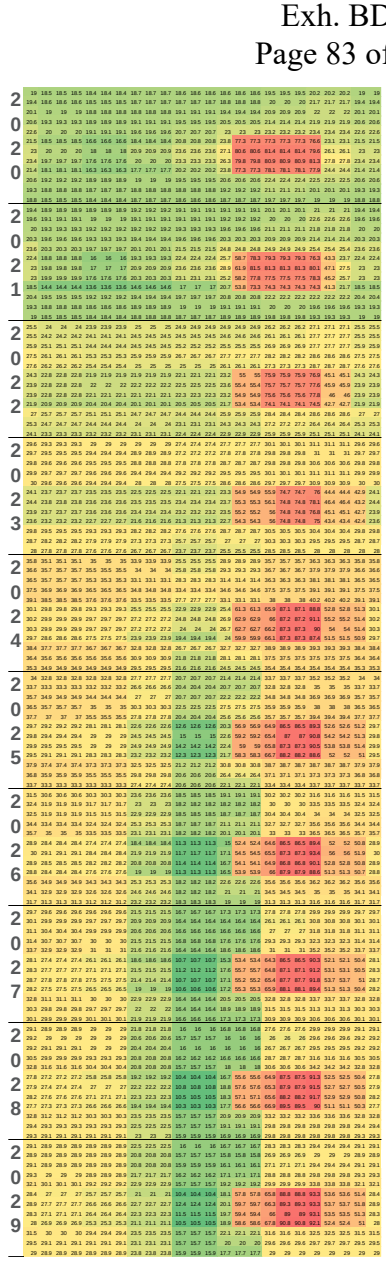
Source: Utility reports filed under California Public Utilities Commission Decision 15-07-001 and Rulemaking 13-01-011

Developing Time of Use Rates: Abu Dhabi

Context

2018 – Abu Dhabi recognized need to modify existing tariff structures for both inter sector transfers and to end-user customers, reflecting change in portfolio

2019 – Initiated a Taskforce to review all rates and design cost reflective rates



Results

Substainable Rate Structure

- Abu Dhabi is about five years behind California and other states with substantial solar generation
  - Resulting in significant changes in cost structure over the next few years
  - Shifting peak period for generation later
- However, unlike California, the distribution and transmission peaks remain and other generation sources are driving up costs in non-solar hours
  - Generation is utility scale versus behind the meter
  - Costs are increasing as electricity and water sectors decouple and the benefits of free generation from desalinization are lost

Source: Navigant Tariff reform project for Abu Dhabi

Best Practice and Lessons Learned

Preparing for Alternative Rates

Infrastructure and Technology

AMI (Advanced Metering Infrastructure) / **Smart Meters** to include access to data

Enabling technologies (smart **appliances**, controls and thermostats) and flexible loads

Advanced billing systems to ensure utility can implement and process **billing**

Awareness and Education

Communication channels to **reach consumers**

Education and **awareness**-raising about time-variable pricing

Knowledge about **behavioral responses** to be expected

Tools for customers to choose their best option

Capabilities and Agility

Data analytics capabilities and **technology**

Ability to **monitor and evaluate** impact of dynamic pricing and adjust schemes

Utility-regulator **dialogue** to approve innovative rate schemes

Feed-back loops for continuous communication

Compelling Regulatory Strategy

Data driven filing with demonstration of cost basis for price differentials

Customer impact assessment with heat maps that show which customers have most dramatic bill changes

Clear narrative for regulator on goals and objectives and articulation of evaluation criteria

Rolling out alternative rates requires thorough preparation and monitoring.

Learning from Within

Lessons learned from earlier program still inform on TOU design options

- In 2001 PSE introduced PEM program and cancelled a bit more than a year later
- Noted challenges from first effort:
  - Unrealistic customer expectations
  - A weak price differentiation among three period (less than 1cents/kWh)
  - Lack of enabling technologies
- Other 'Exogenous Factors'
  - PSE's program was created as a result of market volatility in 2000, but these conditions went away shortly after (in part due to overbuild in the WECC after the crisis followed by increased focus on renewable power)
- On the positive side, the PSE program showed:
  - AMR systems could be used for much more than simple data collection.
  - A complex system and billing program could be implemented fairly rapidly.

Provide customer education and outreach to help customers understand how and how much they can save

While ensuring cost reflectiveness, design rate differentials that create meaningful savings for customers if they shift

Give customers access to or knowledge of technologies that will help them save (such as smart thermostats)

Is this consistent with your view of the challenges of PSE's rate?

#1 Lesson Learned

Success of alternative pricing relies on both *thoughtful design* and *significant preparation*

Prepare Yourselves

- Design rates that will result in **meaningful options** for customers
- **Plans** for metering and billing
- Call center **training**
- Robust **analytics** (make sure you know your numbers are right especially with communications on bill impacts!)
- Customer **outreach** and education plans

Prepare Your Customers

- Understand **who** will be impacted and by how much
- Prepare overall messaging on not just **'Why' but 'What'**
- Prepare **targeted** messaging for customers impacted significantly
- Have **tools** ready for customers to understand their bills
- Communicate frequently **before** implementing

Prepare Your Stakeholders

- Many Stakeholders are **new** to 'marketing' concepts
  - Consider inviting key stakeholders to any customer outreach
  - Beware of too many 'chefs' in designing outreach
  - Customer outreach is not 'one size fits all'
- Manage **expectations** on potential impacts
- Expect customer **complaints**

Prepare Yourselves: Coordinate with AMI Rollout

- Plan AMI rollout relative to rate roll-out
  - Avoid confusing customers with changes in bills due to rate changes vs equipment
  - Resolve new meter issues prior to implementing alternative rates
  - Teach customers the benefits of access to their AMI data as you implement alternative pricing

- Consider investing in Meter data management system that allows you to access your data and make the data useful to rate design and customer care team
  - Data will provide invaluable information on rate design, therefore a minimum of one year of data is ideal
  - Data will also serve as means to quantify impacts on individual customers allowing for target outreach

How prepared is PSE to receive AMI data?

Timing and internal coordination are key to success

Prepare Yourselves: Build Analytical Capabilities

- Consider investing in Meter data management system that allows you to access your data and make the data useful to rate design and customer care team
  - Data will provide invaluable information on rate design, therefore a minimum of one year of data is ideal
  - Data will also serve as means to quantify impacts on individual customers allowing for target outreach
- Design and develop new rate design models that leverage AMI data
- Develop bill impact estimation capabilities to test impacts of rate design and allow for targeted customer outreach
- Create ‘Red Team’ to test bill impact results to ensure quality

Building tools before they are needed will save time and headaches

What are you model platforms?

Preparing Your Customers: Know Your Customers

01 Collect data **up front** to **segment** customers

02 **Test** messaging to know what works

03 Provide feedback to customers on their **consumption and bills** through a **variety of means**

04 Enable interested customers to **self-identify** and support their journey

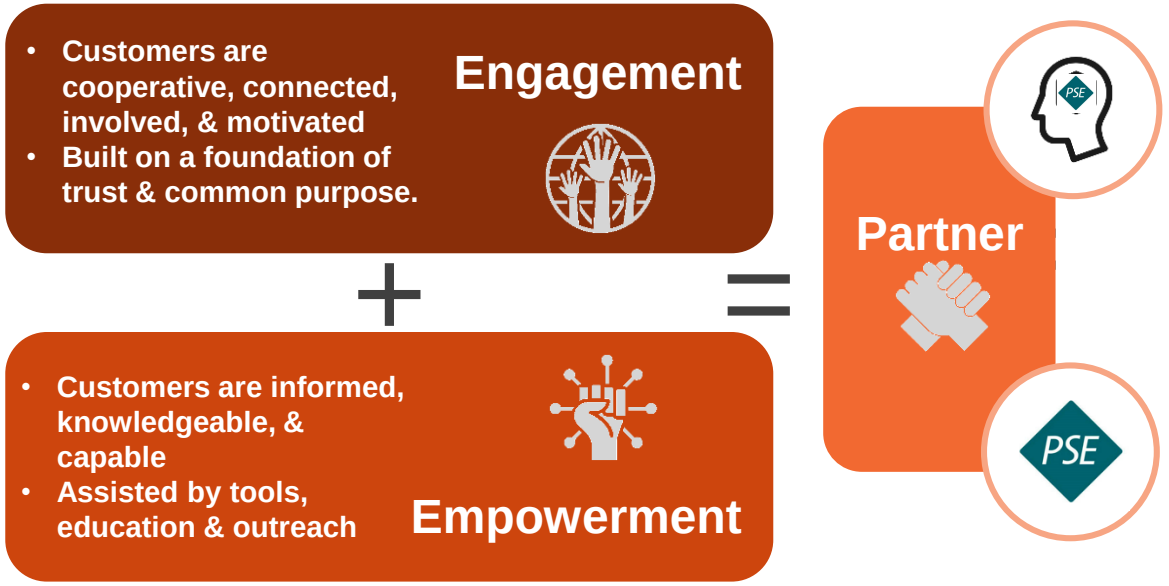
05 Properly identify and research the **key segments** of interest

06 Define **success** up front. Track and report against **key metrics**.

Gather data and use it to ensure success

Prepare Your Customers: Customer Engagement *and* Empowerment

- Customers need ongoing education, information, or tools to help them understand which of their behaviors and enabling technologies are most effective (Xcel CO).
- Even for opt-in pilots customers often have only a basic/modest understanding of the rate design (Xcel CO).
- Messaging should focus on gradual, achievable lifestyle changes. Customers may get frustrated if their efforts are not recognized or if savings are not realized
- There is a strong correlation between relationship with your customer and success of the rate (PG&E)
- Give customers a reason to want to help you. Help them understand the why, and what it means to the customer. Build a shared commitment to make this happen.

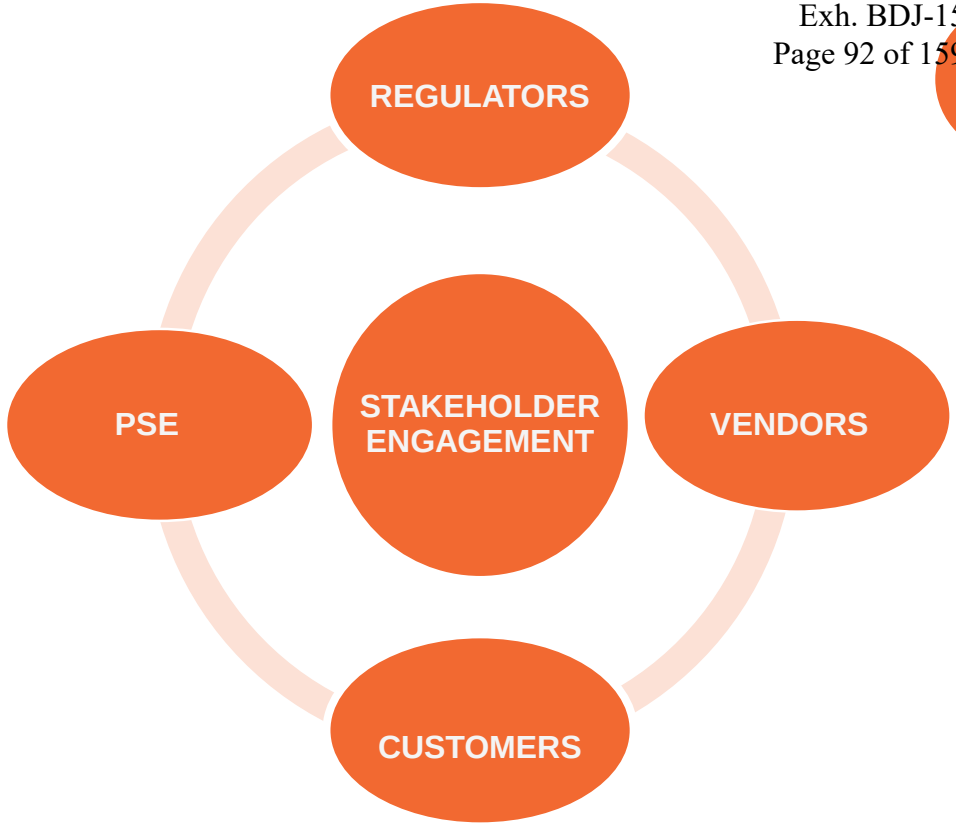


Complex Rates Require More Customer Support

How would you describe PSE's relationship with its customers?

Prepare Your Stakeholders: Stakeholder Engagement

- Bring people onboard to design the roadmap to reduce friction
- Takes longer, harder to do, but reaps rewards
- Multiple stakeholder outreach events are an effective way to align stakeholders over time (Dominion)
- Inviting stakeholders into the process can help build credibility
- Focus on aligning objectives
- What does success look like? What criteria will you use? How will you measure and report on key metrics?
- Consider including key stakeholders in customer engagement activities (PG&E focus groups)



Stakeholder Engagement is an ongoing process and will take significant commitment – **but worth it**!

Who are your stakeholders? How aligned are they with you on most issues?

Lessons Learned from Alternative Rate Implementation

Define clear goal	**Be very clear about the challenge to be addressed (grid congestion, generation peaks, overall demand reduction).**
Ensure thorough preparation	**Ensure prerequisites (technology, education, capacities and agility) are in place for successful implementation and be realistic about the timeline.**
Focus on Data	**Let the data direct the process, including data on costs and customer input to ensure design and implementation are effective**
Prepare customers for change	**Establish communication channels with customers through multiple means.**
Adopt agile culture	**Variant pricing requires an agile culture and constant outreach to customers – well beyond initial awareness campaigns.**
Implement constant monitoring	**Evaluation and monitoring ensures variant pricing contributes to addressing the challenge and is constantly improved.**

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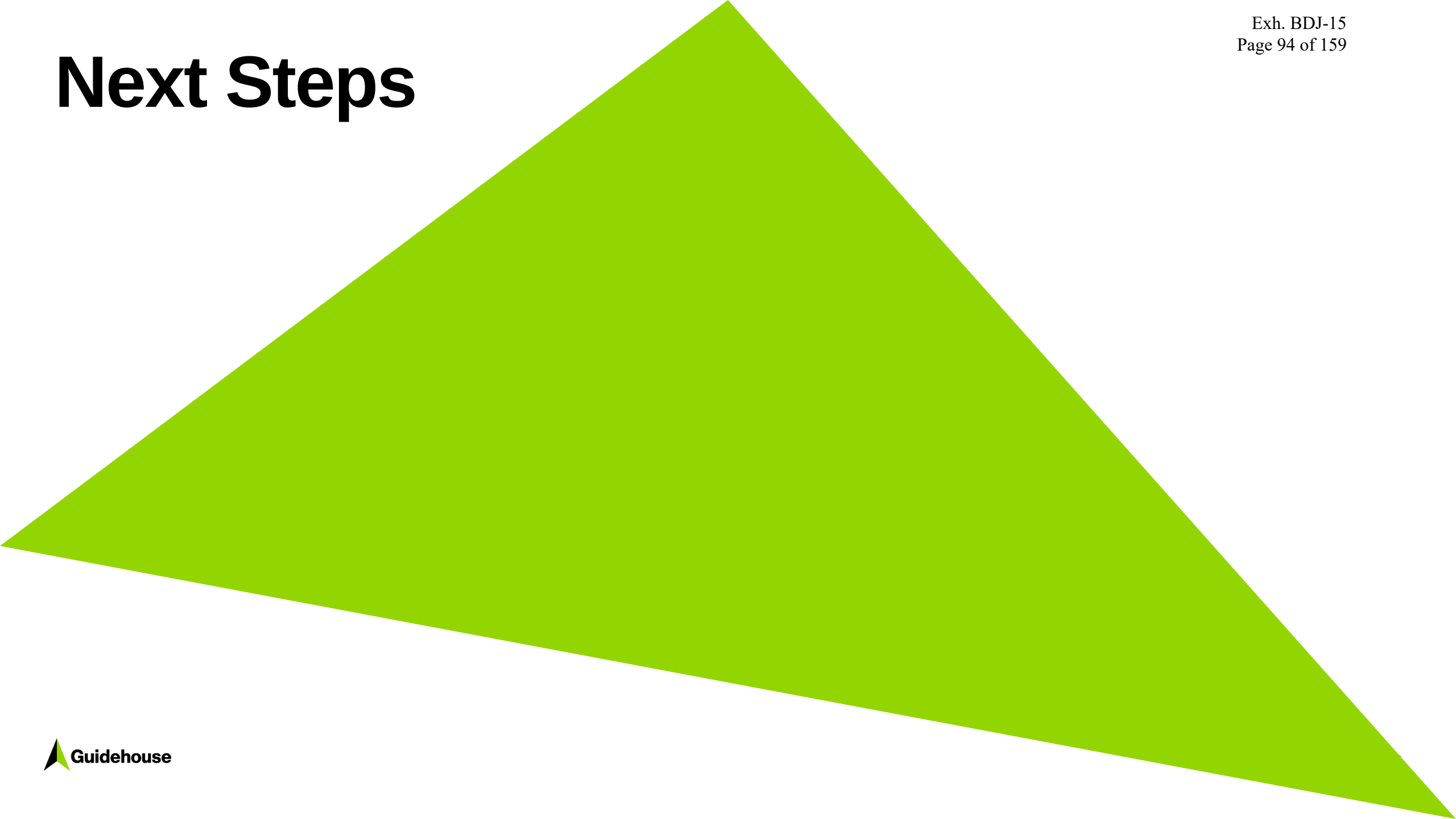
Next Steps



