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April 17, 2019

VIA ELECTRONIC FILING

Public Utility Commission of Oregon
Attn: Filing Center
201 High Street SE, Suite 100
Post Office Box 1088
Salem, Oregon 97308-1088

Re: LC 71—NW Natural's 2018 Integrated Resource Plan (IRP) Update

In compliance with Oregon Administrative Rule 860-027-0400(9), Northwest Natural Gas Company, dba NW Natural, hereby files an update to its 2018 Integrated Resource Plan that was previously filed on August 24, 2018, in docket LC 71.

This update is an informational filing and no Commission action is requested at this time.

Please contact me at (503)721-2452 if you have any questions.

Sincerely,

NW NATURAL

/s/ Natasha Siores

Natasha Siores
Manager, Regulatory Compliance

Enclosure

NW Natural's 2018 IRP Update
Docket No. LC 71
April 17, 2019

Introduction

NW Natural filed its 2018 Integrated Resource Plan (2018 IRP) on August 24, 2018 and the Public Utility Commission of Oregon (Commission) acknowledged the associated Action Items in Order No. 19-073, entered on March 4, 2019. NW Natural submits this update in compliance with Oregon Administrative Rule (OAR) 860-027-0400(8) and does not seek Commission acknowledgement of any action items with this update. This filing is for informational purposes only.

Mist Storage Capacity Recall

NW Natural's acknowledged[1] 2016 IRP action plan included the following item:

> *Plan to recall 15,000 Dth/day of Mist storage capacity from the interstate storage account effective May 2019 to serve core customer needs, subject to a review based on an update of the annual load forecast in the summer of 2018.*

Since the previous 2016 IRP update, NW Natural filed the 2018 IRP on August 24, 2018. The 2018 IRP contains forecasts for the customer count, annual load and peak day, which were developed over the previous year. These forecasts were updated again in the summer of 2018 using the same methodology.

The new peak day forecast for the 2019-2020 heating season is estimated to be about 974,000 Dth per day during peak weather event. NW Natural's daily deliverability, including segmented capacity and assuming no supply outages, for the 2019-2020 winter is 992,127 Dth per day. Therefore, capacity recall from Mist storage is not needed to serve peak day demand this upcoming winter. In addition to peak day requirements, the Company evaluated the need for incremental storage options (e.g., Mist Recall) to meet annual energy requirements. Using the supply resource planning model (SENDOUT) and a cold weather design, the evaluation demonstrated that recalled storage from Mist was not needed for energy requirements for the upcoming 2019-2020 winter.

With this load forecast re-evaluation, the 2016 IRP action plan item to recall 15,000 Dth/day of Mist deliverability effective May 2019 to serve the 2019-2020 winter is not needed. NW Natural will not recall any Mist storage capacity in order to serve the 2019-2020 winter season.

Geographically-Targeted Energy Efficiency Pilot

NW Natural's acknowledged 2016 IRP also included a demand-side resource action item stating that NW Natural will:

> "Work with Energy Trust of Oregon to further scope a geographically targeted DSM[2] pilot via accelerated and/or enhanced offerings ("Targeted DSM" pilot) to measure and quantify the

[1] Commission Order 17-059 entered on February 21, 2017.
[2] DSM stands for demand side management and in this case DSM resource refers to energy efficiency.

> potential of demand-side resources to cost-effectively avoid/delay gas distribution system reinforcement projects in a timely manner and make a Targeted DSM pilot filing with the Oregon Public Utility Commission in late 2017 or early 2018".[3]

The Targeted DSM pilot filing from the 2016 IRP action item above has been rebranded as Geographically-Targeted Energy Efficiency (GeoTEE) and is being completed through this 2018 IRP update filling with the Oregon Public. Although the filing of this pilot has been delayed from the dates anticipated in the 2016 IRP action item, the actual pilot is still on schedule.