Interviews

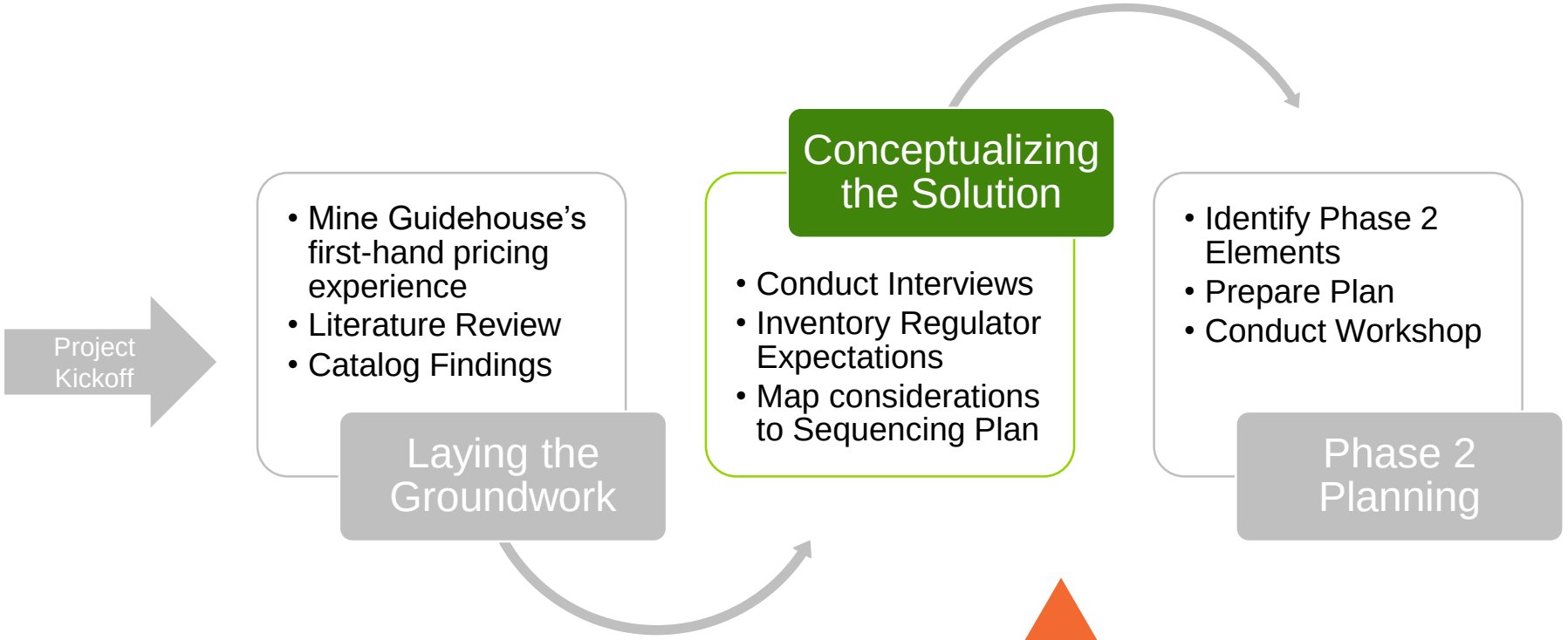
Identifying interview target and key questions for discussion

- Customer care
- Finance
- Operation
- Procurement
- Billing
- IT

Based on today's discussion, who is important for us to speak to?
What questions are important for us to ask?

Looking Ahead to Task 3

Pricing Pilot Sequencing Plan



Task 3:

- Recommend **sequencing** of pricing offerings from pilot to rollout
- Map key PSE **technical, operational, customer and external considerations** to pricing options
- Explore future rate **vision for each customer group**

B.2 Workshop: Priorities, Capabilities, and Considerations

Guidehouse

Alternative Pricing Roadmap and Pilot Design

Workshop #2 – Part I
Priorities, Capabilities, and Considerations for Alternative Rates

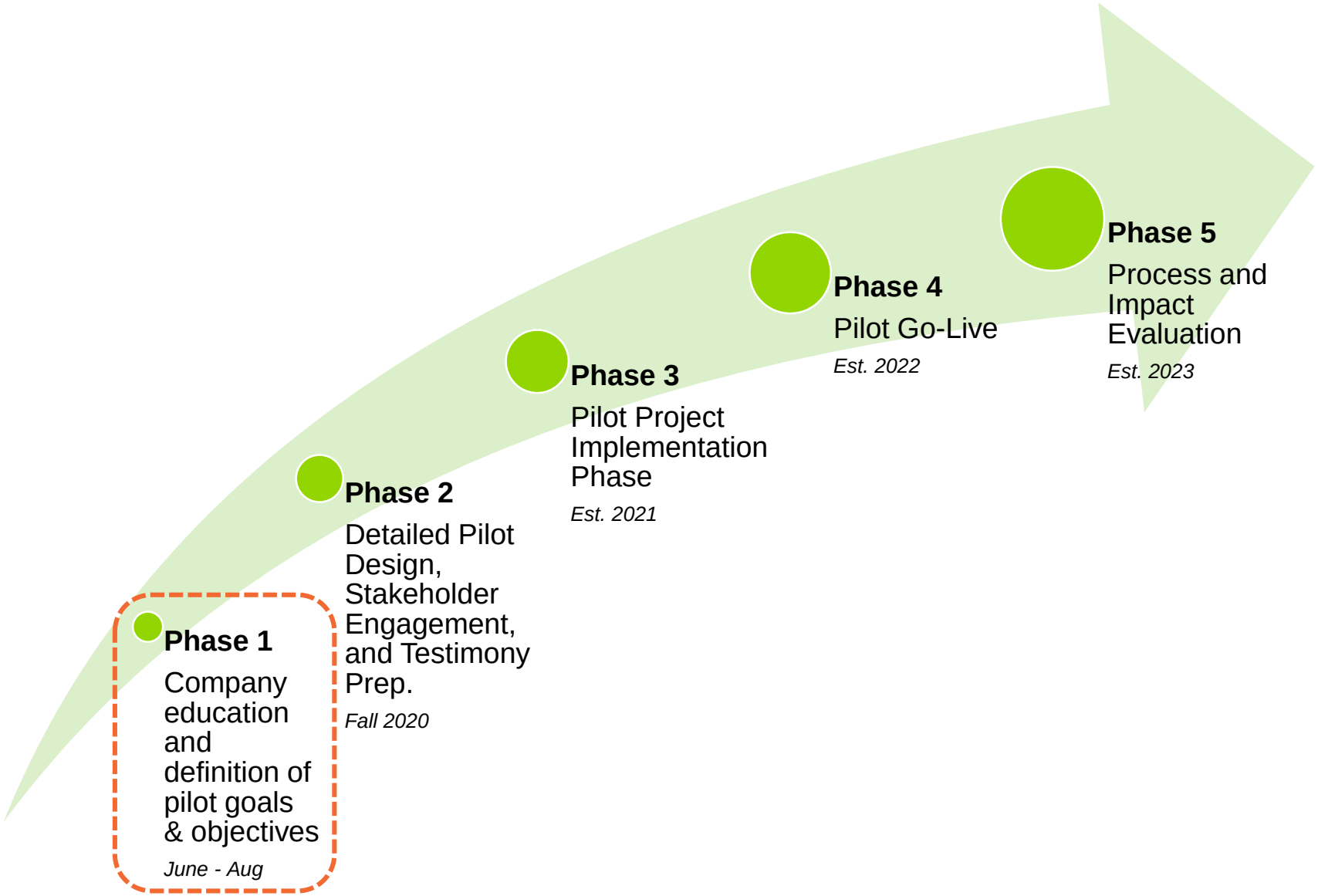
August 18, 2020

Workshop Objectives and Agenda

Topic	Objective	Start Time	End Time
Internal Capabilities and Constraints	Share key takeaways from Guidehouse panel interviews, confirming that takeaways are accurate and there are no gaps	1:00	1:40
Objectives and Priorities	Share drivers, priorities, and considerations for input and discussion	1:40	2:00

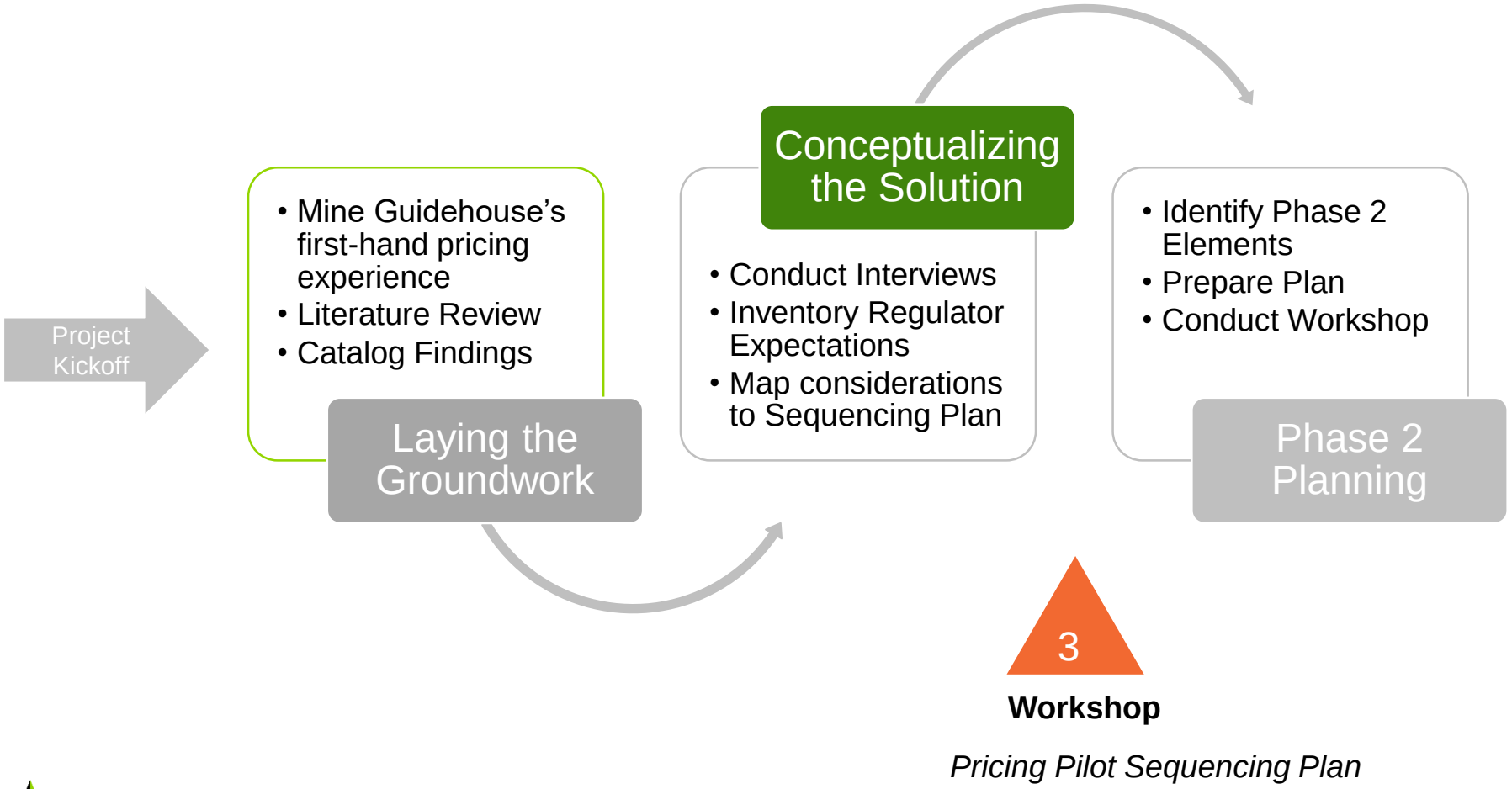
Programmatic Goals – Phased Approach

Phase 1 is part of a longer-term approach to defining, designing and implementing alternative rates



Phase 1 Task 3 Objectives

Our current focus is Conceptualizing the Solution



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Interview Takeaways - Capabilities and Constraints

Billing

- Large ***bill redesign project*** four years ago, next redesign planned in 2022
- ***Get to Zero*** initiative focused on customer self-service and online options
- Meter reads come through ***AMI → MDMS → SAP*** monthly for billing.
- Tracks revenues by ***decoupling mechanisms*** and accounts.
- ***Bill presentation*** approved through Corporate Communications

Capabilities

– Winter and summer season schemes exist
– Get to Zero efforts are successful
– MDMS can be configured, validation is end-of-day
– Shadow billing is a possibility

Constraints and Considerations

– Dynamic pricing would require additional configurations and significant effort
– May be constraints on bill real estate to explain the rate and the charges
– Billing exceptions and EMMA cases in SAP – need to be considered

Customer Communications

- Often required to ***communicate rate changes*** with bill inserts, post changes to website, newspaper ads
- All ***Call Center staff*** are expected to have general knowledge to speak to rate questions.
- More complicated rates requires more ***customer friendly tools and information***
- Occasionally invite ***Commission Staff or Public Council*** to review customer communication as a courtesy
- Bill inserts created by ***DCG ONE***, Wayne Clark facilitates with ***KUBRA*** who puts it all together.

Capabilities

– Flexibility to design customer support tools and processes beyond those required by regulatory

Constraints and Considerations

– How to inform and support for customers who lack internet access
– More complicated bill calculators make take time, never be done before
– Customer need robust tools and support to ensure they can understand new rates

IT

- Likely considered a ***capital project and a major initiative*** because of impact across the enterprise
- Currently ***planning for 2022*** projects
- Plans can shift with ***change in priorities***

Capabilities

– Flexibility to accommodate initiatives that are contingent on regulatory approval

Constraints and Considerations

– Pilots are difficult because the same changes are needed as for a full rollout
– Amount of AMI data puts a lot of upgrading processing strain on our CIS system
– Combining rates and programs may require enhancements to MDMS and CIS system
– IT timeline and requirements require more detailed scenarios (follow-up action)

AMI

- This is a ***five-year program,*** to be complete in 2023.
- Customers can ***opt-out*** of AMI meter
- Rollout is geographic, ***40% complete*** to date

Capabilities

– AMI provides 15-minute interval data on a one-day lag for validation
– Meter reads could be as frequent as every four hours (from MDMS to head end)
– Meters are bi-directional with respect to the premise (DER capabilities)

Constraints and Considerations

– Challenging to do anything that is real-time or intra-day
– Billing scheme could be orders of magnitude difference in cost depending on the solution
– Real-time data reads for the customer would significantly increase processing requirements

Customer Solutions

- For new rates, want to be able to share:
  - How the bill is ***calculated***
  - How the ***rate design works***
  - Tips/information to help ***customers save***
- Actively involved in AMI transition, focused on building ***tools*** to help customers better manage their energy usage in new ways.
- Customers have access to ***budget billing***, similar to subscription rate design

Capabilities

- Customers have access to PDF of their bill on the website, more flexibility than paper bill

Constraints and Considerations

- Need to ensure positive customer experiences
- Rate needs to be easily explained and easily understood

Accounting

- ***Decoupling*** in place for load variation
- Systematic billing of TOU rates through ***SAP***
- There is a need to ensure that PSE receives accurate meter data for ***unbilled revenue***; may add complexity to alternate rates
- Unbilled revenue accounting occurs ***monthly***
- Accounting responsible for incorporating rate changes ***after the changes occur*** not before or during

Considerations

– Likely no issues implementing a TOU rate from an accounting perspective

– CPP rates could likely be accommodated but need to be explored further

Process and Organizational Change

- Training, Organizational Change Management, Process Improvement work together to address the "people side" of change.
- Goal is to ensure end users are engaged and prepared for changes to daily roles and responsibilities.
- Business lead help identify stakeholders, assess the change and develop overall change strategy

Key Questions to Consider

- How is PSE going to have to change its business processes?
- How do the changes impact roles and responsibilities in the organization?
- Do we have the skills and knowledge to support a different rate?
- How do all the different stakeholder groups within PSE have to adapt?
- What changes need to be made as an organization to support the pricing pilot?

Clean Energy Strategy

- Focused on PSE's implementation of Clean Energy Law requiring ***100% clean energy by 2045***
- Solution includes ***DERs, equity requirements***
- The next ***IRP*** will help determine targets for renewable generation and storage
- Moving to renewables reduces marginal costs, ***increasing fixed costs*** in the future
- Requires ***procurement*** separate from rate structures
- PSE has ***not yet hit the cap*** for net energy metered (NEM) solar

Considerations

– Design for the ***future peak*** in 5-10 years not only the current peak

– Consider an ***equitable distribution*** of benefits and costs

Clean Energy Products and Business Services

Electric Vehicles

- Customers are ***tech-savvy,*** interested in saving money, but have ***low understanding*** of rates
- ***Needs vary*** but customer class, and sometimes by customer (Tesla vs. Amazon)
- Prefer ***incentives*** to penalties
- Current ***low income structure*** creates challenges for low income-specific EV rates and programs
- Unable to ***identify EV customers***
- Demand charges create ***barriers for public charging***

EE / Demand Response

- ***No DR programs*** right now
- Looking at small ***pilots*** and larger system-wide programs next year
- Interested in ***fast frequency response*** options
- Looking to ***this process*** to help inform DR rates

Customer Renewables

- Net energy metering until the cap, then value of energy is TBD
- Customers want rates to support ***integration of renewables*** with ***price signals*** that allow them to take advantage of renewable technologies
- Customers want ***cleaner energy choices*** with their rates

Business Services

- Increasing interest in TOU from customers ***looking to electrify their fleets***
- Looking for ***more rate options***, currently only two rates with not much flexibility
- ***Large customers*** understand demand charges
  - Some participate in regulatory proceeds (e.g., AWEC, Kroger, FEA, Walmart)
  - ***Reliability*** is the priority
  - Interest in ***conjunctive demand***, ***demand response***, ***EV charging***.
- Increasingly seeking ***green strategies*** and options

Objectives and Priorities

Aligning Priorities and Objectives to Design Alternative Rates

Drivers

What is driving the effort to offer alternative rates?

- Increased customer choice
- Regulatory / Commission direction
- Demonstrating AMI benefits
- Driving cost reductions
- Incorporating renewables at lowest cost

Priorities

What are the key priorities that inform the rate design?

- Three time periods (Commission)
- Design for future expected load patterns
- Mitigate peak impacts
- Rate are easily understood by customers
- Cost causation and cost-based rates
- Design grounded in PSE's data
- Residential and Commercial rates
- Promoting EV charging for residential
- Promoting EV charging for commercial
- Meaningful differences in prices such that customer actions make a difference
- Incentive-based structures (carrots instead of sticks)
- Integrate renewables

Considerations

What else should be considered as part of the design process?