GeoTEE is discussed in detail in Attachment 1 and Attachment 2, but for now, it is defined as energy efficiency savings specifically from customers who contribute to the peak load of an area where the distribution system is projected to experience future weakness (as defined by NW Natural's distribution system standards) and an investment is projected to be needed to serve customer load. GeoTEE savings can be achieved from DSM programs for energy efficiency measures that are not offered in other areas of the state, or from energy efficiency programs that intensify/speed up efforts to acquire savings from measures already offered in the state at large. Given the current method for evaluating DSM cost-effectiveness, special consideration must be given to how to design and deploy a GeoTEE program in order to meet the economic/cost-effectiveness criteria, which may be different at a local level compared to the state as a whole.

NW Natural and Energy Trust of Oregon plan to undertake the pilot over the 2019-2020 to 2023-2024 heating seasons in Silverton, Oregon. The purpose of the pilot is to better serve customers by developing the data and ability needed to construct a peak hour energy efficiency supply curve for any given geographic area so that it can be compared for cost-effectiveness against other distribution pipeline as well as non-pipeline system alternatives (Table 1).

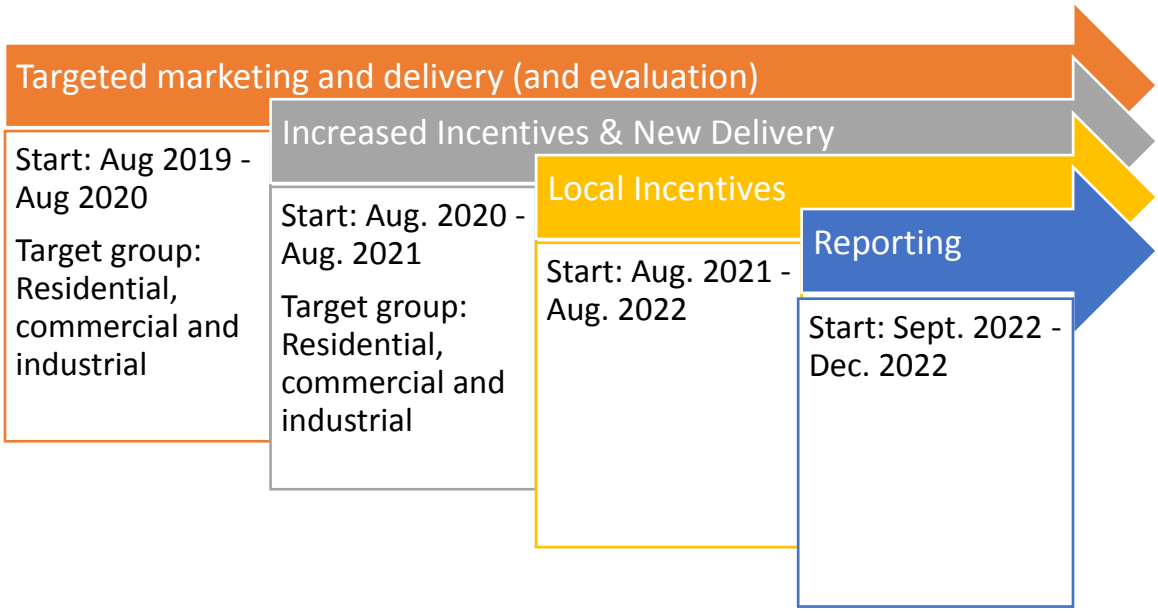
[3] Order No. 17-059 in Docket LC-64.

Table 1: Distribution System Capacity Resource Alternatives

Distribution System Alternatives			Considered when assessing need	Currently used option	Currently Evaluated Option
Supply-side Alternatives	Traditional Pipeline-related Capacity Options	Loop existing pipeline		✓	✓
		Replace existing pipeline		✓	✓
		Install pipeline from different source location into area		✓	✓
		Update existing pipeline infrastructure		✓	✓
		Add or upgrade regulator to serving area		✓	✓
		Gate station upgrades		✓	✓
	Add compression to increase existing pipeline capacity				✓
	Mobile/fixed CNG storage in area			✓	✓
	Mobile fixed LNG storage in area				✓
	On-system gas supply (e.g. renewable natural gas)				✓
	Underground storage in area				✓
Demand-side Alternatives	Demand Response	Interruptible schedules (DR by rate design)	✓	✓	✓
		Geographically targeted interruptibility agreements			✓
		Geographically targeted demand response programs			
		Time of use pricing			
	Energy Efficiency	Peak hour savings from statewide EE Programs	✓	✓	✓
		Geographically targeted energy efficiency (GeoTEE)			

The pilot will proceed in phases beginning in August 2019 (Figure 1). The first phase will increase marketing and delivery mechanisms in the targeted area above the statewide baseline. The second phase will test increasing incentives up to the statewide cost-effective maximum as well as considering new delivery pathways. The third phase will test incentive levels and additional measures that are not currently cost-effective statewide, but may be cost-effective when viewed through a localized avoided cost calculation that considers the deferral or avoidance of a distribution system project. Incentives beyond the current statewide maximums and any additional programs that are not currently cost-effective when using statewide avoided costs will need to be approved by the Commission before proceeding with them. Much of the development of those additional incentives and programs will occur in 2020, well before the planned launch of the third phase.

Figure 1: Phased GeoTEE Pilot Plan



Additional details on the GeoTEE pilot purpose and objectives are found in Attachment 1. Further detail on the pilot plan is found in Attachment 2.

NW Natural's 2018 Integrated Resource Plan (IRP) Update

LC 71

Attachment 1
Geographically-Targeted Energy Efficiency Pilot Program

April 17, 2019

Geographically-Targeted Energy Efficiency Pilot Program

The purpose of the Geographically-Targeted Energy Efficiency (GeoTEE) Pilot is to better serve customers by gathering the information necessary to evaluate whether GeoTEE is a cost-effective capacity resource alternative for a natural gas local distribution company (LDC). In order for capacity resources (e.g., GeoTEE, pipeline reinforcement projects, demand response, etc.) to be considered on a fair and consistent basis against alternatives in a resource planning cost-effectiveness analysis, the cost, impact, and reliability of each alternative needs to be understood with a reasonable degree of certainty. For capacity planning alternatives that have not been used before, the cost and impact information is often lacking or incomplete and needs to be improved before the alternative can be relied upon to meet customer needs. GeoTEE is a very intriguing system capacity option that has a lot of attractive features, though the Company does not currently have enough information available to be used in LDC resource planning without further research. This pilot is a research project intended to fill that information gap so that GeoTEE can be included in the menu of alternatives analyzed to address system weaknesses in a least-cost/least risk manner in the future. [1]

To this end, the primary objective of this pilot is to:

(1) Develop the data and ability needed to construct a peak hour energy efficiency supply curve for any given geographic area so that it can be compared for cost-effectiveness against other distribution system capacity options

The pilot is also being proposed to meet the following secondary objectives:

(2) Determine whether GeoTEE represents a socially desirable tool to serve LDC customers if it shows the potential to be a cost-effective capacity resource in some situations
(3) Explore and discuss with key stakeholders the appropriate funding mechanism for future GeoTEE projects should they show as a potentially cost-effective way to address distribution system weaknesses

What is Geographically-Targeted Energy Efficiency (GeoTEE)?

[1] Pending an assessment that in some situations it could be a cost-effective resource option

Generally, customer rates are set on a situs basis so that all NW Natural customers in the company's Oregon service territory share in the costs of the Company's local distribution system reinforcements throughout the state. In planning for distribution system improvement NW Natural selects the option that represents the best combination of cost and risk for the customers in the state to address the local distribution system need. In order to compare GeoTEE to the best supply-side distribution system option (e.g. a new pipeline connecting two previously isolated areas) we must know the costs and risks of acquiring demand-side management (DSM) savings in the localized area to achieve a reduction in peak hour load that is sufficient to delay or avoid the cost of the distribution system enhancement. This requires the use of a location-specific DSM supply curve that focuses on peak hour savings in the area in question.