- Look to winter peaking examples and best practices
- Start with something manageable and well-supported
- Ensure that customers understand the rate, their bill, and how their actions can affect what they pay
- External stakeholders are supportive of initiatives that promote electrification
- Provide customers with more data and more current ways to pay their bills

Are any of these priorities more or less important?

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Alternative Pricing Roadmap and Pilot Design

Workshop #2 – Part II
Priorities, Capabilities, and Considerations for Alternative Rates – Policy Discussion

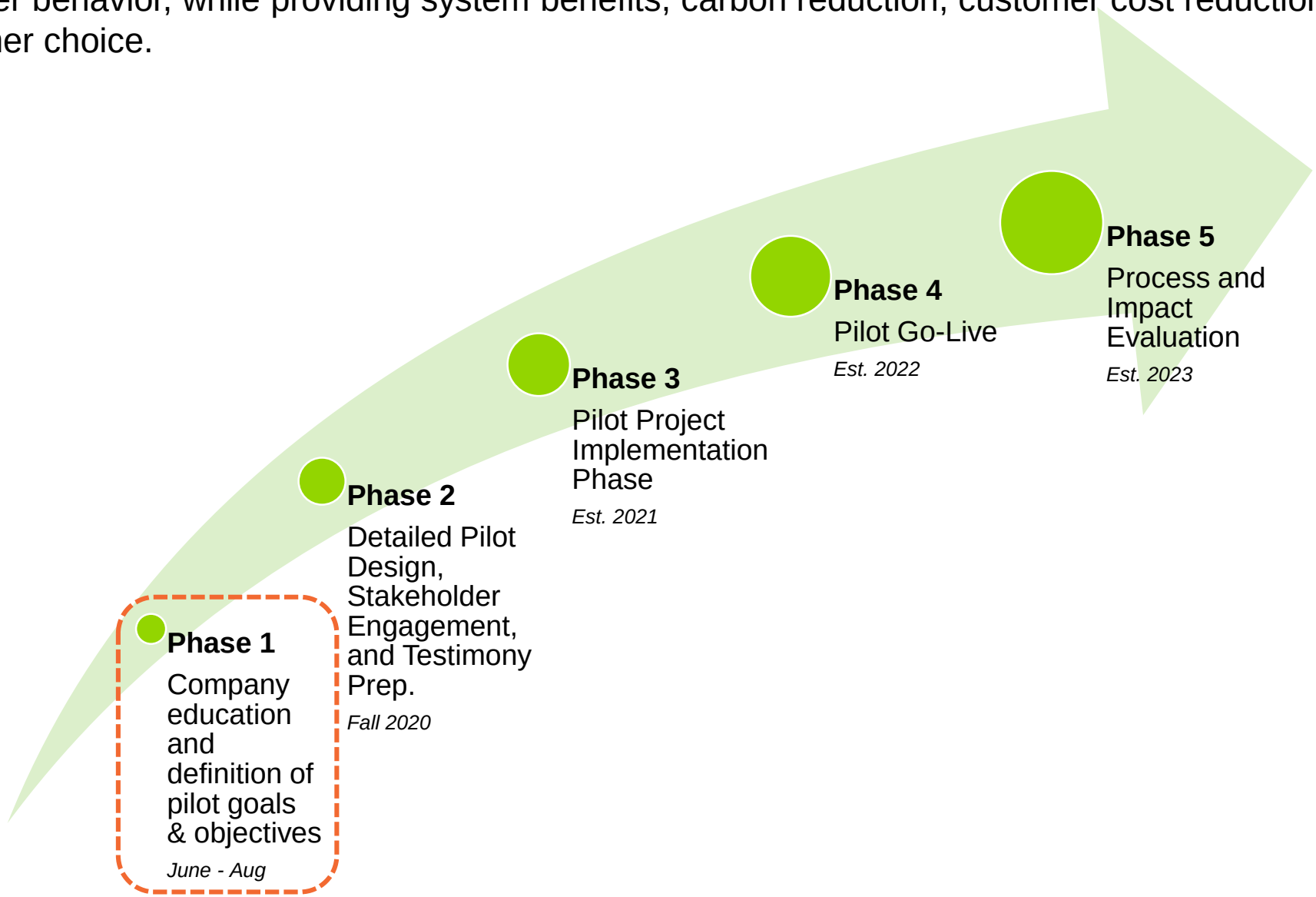
August 18, 2020

Workshop Objectives and Agenda

Agenda Topic	Objective	Start Time	End Time
Objectives and Priorities	Align on alternative rate objectives and priorities	2:00	2:20
Best Practice and Rate Examples	Share best practices and lessons learned for winter peaking rates and incentive design options (e.g., peak time rebates)	2:20	2:40
Conceptualizing Rates	Discuss potential TOU rate options that could align with priorities	2:40	3:00

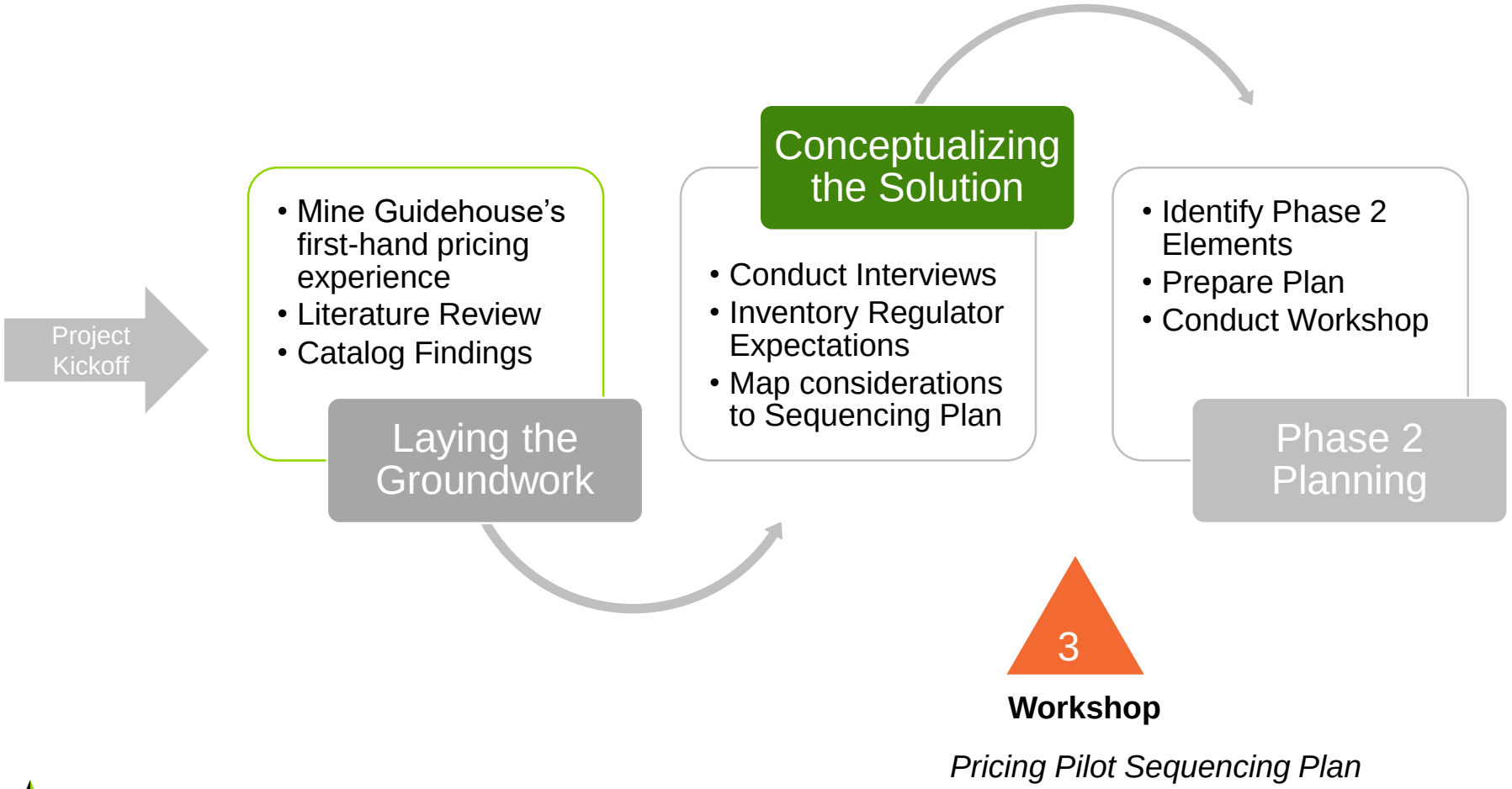
Programmatic Goals – Phased Approach

The overarching goals of the pricing pilots are to explore the efficacy of time-of-use and/or dynamic pricing designs to influence customer behavior, while providing system benefits, carbon reduction, customer cost reduction, and increased customer choice.



Phase 1 Task 3 Objectives

Conceptualizing the Solution



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Objectives and Priorities

Aligning Priorities and Objectives to Design Alternative Rates

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- Promoting EV charging for residential
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- Meaningful differences in prices such that customer actions make a difference
- Incentive-based structures (carrots instead of sticks)
- Integrate renewables

Considerations

What else should be considered as part of the design process?

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- Start with something manageable and well-supported
- Ensure that customers understand the rate, their bill, and how their actions can affect what they pay
- External stakeholders are supportive of initiatives that promote electrification
- Provide customers with more data and more current ways to pay their bills

Are there any gaps? Which three priorities are most important?

Best Practices and Lessons Learned

Ontario's Regulated Price Plan (RPP) Roadmap (1/2)

- Residential and small business (GS<50) commodity rates in Ontario are set by the regulator via its Regulated Price Plan (RPP)
- The RPP began in 2005 with an inclining block ("tiered") rate structure.
- Beginning in 2008, all consumers subject to the RPP began to be migrated to a three-period, two season time-of-use (TOU) rate.
- Evaluation determined that this rate structure was having a modest impact on summer and winter On-Peak consumption.
- A direct outcome of this evaluation was the creation of the "RPP Roadmap", a conceptual vision of how the RPP should be evolved to: better align prices with system costs, provide greater choice to consumers, deliver more significant system benefits via rates.
- In 2018, the OEB engaged four local distribution companies (or groups of companies) to pilot new price-plans and non-price informational tools.

LDC	Treatment Group	Mobile App	Enhanced TOU Ratios	Alternative TOU Structure	Variable Peak Pricing	Critical Peak Pricing	DR Enabling Technology	Enrolment Type	Sample Size	Attrition
Alectra	Enhanced TOU		●					Opt-Out	5400	9%
Alectra	Dynamic				●	●	✦	Opt-In	700	15%
Alectra	Overnight			●				Opt-In	400	10%
CustomerFirst	Enhanced TOU		●					Opt-In	600	
CustomerFirst	Seasonal TOU			●				Opt-In	450	
London Hydro	Fast-Ramp CPP and CPP/RT	✦				●	●	Opt-In	600	8%
London Hydro	RT-Only	●						Opt-In	1100	2%
Oshawa PUC	Super-Peak			●				Opt-Out	1600	22%
Oshawa PUC	Seasonal TOU with CPP			●		●		Opt-In	450	10%
Oshawa PUC	Information Only	●						Opt-In	500	4%

✦ Applies to some, but not all participants.
● Applies to all participants

Ontario's Regulated Price Plan (RPP) Roadmap (2/2)

The evaluation reports are available online:

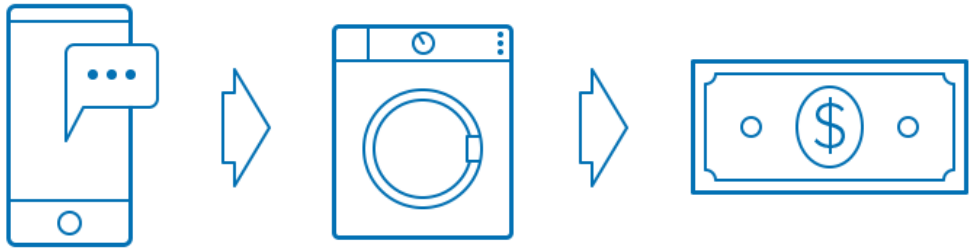
- Alectra (interim report)
- CustomerFirst (interim report)
- London Hydro (final report)
- Oshawa PUC (interim report)

Some of the key findings reported or implied by these studies include

- **Enhanced TOU.** Enhancing the existing TOU differentials resulted in no statistically significant impact on consumption, either in metropolitan suburbs (Alectra) or in northern, winter-peaking jurisdictions (CustomerFirst)
  - In Ontario, commodity costs may be as little as 40% - 60% of consumers' bill.
  - This means even extreme behavioural response will yield relatively modest bill savings.
- **Overnight.** Alectra's Overnight rate (targeting electric vehicle, EV, owners) had the most significant impact, pushing consumption up by 30% from midnight to 6am.
- **Recruitment.** Recruitment was very challenging in northern Ontario (where consumers are more likely to use electric heat, and where incomes are on average lower) – only a quarter of targeted recruitment was achieved. Participants were not offered bill protection, and rapid growth in the cost of residential electricity may have made consumers more risk-averse.
- **Engagement.** A major x-factor in achievement appears to be customer engagement: in-person drop-in support (London Hydro) and digital engagement with a mobile app (Oshawa PUC) were highly correlated with desirable outcomes.
- **Critical Peak Events.** Critical peak event impacts appear overwhelmingly driven by space conditioning end-uses. Most London Hydro participants use gas to heat their homes. Summer impacts were high and strongly correlated with weather. Winter impacts were low, uncertain, and not correlated with weather.

Incentive Options (e.g., Peak Time Rebates)

Example: PGE (Portland)



GET NOTIFIED

Customer receives a text and/or email notification the day before a Peak Time Event.

SHIFT USE

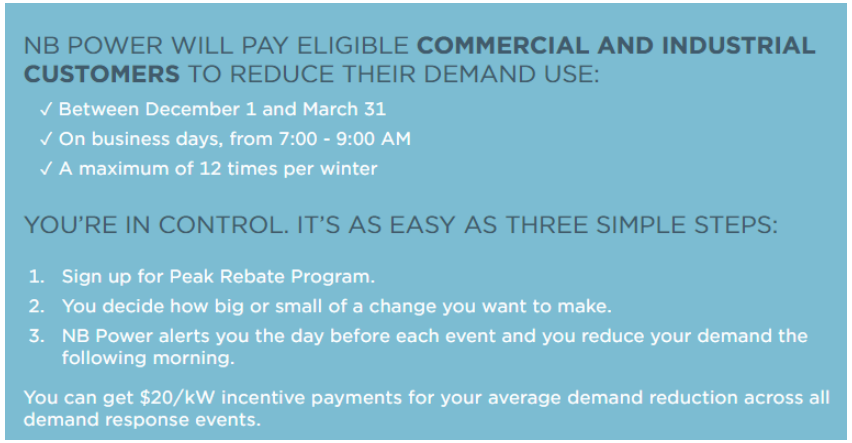
During an event, customer reduces energy use with simple changes like waiting to do laundry.

EARN REBATES

If customer reduced use during the Peak Time Event, customer is rewarded with a rebate on next bill.