"Geographically-Targeted" Energy Efficiency is defined as additional energy savings from marketing and offers that are specific to and cost-effective in particular locations within a state. The additional savings from energy efficiency should target customers and end-uses that contribute to the peak load of a defined area where a supply-side project is identified as being needed to serve growing customer peak demand. GeoTEE savings can come from DSM programs that either intensify/speed up efforts to acquire savings from measures currently available in the state at large ("accelerated") or programs for measures that are not currently being offered anywhere in the state ("enhanced"). Given the current method for evaluating DSM cost-effectiveness, special consideration must be given to how to design and deploy a GeoTEE program in order to meet the economic/cost-effectiveness criteria.

While reductions in peak load anywhere on the system reduce the amount of *supply* resources needed by the Company to serve its customers, only reductions in peak hourly load from the customers that are serviced by the stressed portion of the distribution system are relevant to avoiding or delaying *supply-side* distribution projects on the system-within-a-system. For example, peak reductions from customers in Portland have no impact on the need for or timing of a distribution system reinforcement in Eugene or Vancouver.

As noted above, GeoTEE savings can be achieved by "accelerating" and/or "enhancing" DSM offerings in the location in question. *"Accelerated" DSM* speeds up the timeline to acquire savings from programs which meet current Energy Trust cost-effectiveness requirements (based on statewide avoided costs) in a local area with location specific targeted marketing and/or increased incentives. In other words, accelerating DSM is acquiring savings that would be acquired eventually through statewide operations faster in the locality in question. This approach would have an increase in delivery cost based on the

level of additional marketing, marketing complexity, or any increase in incentives. For example, increasing incentives to replace inefficient space heating equipment early, prior to the timing based on end-of-life replacement.

"Enhanced" DSM savings are savings that do not meet current Energy Trust cost-effectiveness requirements (based on statewide avoided costs) but are cost-effective if location-specific avoided costs[2] are used to represent the value of achieving peak hour savings from DSM in the local area that is experiencing a distribution system weakness. In other words, enhancing DSM is acquiring savings in the local area that are cost-effective using localized avoided costs that are not cost-effective under current state-level planning using statewide avoided costs.

Accelerated and/or Enhanced DSM is by definition above and beyond the "business as usual" DSM savings that would be acquired. This additional effort is required in the geographically targeted area to achieve the required peak hour savings since the "business as usual" process for acquiring DSM savings is already accounted for in the peak hour distribution system planning when determining if a project is needed to address a weakness. Allowing for GeoTEE to be a viable option is breaking new ground for LDCs operating in the region and requires major changes to the way NW Natural plans distribution system upgrades and the way Energy Trust evaluates cost-effectiveness and deploys its programs. While NW Natural and Energy Trust are open to these changes to work towards planning as optimally as possible for customers, an explanation for why both organizations operate the way they do is useful in highlighting some of the issues with using GeoTEE as an option to address distribution system needs.

GeoTEE measures would only be implemented if they are cost-effective when compared to the lowest cost supply-side resources. It is likely that if load growth in the targeted location continues, GeoTEE would act to defer rather than avoid the pipeline reinforcement altogether, though this can still prove as a cost-effective strategy using the standard present value of revenue requirement (PVRR) evaluation metric.

Natural Gas Infrastructure Planning

Overview

[2] Inclusive of the expected costs of the potential supply-side distribution enhancement.