Customer's energy use "baseline" is calculated from their average use over the past 10 days for the same hours of the day as the Peak Time Event. This excludes weekends, holidays and any other past Peak Time Event days. Customer earns $1 for every kilowatt hour (kWh) customer reduces below that baseline during the Peak Time Event

Example: Energie NB Power (New Brunswick)

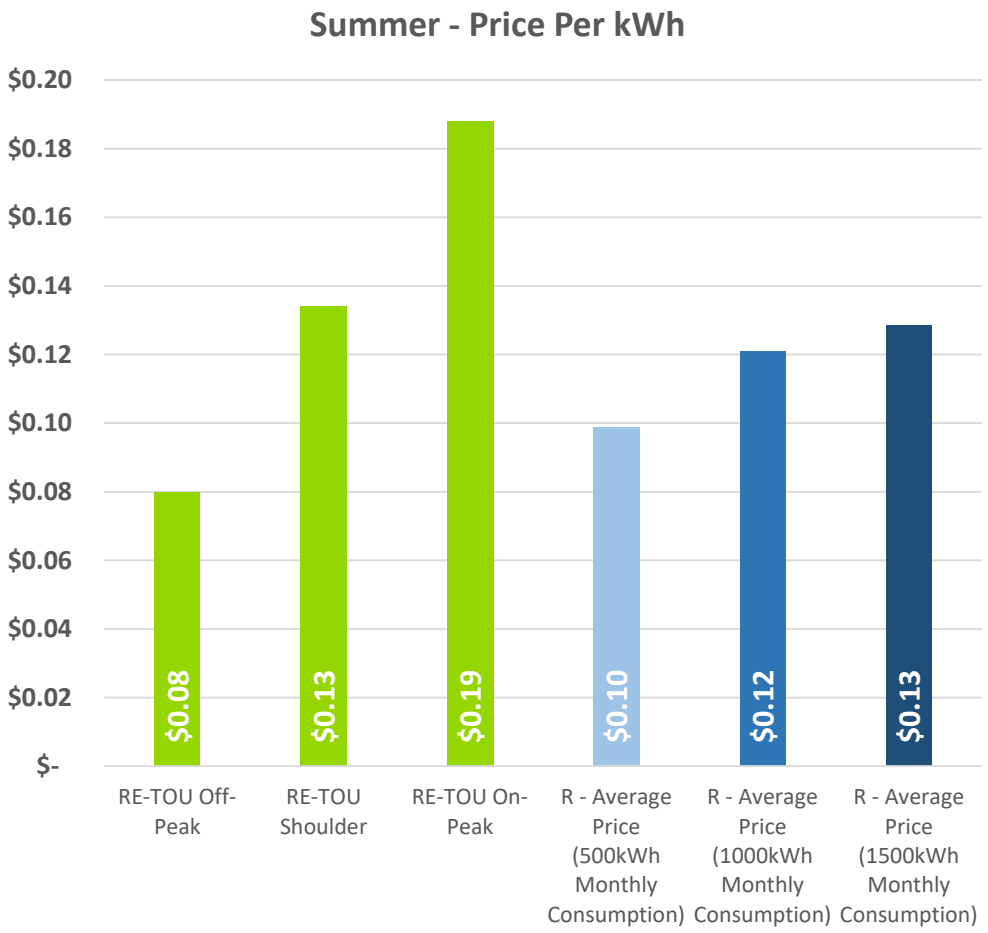


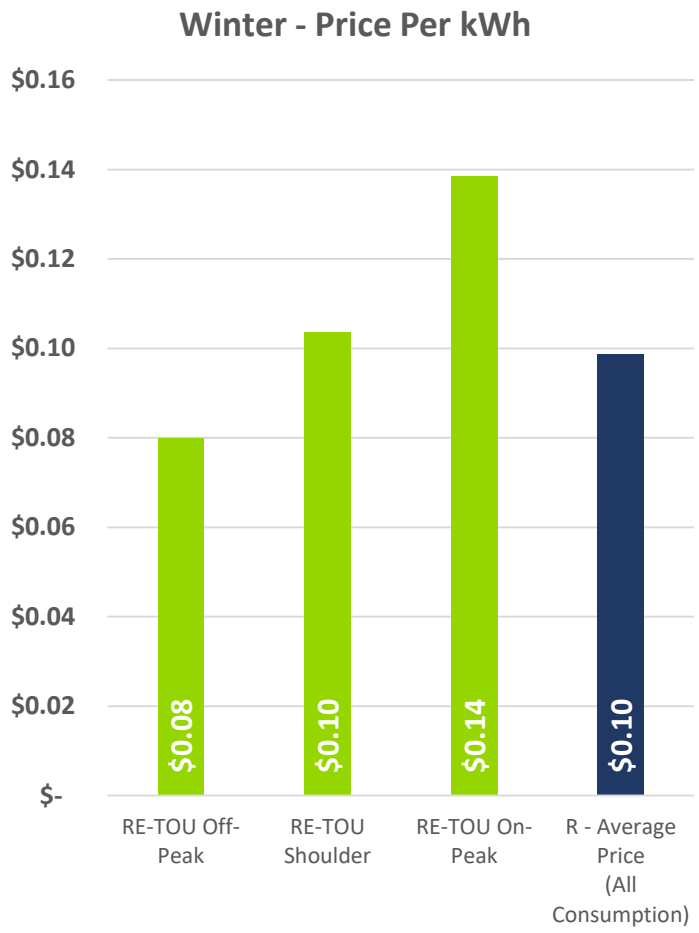
Customer decides how big or small of a demand reduction they want to make. Incentive is $20/kW for the average demand reduction across *all* demand response events. For example: **200 kW x $20/kW = $4,000 incentive payment.**

Customer must commit to a minimum reduction of 50 kWs that represents 10% or more of customer's average energy demand from 7:00-9:00 AM.

If there are no demand response events, customer is compensated $20 for 10% of their Dec. 1-March 31 average monthly peak demand between 7:00-9:00 AM. For example: Average is **1000kW x 0.10 x $20 = $2,000 (or $10,000 whichever is less)**.

Xcel Energy TOU Pilot: Bill Impacts – Transition from Tiered Rate

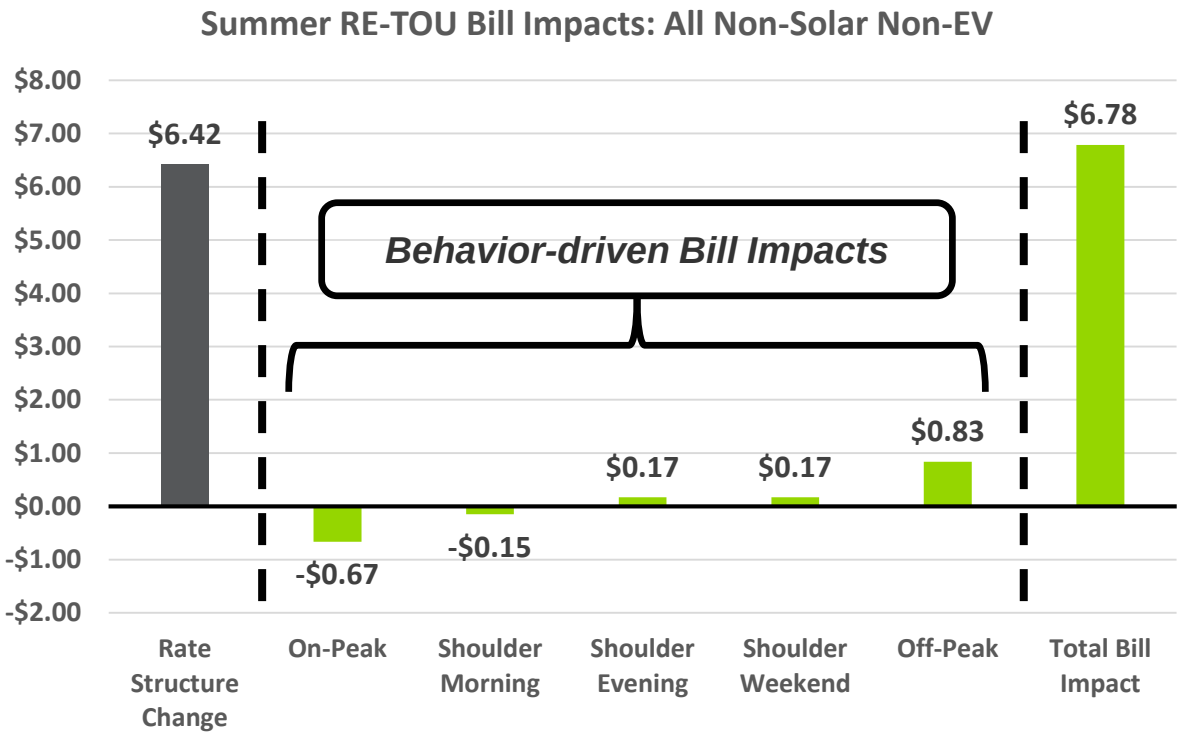


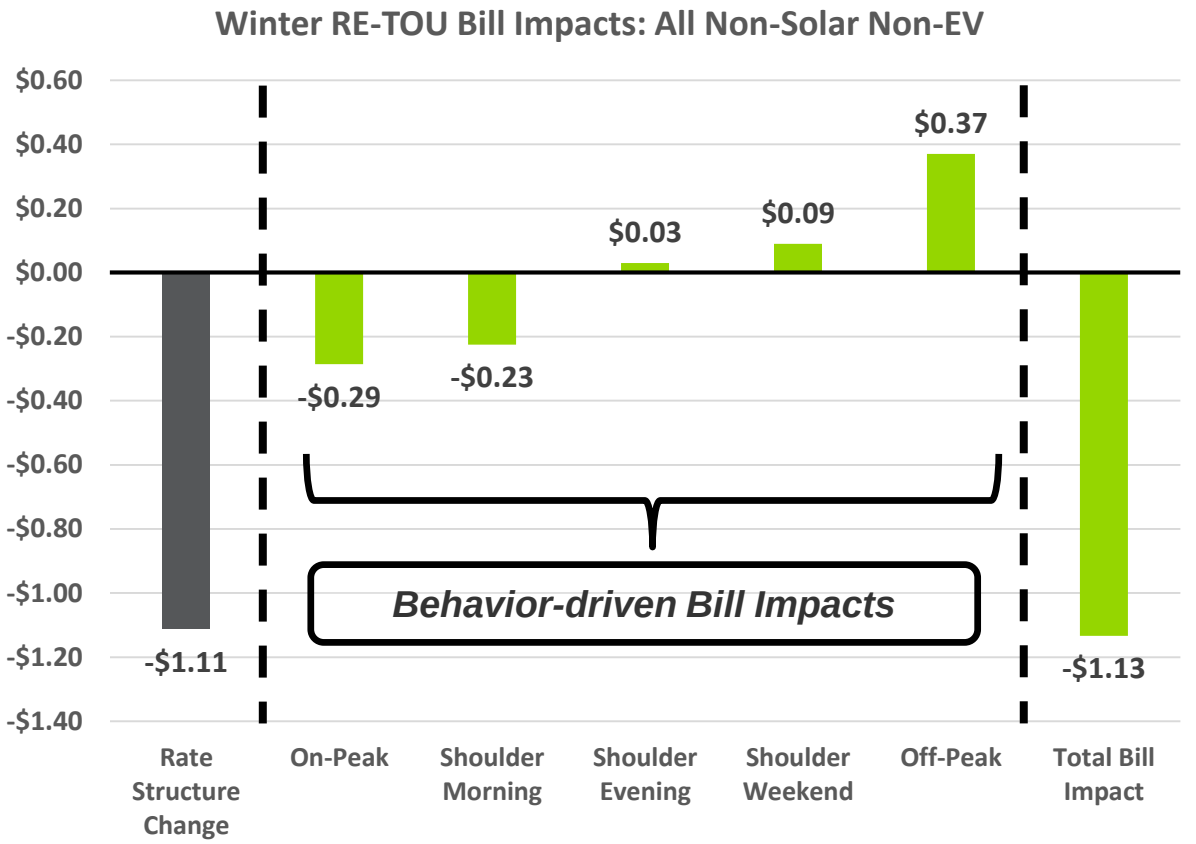


- Participants are transitioning from an R rate with an **inclining block design.**
- During the Summer, consumption up to 500 kWh on the R rate is billed at a lower price ($0.10/kWh) than consumption over 500 kWh ($0.14/kWh). This results in a **higher average price per kWh for higher consumption customers on R**.
- High consumption customers are transitioning onto TOU with a higher average price than lower consumption customers – which results in a **greater initial propensity to save money on RE-TOU**
- During the Winter, all consumption is billed at the same price on R and all customers have the same initial propensity to save money.

Xcel Energy TOU Pilot: Bill Impacts – Transition from Tiered Rate

Bill impacts are a function of the changes in rate structure and customer behavior. The net of these effects is the total bill impact.