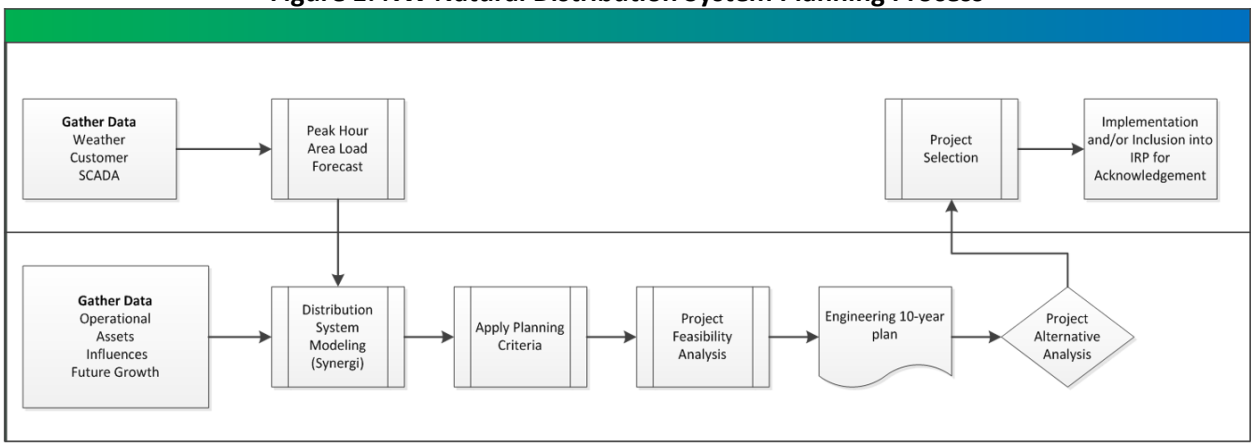
There are two types of infrastructure resource planning processes for a natural gas local distribution company (LDC) – supply capacity planning and distribution system planning – that both follow the same general methodology: (1) determine resource needs; (2) define resource options to meet the need; and (3) select the resource(s) that is (are) the best combination(s) of cost and risk for customers to serve that need. Supply resources are "global" resources the Company uses to move gas from either markets or storage areas onto its distribution system, whereas distribution resources are the "local" assets used to distribute the gas from those supply resources to all of NW Natural's customers.[3] Supply resources – like interstate pipeline contracts, storage facilities, or behind-the-gate RNG – are held and evaluated on a system-wide portfolio basis. Distribution system resources – like higher pressure transmission lines, lower pressure distribution mains, pressure regulators, and gate stations – are geographically defined systems within the Company's overall distribution system that all need to be independently sufficient in order for customers to receive reliable service. NW Natural's distribution system planning process is designed so that the Company:

- Operates a distribution system capable of meeting firm service customers' peak hour demands;
- Plans for future needs in a timely fashion;
- Minimizes system reinforcement costs by selecting the most cost-effective alternative; and
- Addresses distribution system needs related to localized customer or/and demand growth.

Figure 1 below shows NW Natural's distribution system planning process (more information can be found in Chapter Eight of the Company's 2018 IRP).

[3] In reality, a perfect separation of resources into supply vs. distribution system resources is not possible as they need to work in concert for all customers to be served reliably, which is considered in both resource planning processes.

Figure 1: NW Natural Distribution System Planning Process



Like most utility infrastructure planning, natural gas utility distribution system infrastructure planning is predominantly an exercise in peak load planning. In terms of distribution system planning, each distinct service area within the distribution system is designed to meet expected peak hour load.[4] When forecasted peak hour load grows (or is expected to grow) in excess of system capability, a distribution system project is necessary to maintain reliable service.

Natural Gas Peak Planning

Natural gas utility peak planning is about estimating loads, primarily from space heating of homes and businesses during cold events, when there is much higher gas use than at other times. Figure 2 shows the Company's current normal weather sales load by month and depicts how seasonal (and consequently weather-dependent) NW Natural's load is. Figure 2 also breaks down customer usage by end use and shows that space heating load is the primary load for sales customers, especially in the winter months when space heating use is much more prominent. While this figure shows generally how much more load is used in the winter than the summer, it is insufficient to show the difference in usage between normal winter weather vs usage during cold weather events.

[4] See Chapter Three of NW Natural's 2018 IRP for an explanation of how the Company forecasts peak loads and its peak planning standard.

Figure 2: NW Natural System-Level Normal Weather Monthly Sales Load by End Use

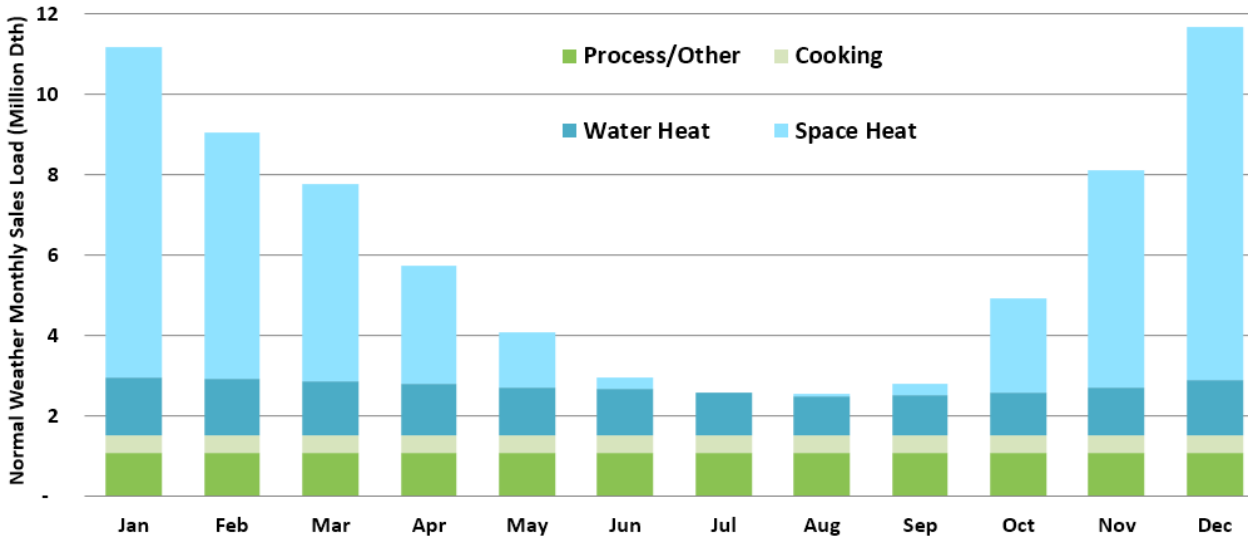


Figure 3 shows NW Natural's average daily firm sales load by temperature. The typical January day in the Company's service territory has a temperature of about 40°F, though design peak day temperatures are roughly 12°F.[5] It can be seen that demand during this typical January day is well less than half of what would be expected during a design peak day, when space heating requirements spike. The vast majority of the difference between summer loads and peak day load is space heating load, such that roughly 80% of the load served to firm sales customers during a peak day is used for space heating. Again, however, Figure 3 is insufficient to show how load varies throughout a day and does not provide the area specific peak hour load, which NW Natural plans it distribution system to be able to serve.

[5] See the discussion of NW Natural's peak planning standard and peak load forecasting methodology in Chapter Three of the 2018 IRP for an explanation of why temperature is not the only variable used to forecast load and why the Company's planning standard doesn't correspond perfectly with any given temperature.