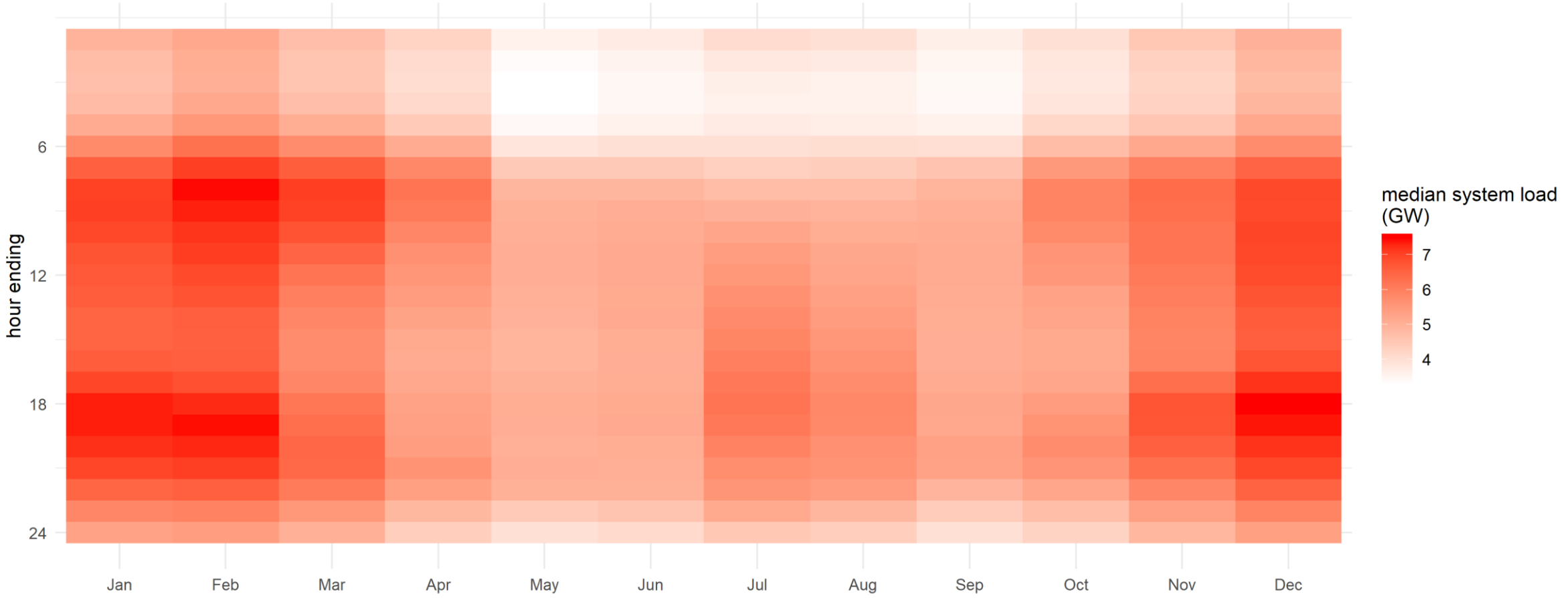




Conceptualizing TOU Rates

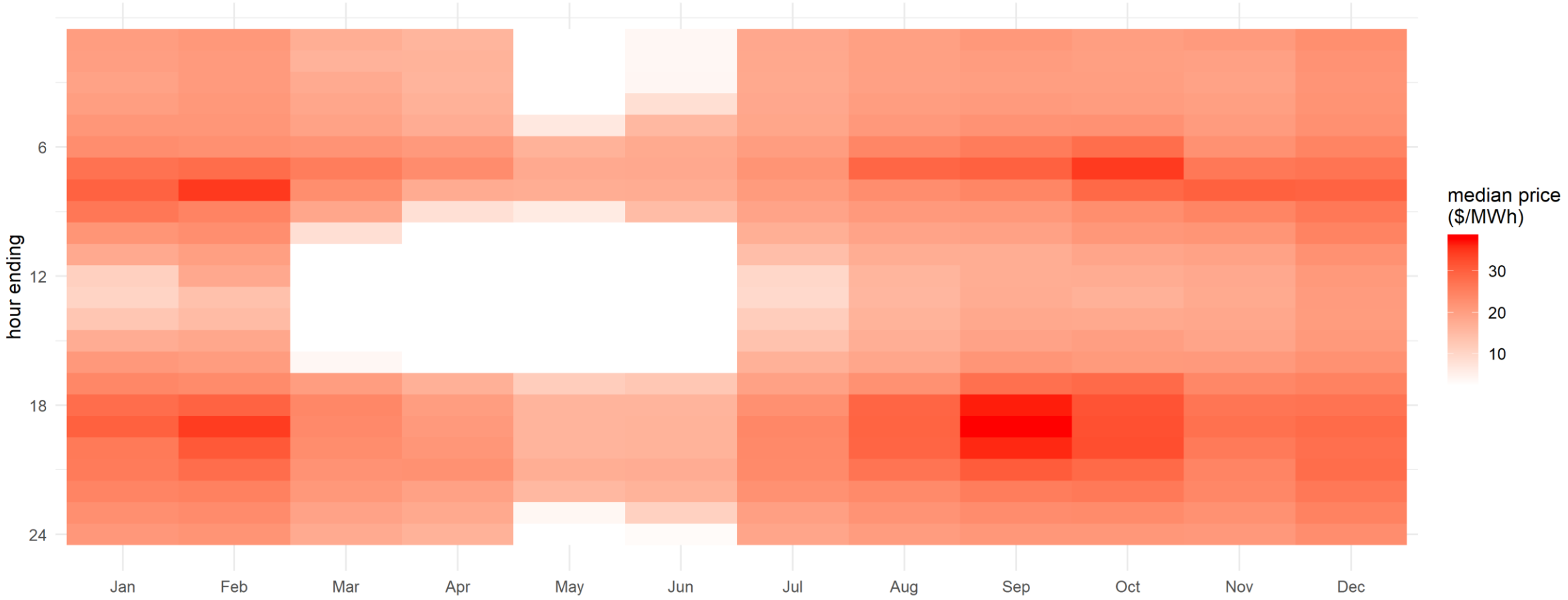
System load profile – 2019

PSE are winter-peaking

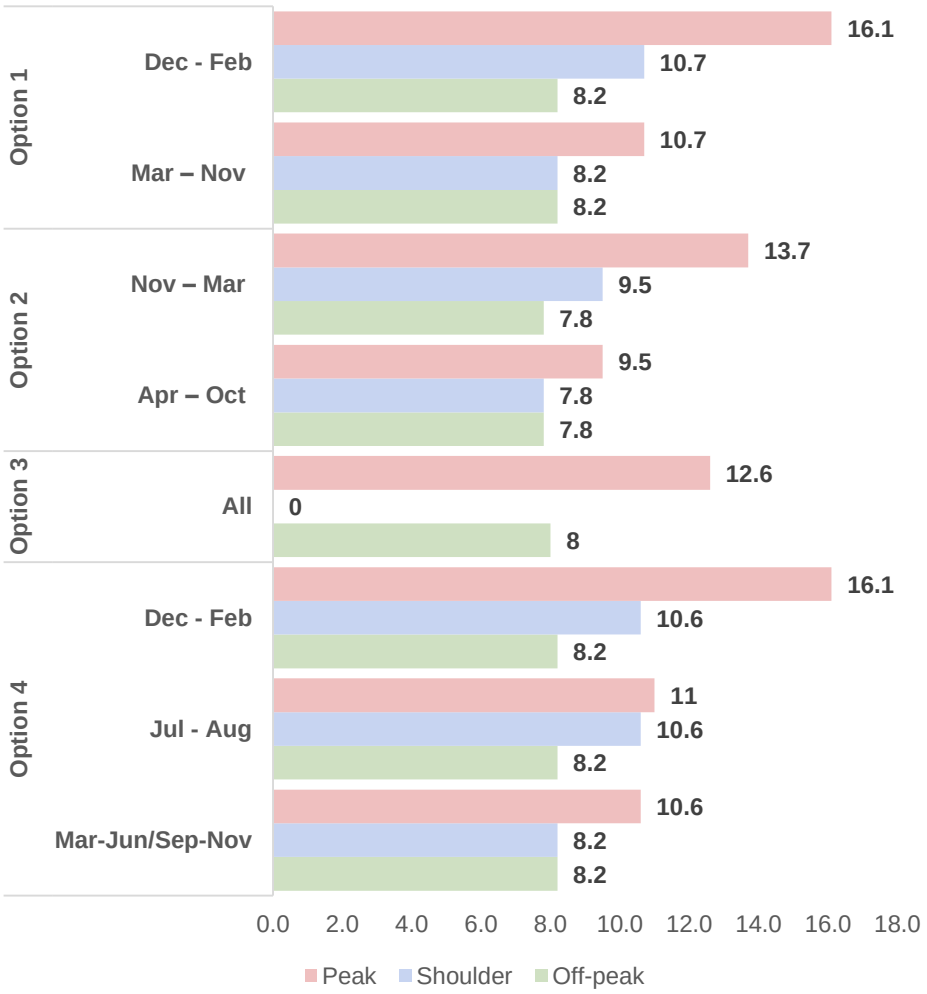


Forecast energy costs – 2021 to 2025

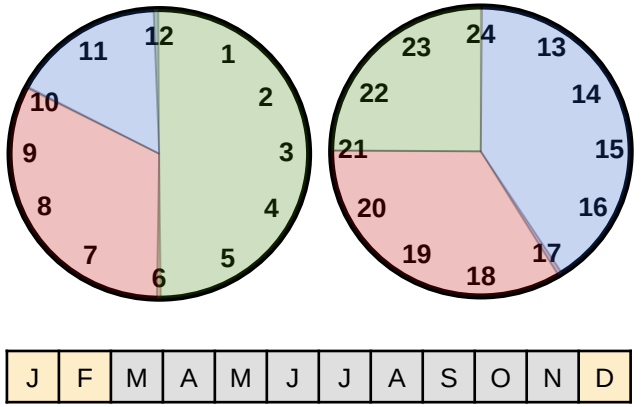
Costs show a clear dual-peak pattern



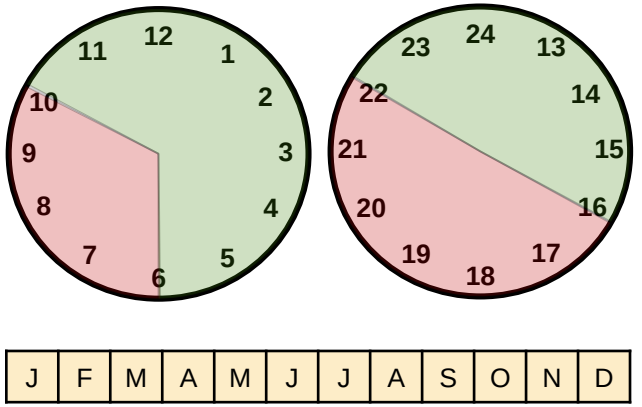
Conceptual Rates



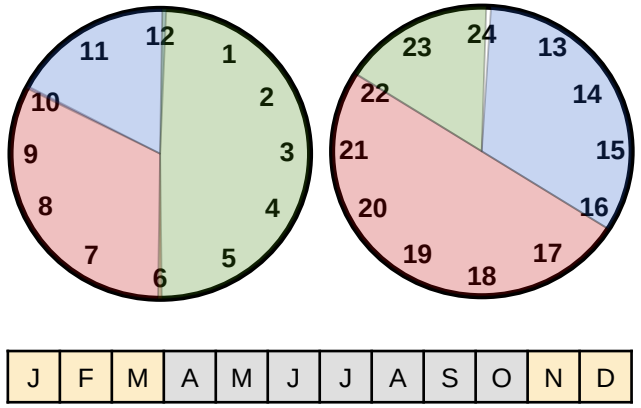
Option 1: 3 month winter, four hour peak periods



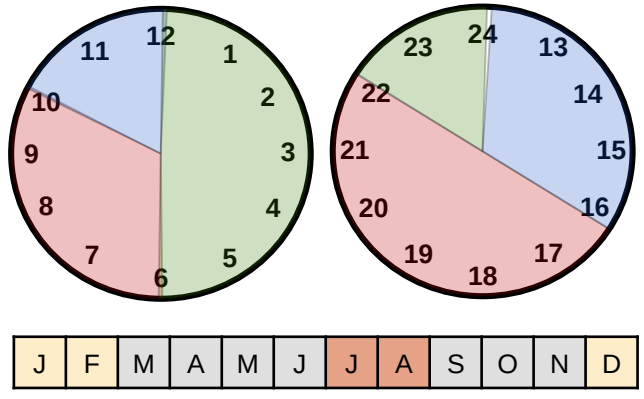
Option 3: Year round with peak periods

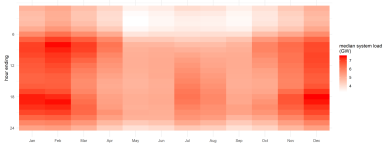


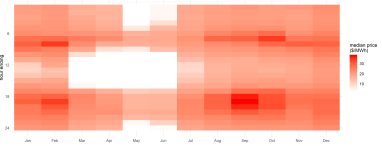
Option 2: 5 month winter, four hour peak periods



Option 4: 3 month winter plus 2 month summer

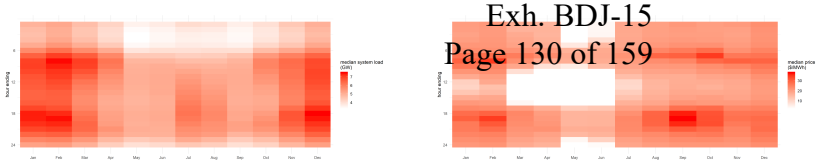






xx.x Winter
xx.x Non-Winter

Winter
Non-Winter
Summer
Shoulder
Peak
Off-Peak

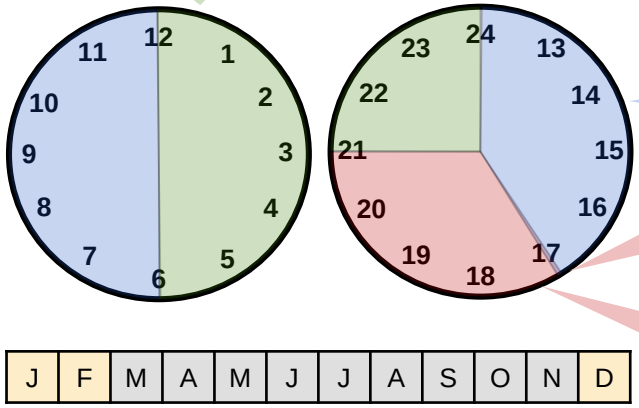


Scenario 1

Key Objectives:

1. Peak Shaving: Significant price differential
2. Customer Acceptance: Few periods and short peaks
3. Technology Support: Low cost hours for EV charging

TECHNOLOGY SUPPORT: Super off-peak rates for evening/early morning charging

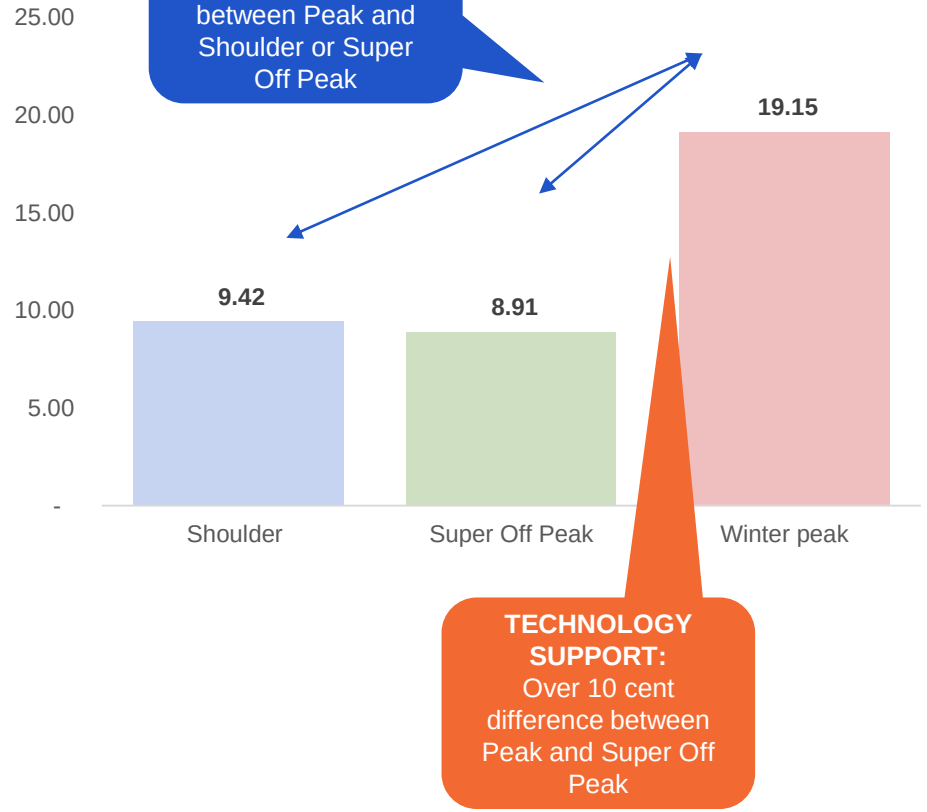


PEAK SHAVING: Peak Period prices that capture highest priced hours with low cost hours to shift to

CUSTOMER ACCEPTANCE: Short – three-hour peak period and only in the evening

CUSTOMER ACCEPTANCE: Only three-month winter peak

PEAK SHAVING: An average of ~10 cent different between Peak and Shoulder or Super Off Peak



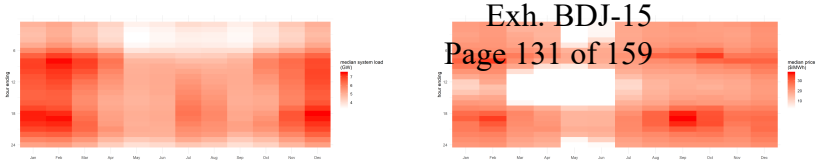
TECHNOLOGY SUPPORT: Over 10 cent difference between Peak and Super Off Peak

Winter
Non-Winter
Summer
Shoulder
Peak
Off-Peak

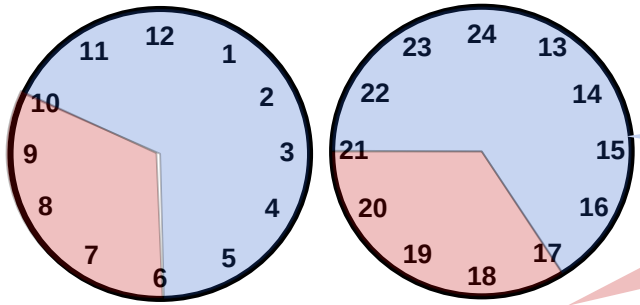
Scenario 2

Key Objectives:

1. Optimal Peak Shaving: Significant price differential
2. Cost Reflective: Avoid average rates
3. Grid Optimization: Encourage higher utilization in low cost hours

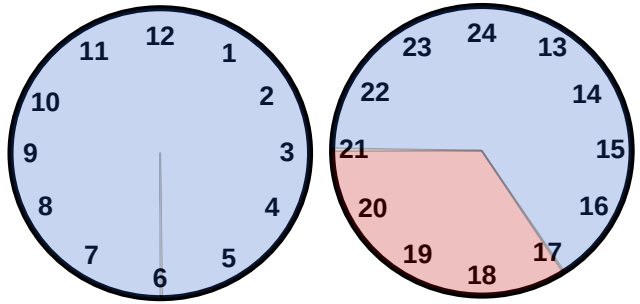


Winter Hours



OPTIMAL PEAK SHAVING: Peak Period prices that capture highest priced hours with low cost hours to shift to

Summer Hours



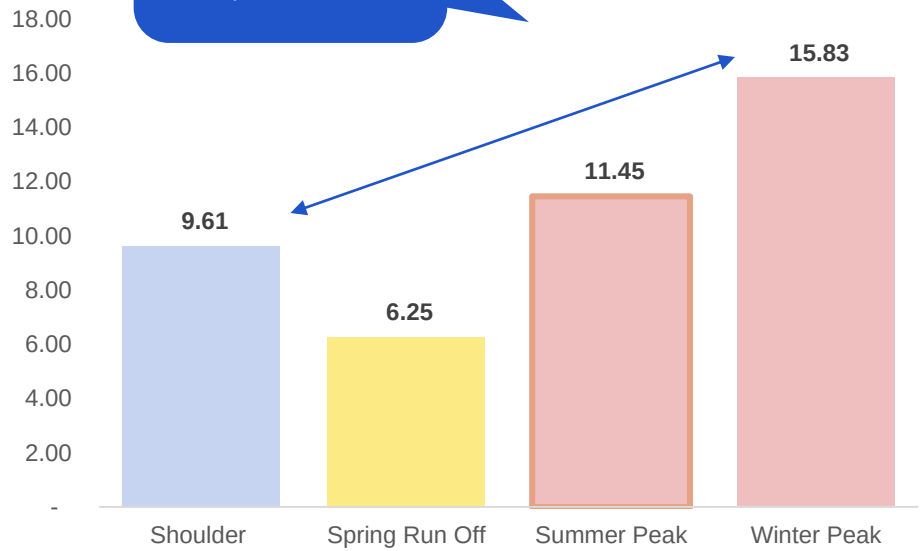
J	F	M	A	M	J	J	A	S	O	N	D

Spring Run Off Hours: Same for all hours

COST REFLECTIVE: Spring Run Off time period to capture very low-cost hours

COST REFLECTIVE: Summer season to reflect summer peak costs

PEAK SHAVING: About six cents Peak and Shoulder or Super Off Peak



GRID OPTIMIZATION: Encourage customers to consume when prices are low from hydro generation

Winter | Non-Winter | Summer

Spring Run Off | Shoulder | Peak | Off-Peak

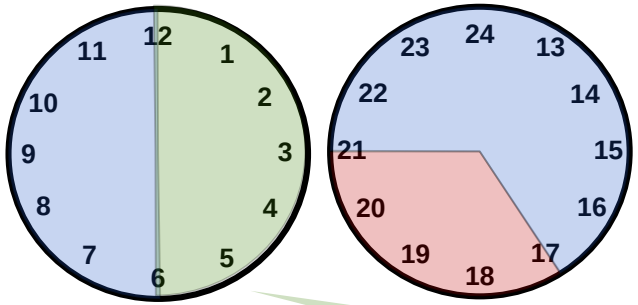
Guidehouse

Scenario 3

Key Objectives:

1. Focus on EV: Significant price differential
2. Cost Reflective: Avoid average rates
3. Grid Optimization: Encourage higher utilization in low cost hours

All HOU



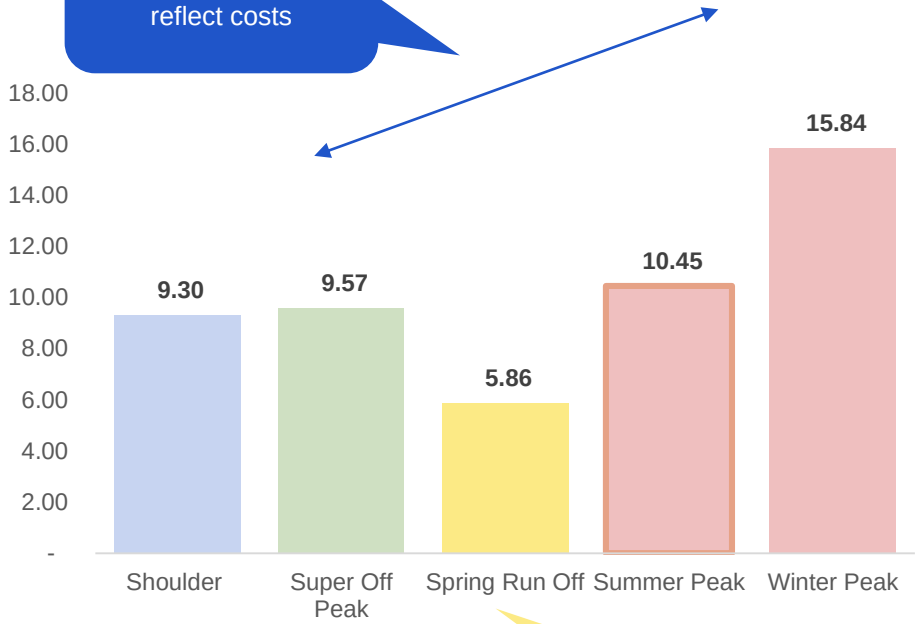
FOCUS on EV: Super Off-Peak period for EV charging

COST REFLECTIVE: Spring Run Off time period to capture very low-cost hours

COST REFLECTIVE: Summer season to reflect summer peak costs

Winter Non-Winter Summer

COST REFLECTIVE: Periods designated to reflect costs

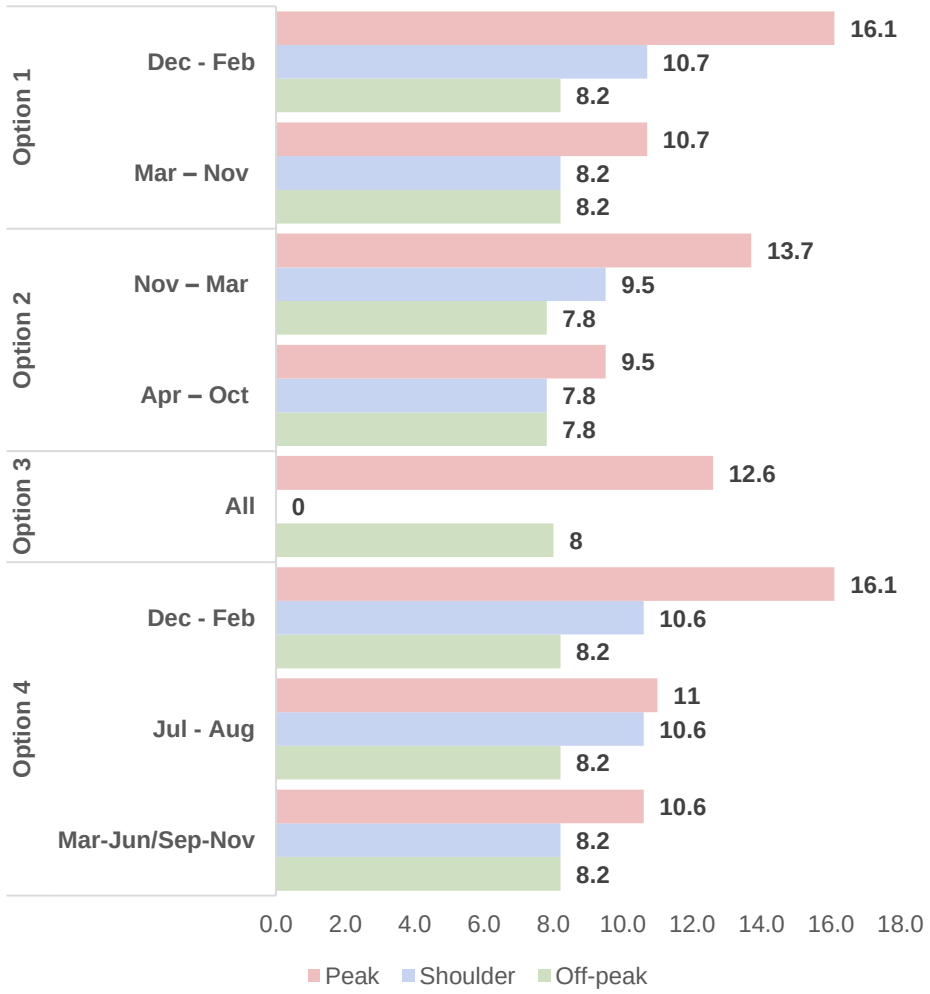


GRID OPTIMIZATION: Encourage customers to consume when prices are low from hydro generation

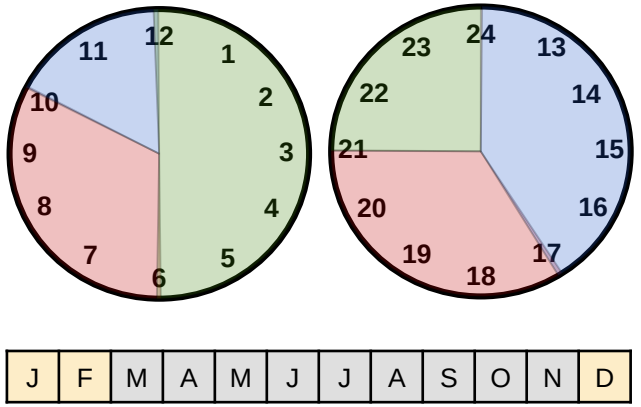
Spring Run Off Shoulder Peak Super Off-Peak

Guidehouse

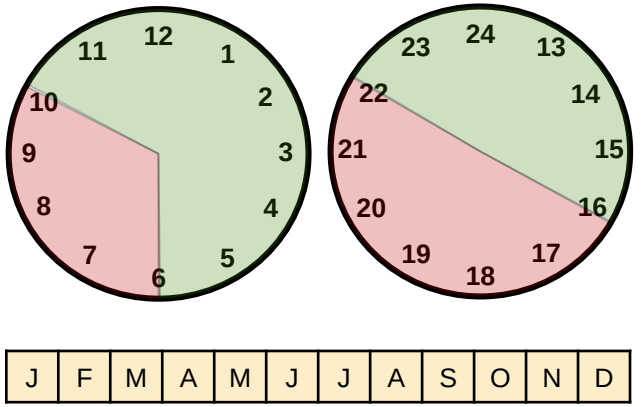
Review of Options



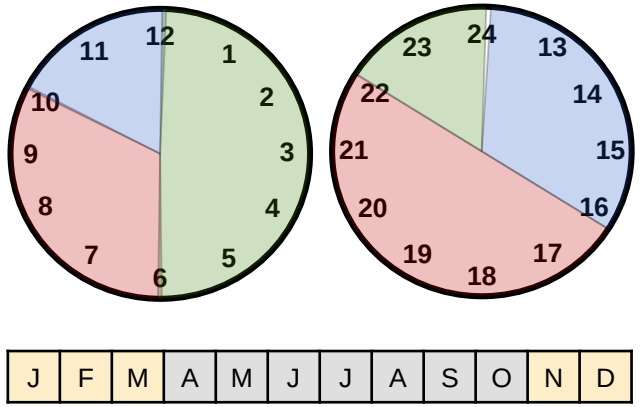
Option 1: 3 month winter, four hour peak periods



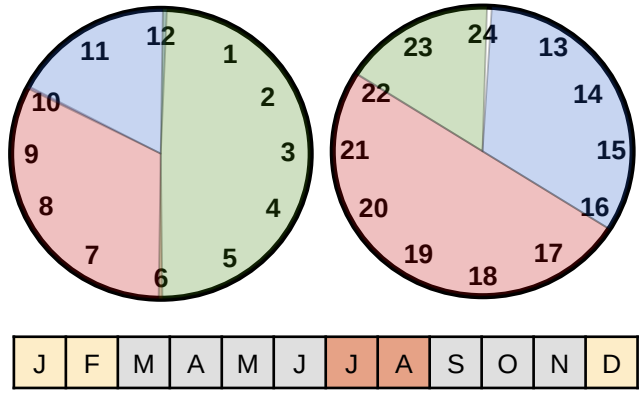
Option 3: Year round with peak periods

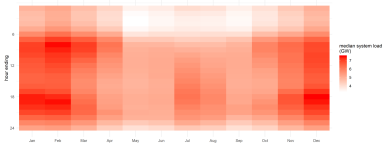


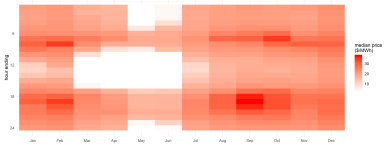
Option 2: 5 month winter, four hour peak periods



Option 4: 3 month winter plus 2 month summer







xx.x Winter
xx.x Non-Winter

Winter
Non-Winter
Summer
Shoulder
Peak
Off-Peak

B.3 Workshop: Rate Design Concepts and Phase 2 Planning

Guidehouse

Alternative Pricing Roadmap and Pilot Design

Workshop #3
Rate Design Concepts and Phase 2 Planning

September 10, 2020

Meeting Objectives and Agenda

Agenda Topic	Objective	Start Time	End Time
Review of Objectives & Priorities	Review alternative rate objectives and priorities	1:00	1:15
Putting the Pieces Together	Share rate designs that consider goals, objectives, principles and PSE's data	1:15	2:00
Discussion and Next Steps	Obtain feedback on rate designs and review Phase 2 approach	2:00	2:30

Objectives and Priorities

Aligning Priorities and Objectives to Design Alternative Rates

Drivers

What is driving the effort to offer alternative rates?

- Increased customer choice
- Regulatory / Commission direction
- Demonstrating AMI benefits
- Driving cost reductions
- Incorporating renewables at lowest cost

Priorities

What are the key priorities that inform the rate design?

- Three time periods (Commission)
- Design for future expected load patterns
- Mitigate peak impacts
- Rate are easily understood by customers
- Cost causation and cost-based rates
- Design grounded in PSE's data
- Residential and Commercial rates
- Promoting EV charging for residential
- Promoting EV charging for commercial
- Meaningful differences in prices such that customer actions make a difference
- Incentive-based structures (carrots instead of sticks)
- Integrate renewables

Considerations

What else should be considered as part of the design process?

- Look to winter peaking examples and best practices
- Start with something manageable and well-supported
- Ensure that customers understand the rate, their bill, and how their actions can affect what they pay
- External stakeholders are supportive of initiatives that promote electrification
- Provide customers with more data and more current ways to pay their bills

Priorities Feedback from Working Groups

Priorities

What are the key priorities that inform the rate design?

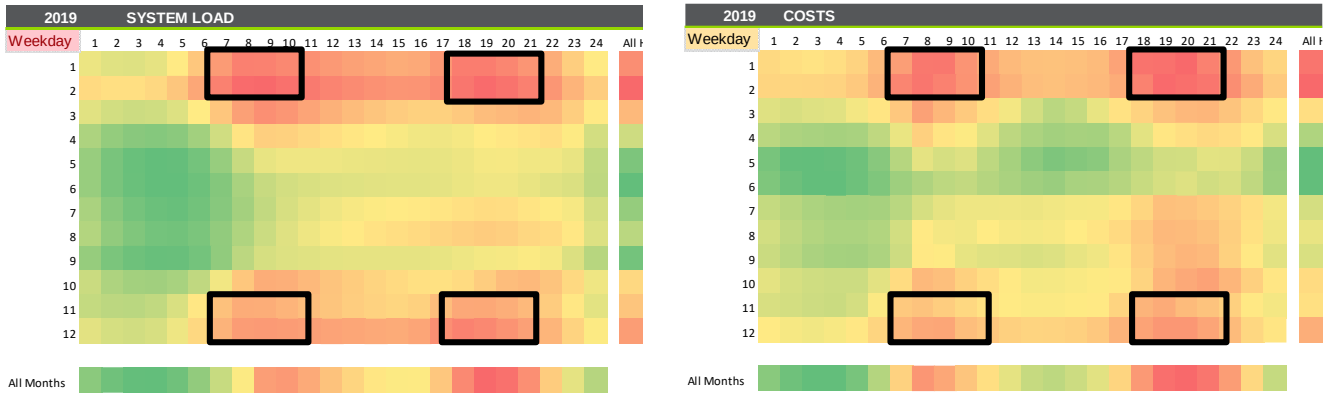
1. **Rate are easily understood by customers (11)**
2. **Meaningful differences in prices such that customer actions make a difference (9)**
3. Cost causation and cost-based rates (6)
4. Design grounded in PSE's data (5)
5. Mitigate peak impacts (5)
6. Integrate renewables (4)
7. Design for future expected load patterns (4)
8. Residential and Commercial rates (3)
9. Incentive-based structures (3)
10. Three time periods (0)
11. Promoting EV charging for residential (0)
12. Promoting EV charging for commercial (0)

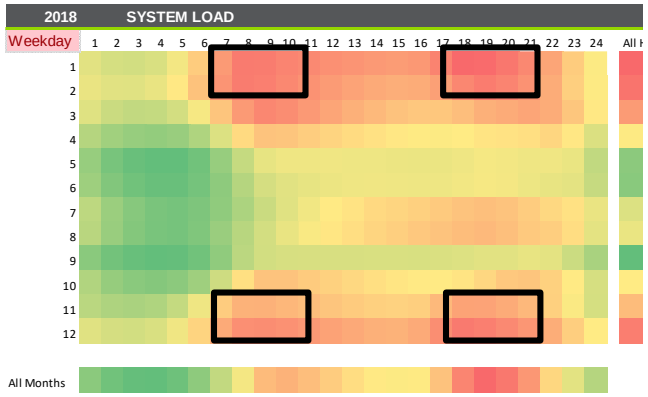
PSE Internal stakeholders want easy-to-understand rates with meaningful price differences

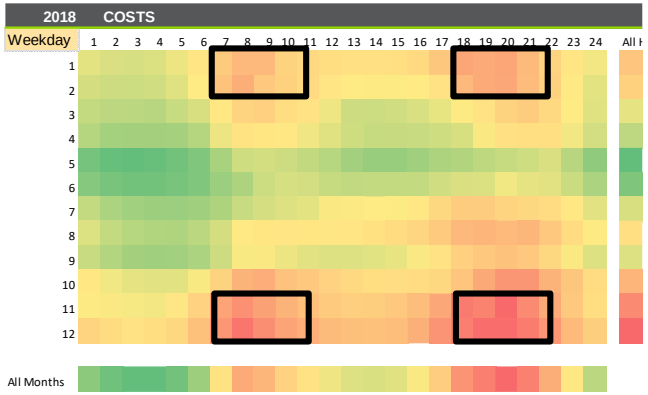
Rate Design Concepts

Conceptual Rate Designs – Two TOU Periods

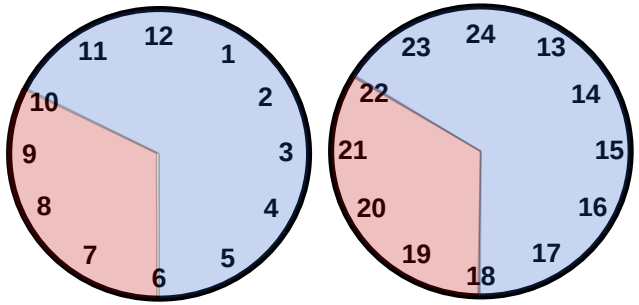
- **Potential Option 1:**
  - Winter peaking with highest priced hours between 7am-11am and 6pm-10pm
  - Peak months between Nov-Feb





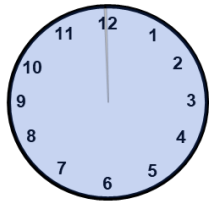


Winter



J	F	M	A	M	J	J	A	S	O	N	D

All other seasons 'off peak'



	2018		2019	
	SC 7	SC 24	SC 7	SC 24
Monthly	$ 7.55	$ 6.06	$ 7.55	$ 6.06
Peak	$ 0.1708	$ 0.1783	$ 0.1530	$ 0.1646
Off-Peak	$ 0.0870	$ 0.0775	$ 0.0889	$ 0.0791
Differential	$ 0.0838	$ 0.1007	$ 0.0641	$ 0.0855

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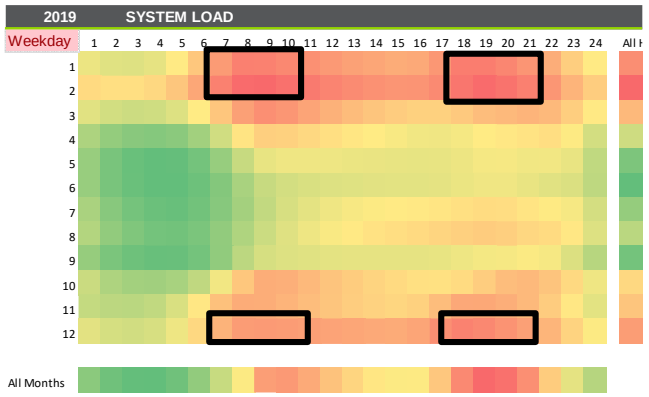
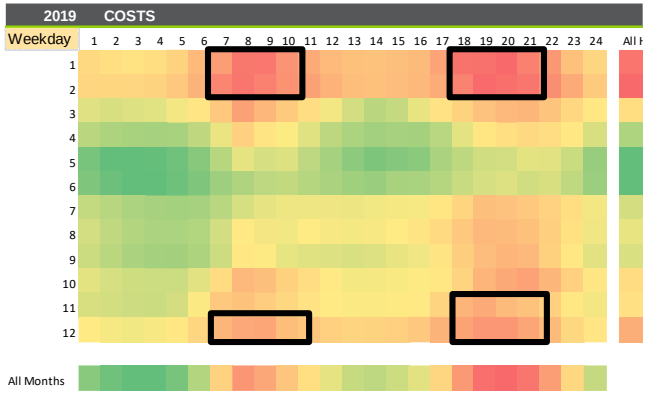
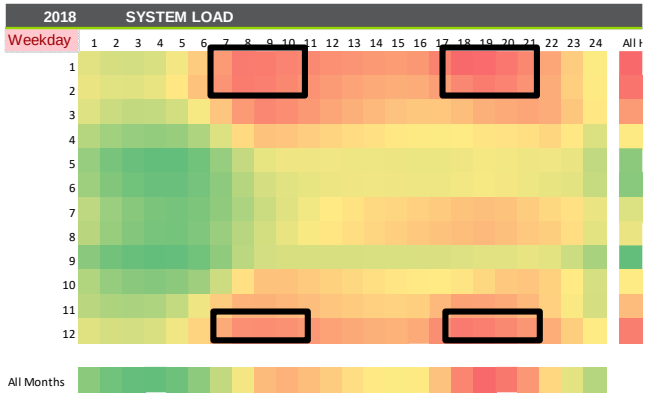
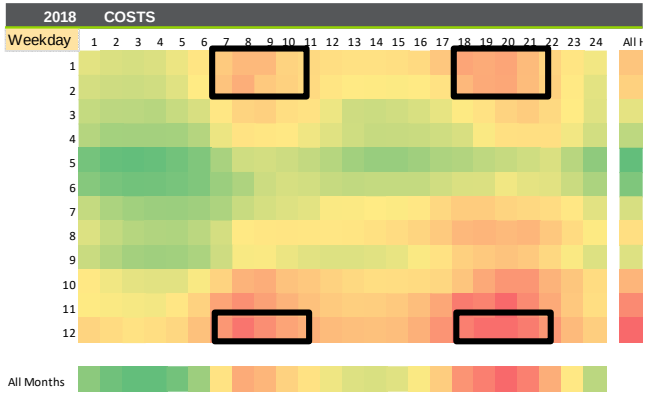
Conceptual Rate Designs – Two TOU Periods

- **Potential Option 2:**
  - Same as Option 1 but with shorter Winter Season
  - Winter peaking with highest priced hours between 7am-11am and 6pm-10pm
  - Peak months between Dec-Feb









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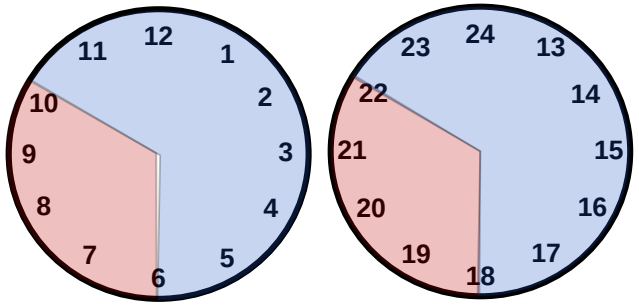
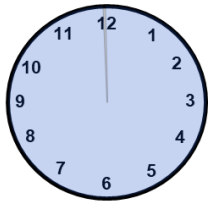


J	F	M	A	M	J	J	A	S	O	N	D

All other seasons 'off peak'



	2018		2019	
	SC 7	SC 24	SC 7	SC 24
Monthly	$ 7.55	$ 6.06	$ 7.55	$ 6.06
Peak	$ 0.1821	$ 0.1924	$ 0.1684	$ 0.1841
Off-Peak	$ 0.0883	$ 0.0789	$ 0.0892	$ 0.0795
Differential	$ 0.0939	$ 0.1135	$ 0.0792	$ 0.1045

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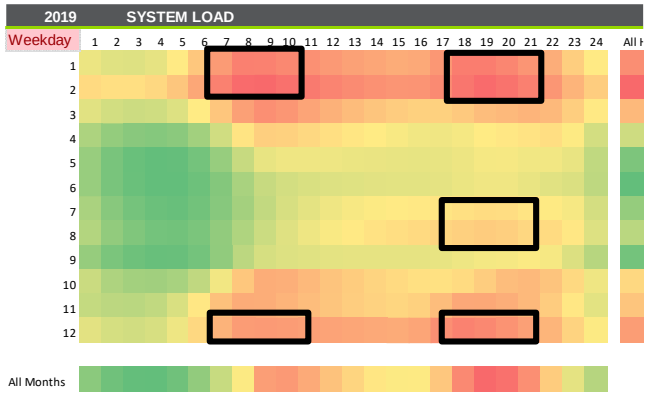
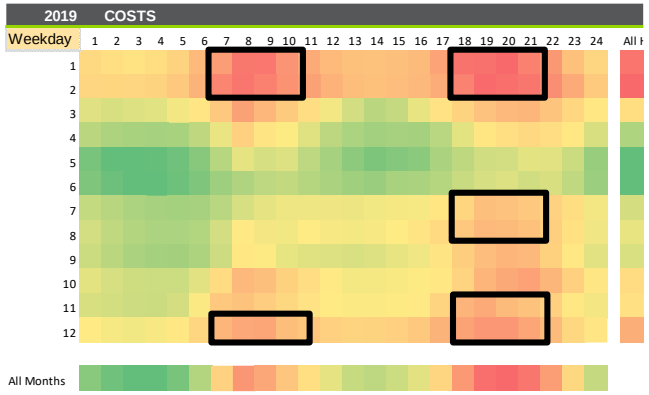
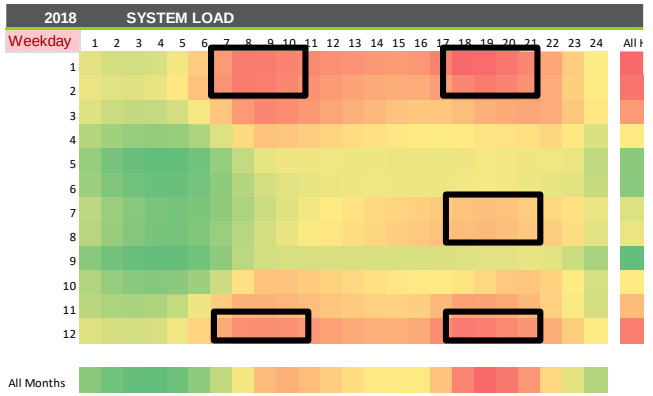
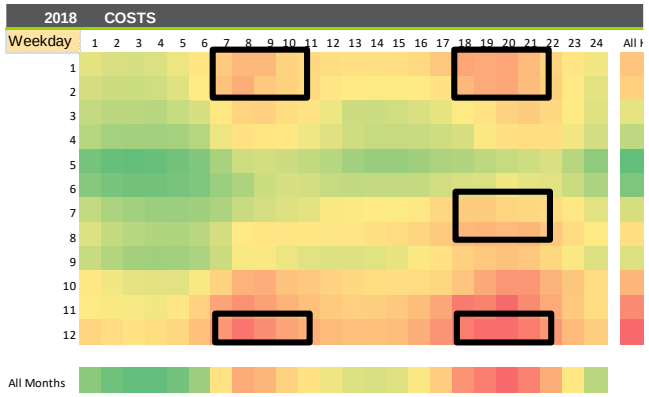
Conceptual Rate Designs – Two TOU Periods

- **Potential Option 3:**
  - Same as Option 2 but peak periods starting one hour earlier, and includes a summer peak
  - Winter peaking with highest priced hours between 6am-10am and 5pm-9pm
  - Peak months between Dec-Feb

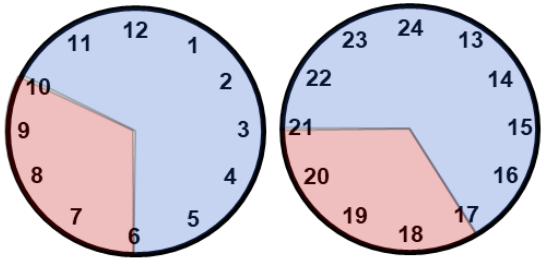


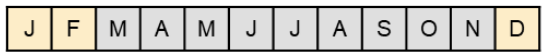




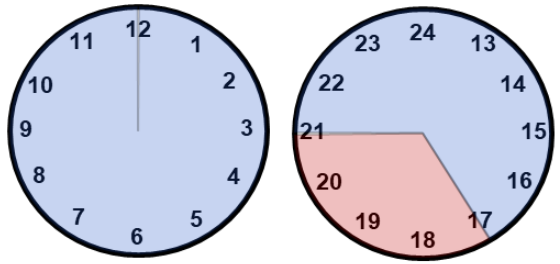


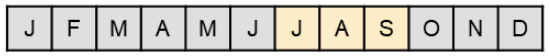
Winter



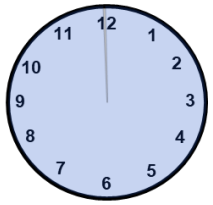


Summer





All other seasons 'off peak'



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Peak	$ 0.1821	$ 0.1924	$ 0.1684	$ 0.1841
Off-Peak	$ 0.0874	$ 0.0778	$ 0.0883	$ 0.0784
Summer Pk	$ 0.1047	$ 0.0999	$ 0.1068	$ 0.1051
Differential WP	$ 0.0947	$ 0.1146	$ 0.0801	$ 0.1057
Differential SP	$ 0.0173	$ 0.0221	$ 0.0185	$ 0.0267

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Conceptual Rate Designs – Tiered Prices with CPP

- 2018 data shows average price per kWh was 2.583 cents/kWh
- Design is incremental to current tiered rate and of considers two factors:
  - Number of Critical Peak Events
  - Duration of event
- Event can occur any day of the year and for any contiguous period equal to prescribed duration
- Rebate based on savings within the calendar year, thus based only on avoided energy costs – and do not include avoided capacity costs
- To incorporate avoided costs, CP events would have to be reliable for system planning

Scenarios show that savings are greatest for less events and shorter duration to capture the highest priced hours, on average

Option 1

Events per Year	15
Duration of Event	4
CPR per kWh	$ 0.03413
Percent Discount to all Rates	99%

Option 2

Events per Year	10
Duration of Event	4
CPR per kWh	$ 0.03494
Percent Discount to all Rates	99%

Option 3

Events per Year	10
Duration of Event	6
CPR per kWh	$0.03035
Percent Discount to all Rates	99%

TOU Preferences

Number of Periods

- Three season, two periods each in Winter, Summer and Shoulder months
- Two seasons, two periods in Winter, one period all other months
- Three seasons, two period Winter, two period Shoulder and one period Summer
- Three season and two periods each season

Winter Periods

- Two peak periods (morning and evening)
- One peak period – morning only
- One peak period, evening only

Period Duration

- Three hours
- Four hours
- Five hours
- Six hours
- More than six

Price Differential

- 10 cents (2:1)
- 8 cents
- 6 cents
- 4 cents
- 2 cents

Lowest Price

- 9 cents
- 8 cents
- 6 cents

Highest Price

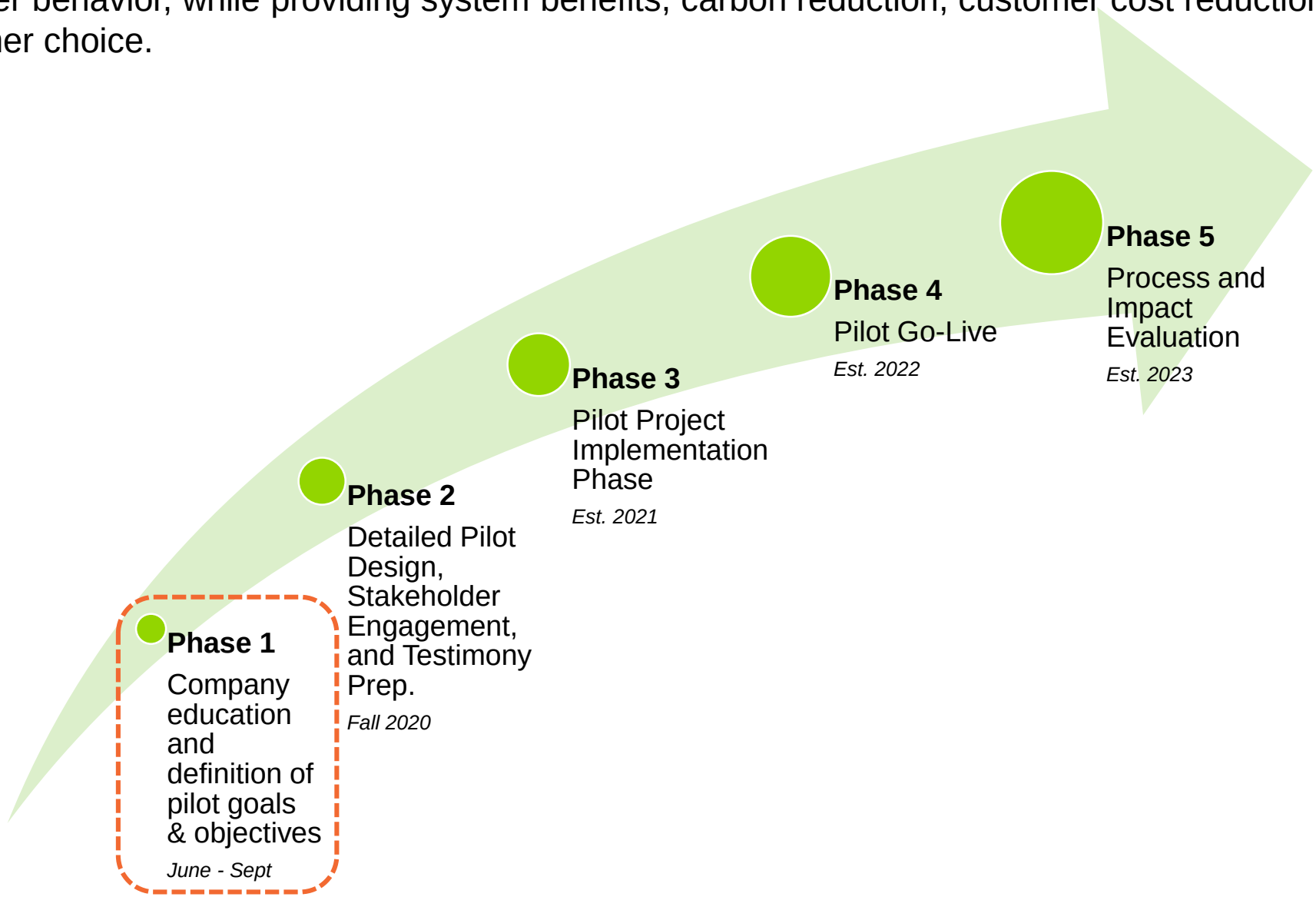
- 19 cents
- 17 cents
- 15 cents
- 12 cents

Current rate ~11 cents

Next Steps

Programmatic Goals – Phased Approach

The overarching goals of the pricing pilots are to explore the efficacy of time-of-use and/or dynamic pricing designs to influence customer behavior, while providing system benefits, carbon reduction, customer cost reduction, and increased customer choice.



Recommended Phase 2 Approach

Detailed Pilot Design and Stakeholder Outreach

Initial Stakeholder Outreach

- Focus on alignment of goals and objectives

Detailed Data Analysis and Rate Design

- Detailed analysis of cost and load data
- Finalize cost allocation approach

Internal Workshops

- Review rate options with PSE internal stakeholders (IT, Billing, Customer Care)
- Confirm feasibility and timeline

Follow-up Stakeholder Outreach

- Present rate concepts for prioritization and feedback

Detailed Pilot Design

- Detailed pilot design
- Evaluation and sample design
- Conduct customer research to test pilot design

B.4 Workshop: Alternative Rates Vision and Roadmap

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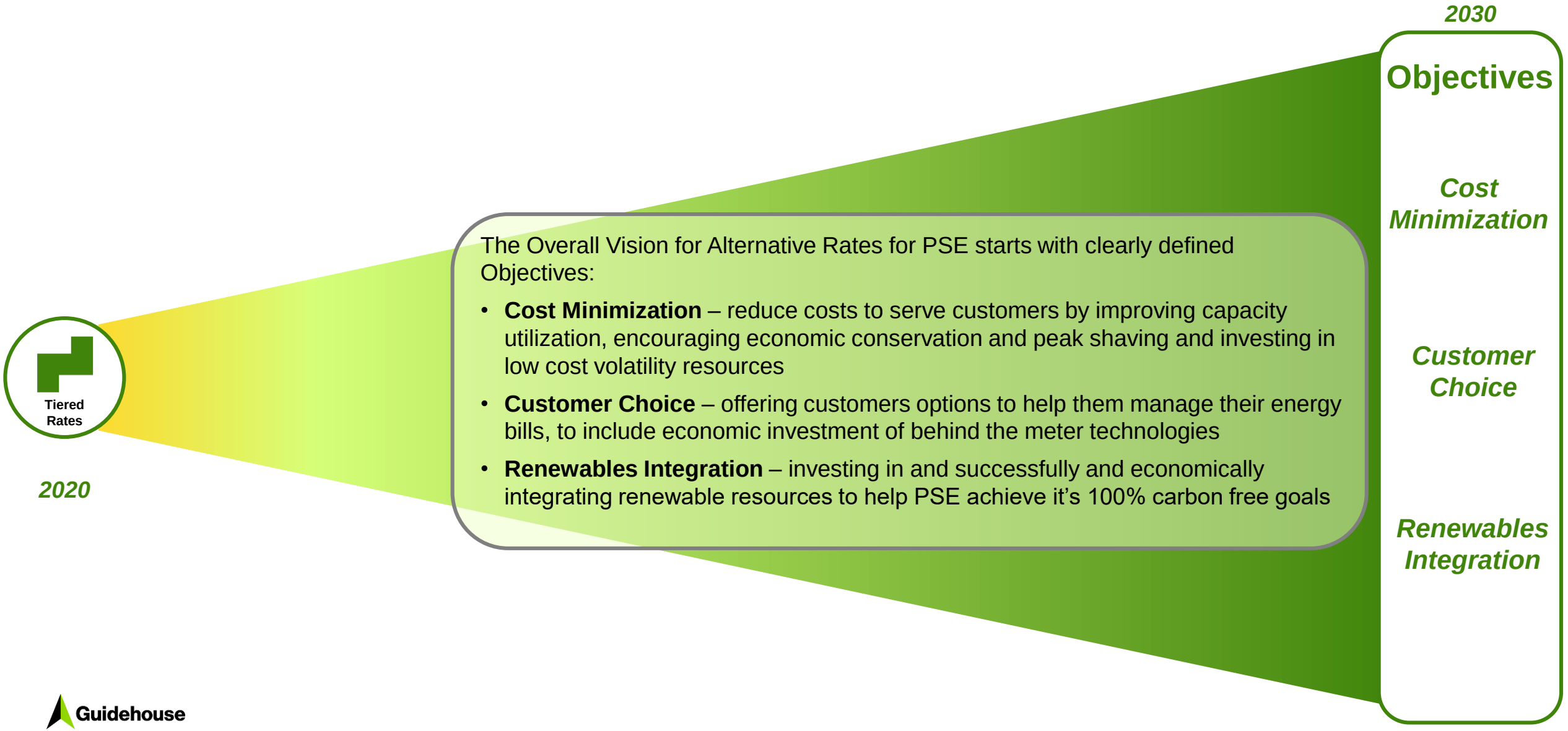
Alternative Pricing Roadmap and Pilot Design

Workshop #3 – Part II
2030 Vision and Roadmap –
Draft for Discussion

September 29, 2020

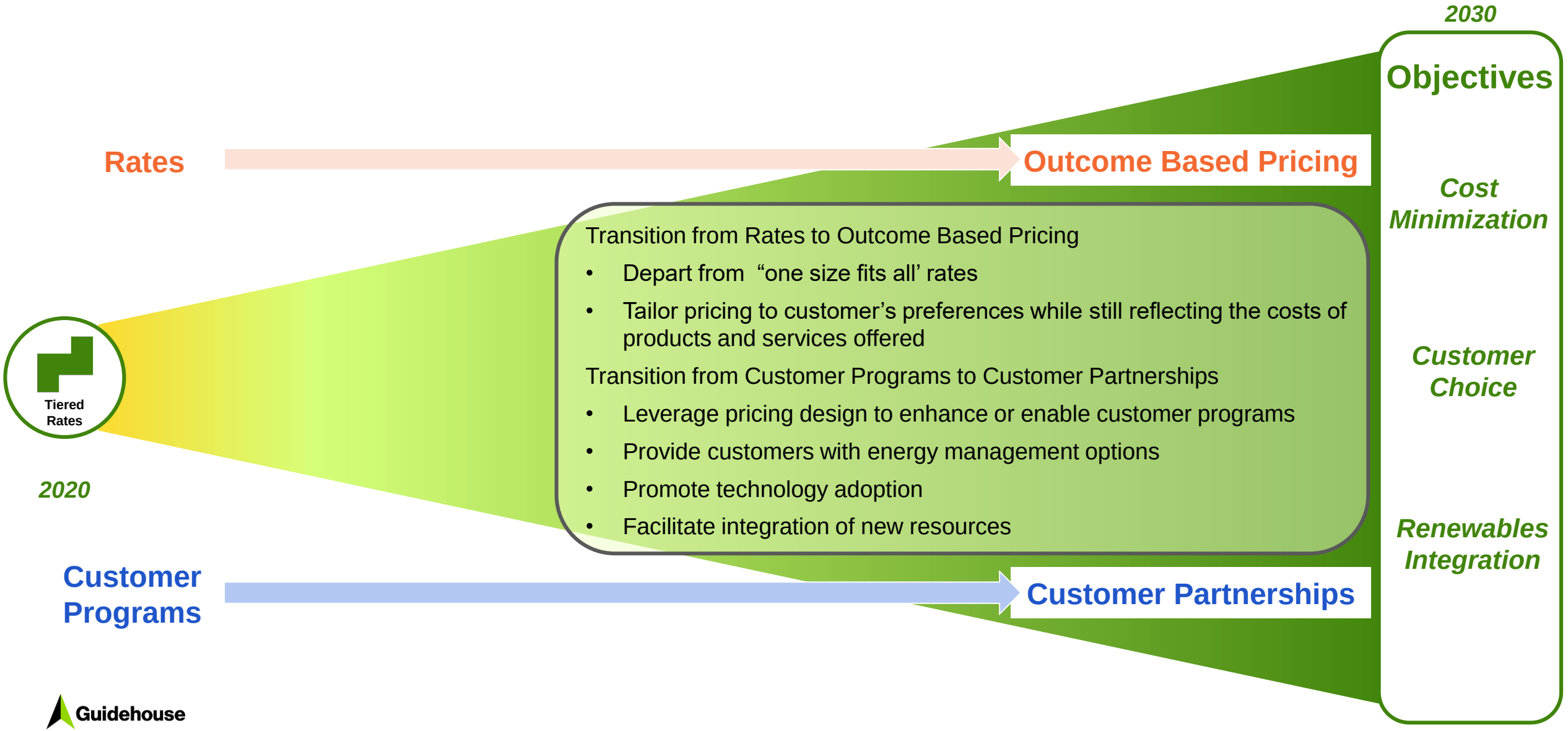
Objectives



The Overall Vision for Alternative Rates for PSE starts with clearly defined Objectives:

- **Cost Minimization** – reduce costs to serve customers by improving capacity utilization, encouraging economic conservation and peak shaving and investing in low cost volatility resources
- **Customer Choice** – offering customers options to help them manage their energy bills, to include economic investment of behind the meter technologies
- **Renewables Integration** – investing in and successfully and economically integrating renewable resources to help PSE achieve it's 100% carbon free goals

Goals


2030
Objectives
Rates
Outcome Based Pricing
Cost Minimization
Transition from Rates to Outcome Based Pricing
• Depart from "one size fits all' rates
• Tailor pricing to customer's preferences while still reflecting the costs of products and services offered
Transition from Customer Programs to Customer Partnerships
• Leverage pricing design to enhance or enable customer programs
• Provide customers with energy management options
• Promote technology adoption
• Facilitate integration of new resources
Tiered Rates
Customer Choice
2020
Renewables Integration
Customer Programs
Customer Partnerships

Outcomes

Rates → Outcome Based Pricing

Customer Programs → Customer Partnerships

2020 — 2028-30 — 2030

Tiered Rates

To achieve Outcome Based Pricing, PSE will need a Suite of Pricing Options

- These options are currently available, but many are not offered
- Some options are trends in the industry in pricing (e.g., subscription rate)
- All options are cost based and provide customers with clear price signals
- ***These pricing options are not all rates to be considered, but generally represent the types of options that should be considered in a pricing roadmap***

To achieve Customer Partnerships, PSE will need a Suite of Price Enabled Programs

- These programs couple traditional DSM programs with pricing options (e.g., price discounts for energy efficiency measures)
- These programs also focus on incenting early technology adoption and use rate design to compliment and enhance the program
- ***These program options are not all the options available and many are already in effect or being designed and tested, but generally represent the suite of options available***

Outcomes

Suite of Pricing Options

TOU Rates; Low Income Support; Two-way Flow Rates; Targeted Class Rates; Critical Peak Rebates; Green Rates; Subscription Rate; Stand-by Rates

Suite of Price Enabled Programs

Storage; EV's; Beneficial Electrification; Energy Efficiency; Peak Shaving; Demand Response; Renewables Optimization; Micro Grids

Objectives

- ***Cost Minimization***
- ***Customer Choice***
- ***Renewables Integration***

Sequencing – Prepare, Plan and Engage

Rates → Outcome Based Pricing

Customer Programs → Customer Partnerships

2020 — 2021 — 2028-30 — 2030

Plan and Outreach

Outcomes

Objectives

Tiered Rates

Stakeholder Outreach

Pricing Roadmap

Customer Journey Map

Pilot Design

Regulatory Strategy

Customer Research

- This stage is already underway with internal Stakeholder engagement.
- Other activities should be completed by end of 2021

The first step towards achieving these goals and outcomes is to **Prepare, Plan and Engage**

- Prepare internally for potential changes by identifying and engaging key internal stakeholder and establishing objectives and goals and outcomes (Phase 1 of PSE's current plan)
- Plan for the future state, which includes a pricing roadmap, a customer journey map, and a regulatory strategy
  - Pricing roadmap outlines the pricing options to pursue and the timing of those pursuits
  - Customer Journey Map is creating a path to engage customers and create programs that address emerging needs while achieving PSE's goals
- Develop Regulatory strategy outlines the sequence of filings and asks to achieve the two end-state 'Suites'
- Engage stakeholders and customers
  - Create forums to reach out to regulators, customer advocates and special interest groups to understand their objectives and goals
  - Conduct customer research to understand customer's needs with respect to pricing options and programs

Suite of Pricing Options

TOU Rates; Low Income Support; Two-way Flow Rates; Targeted Class Rates; Critical Peak Rebates; Green Rates; Subscription Rate; Stand-by Rates

Suite of Price Enabled Programs

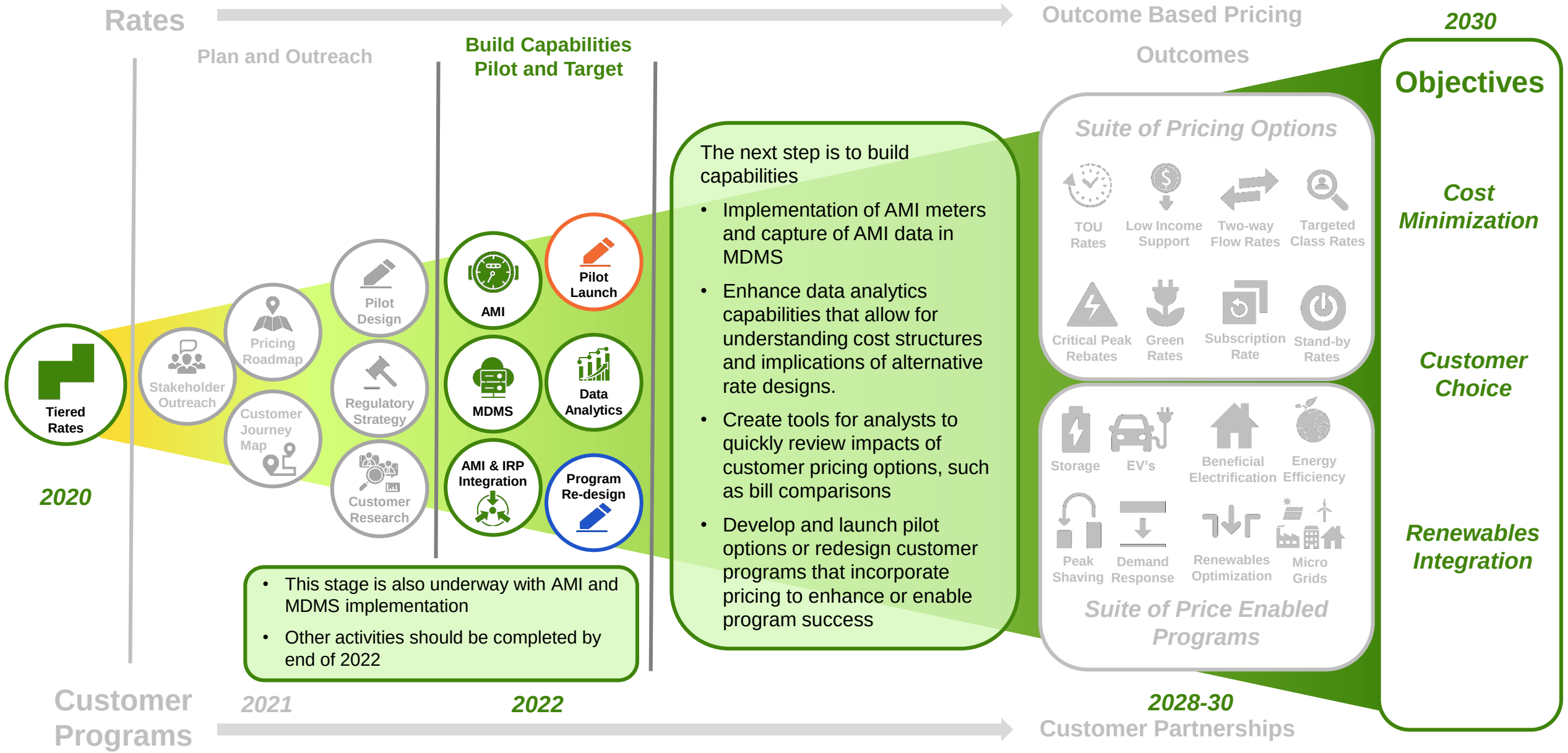
Storage; EV's; Beneficial Electrification; Energy Efficiency; Peak Shaving; Demand Response; Renewables Optimization; Micro Grids

Cost Minimization

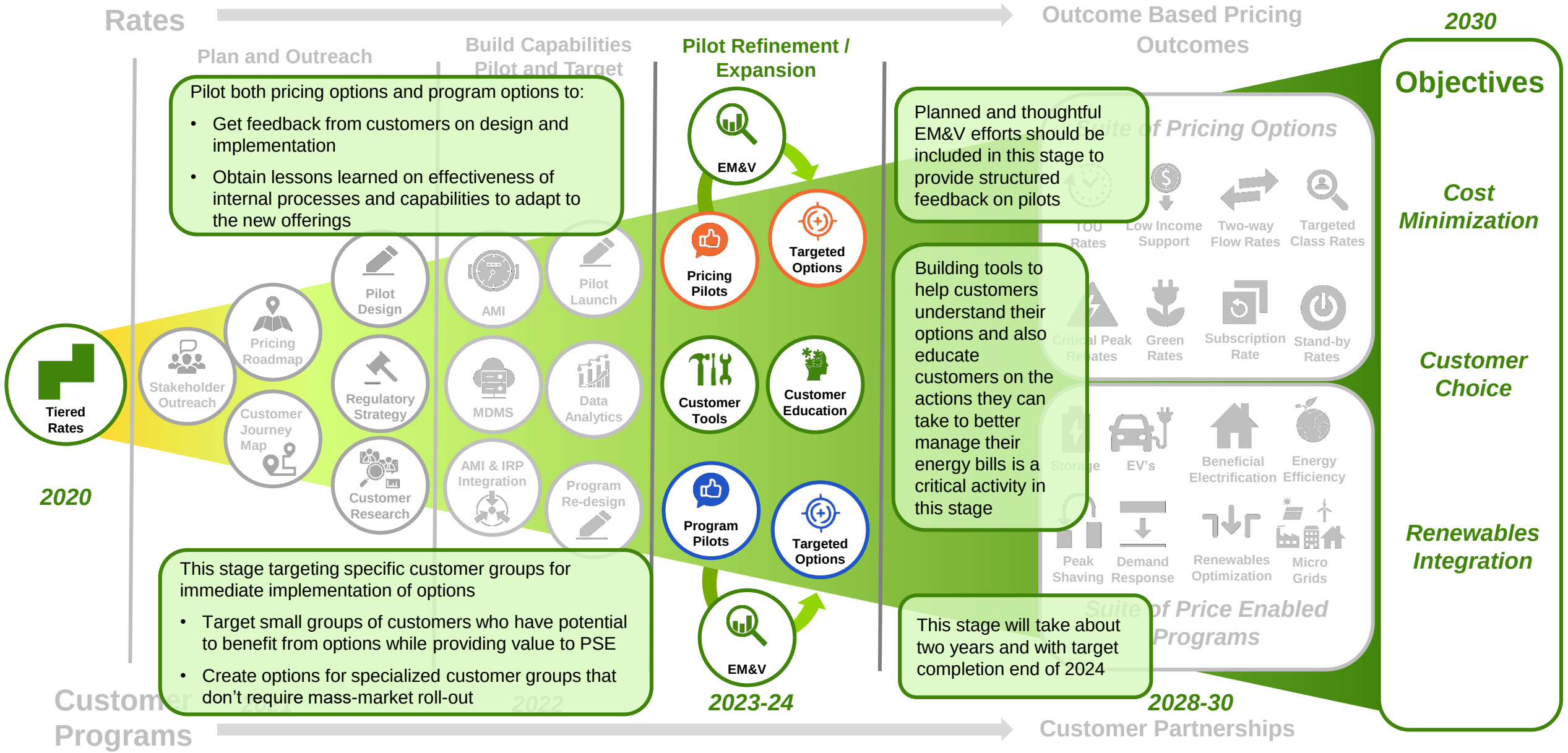
Customer Choice

Renewables Integration

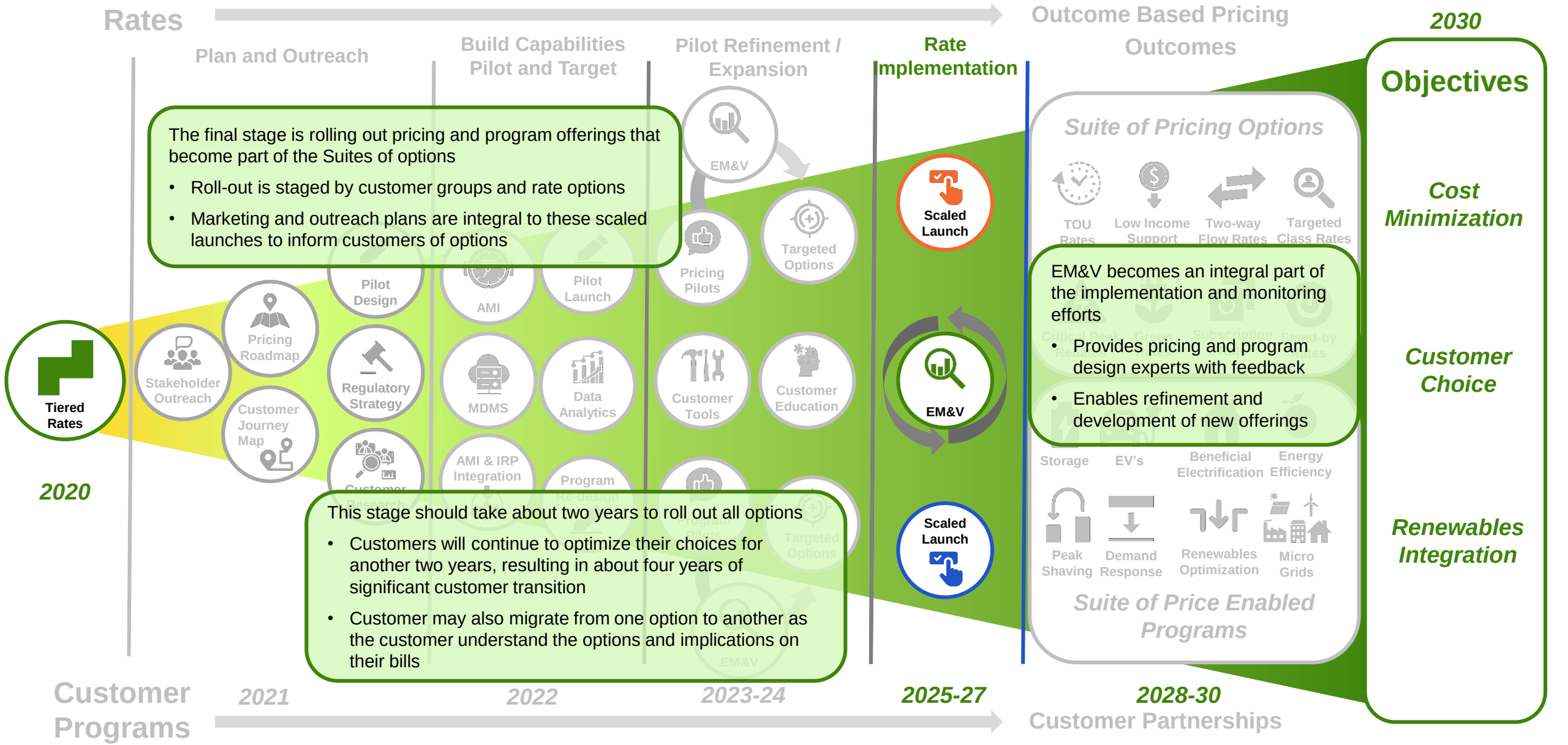
Sequencing – Build Capabilities & Analyze Options



Sequencing – Pilot & Targeted Roll-out



Sequencing - Implement



PSE 2030 Alternative Rates and Programs Vision

Roadmap and Vision

The vision can be achieved with careful sequencing of efforts and a view on the types of offerings customers will want and PSE is able to offer