Figure 3: NW Natural System Daily Load (2014) by Temperature

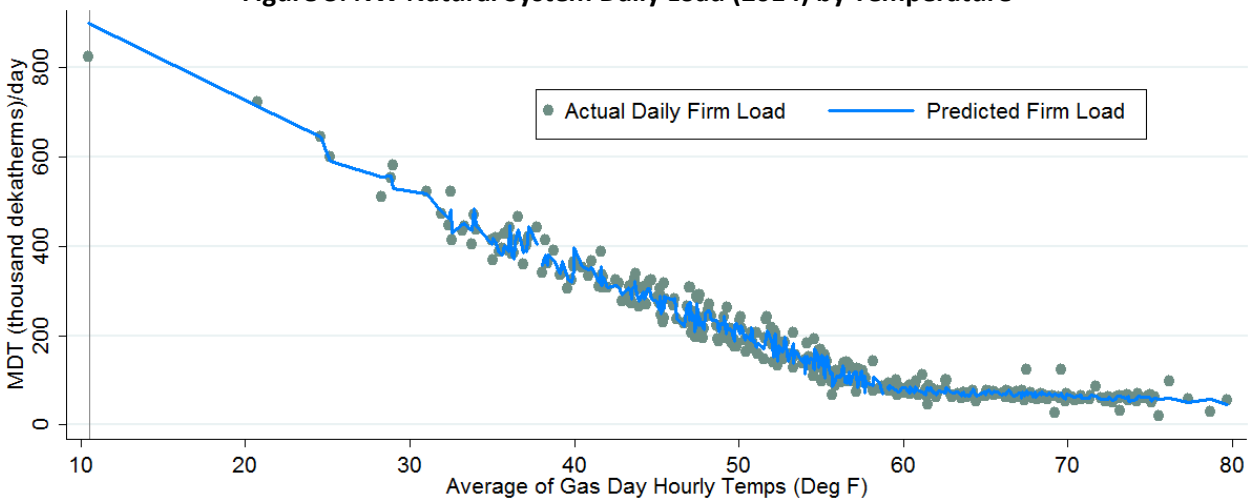
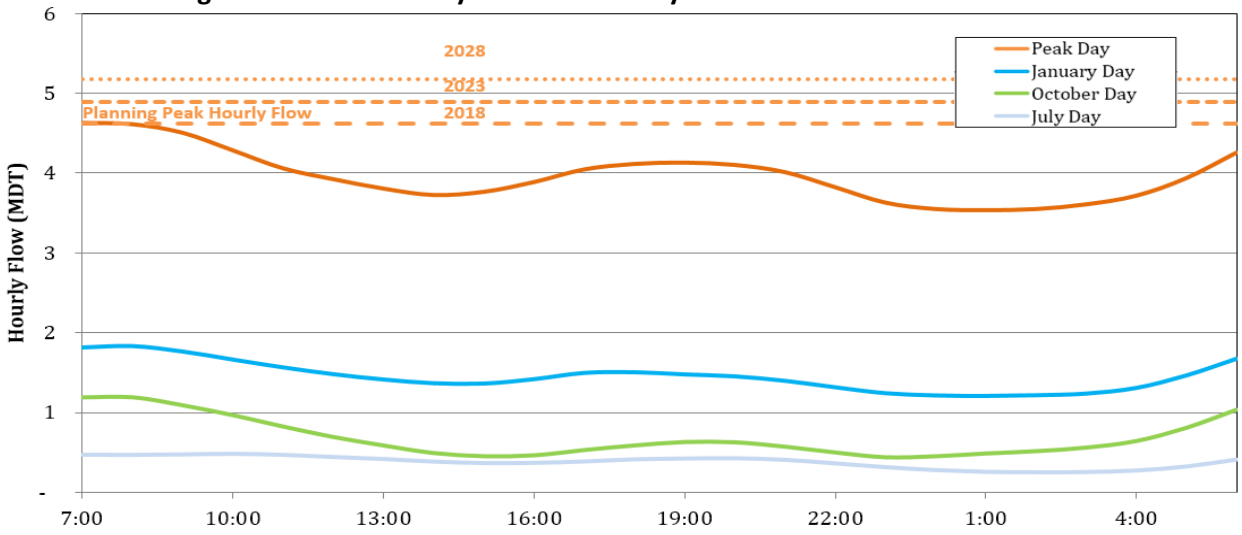


Figure 4 shows how load varies throughout representative days and a peak day and depicts the peak hour load that the distribution system needs to be able to serve to keep customers warm during extreme cold events (i.e., the 7am hour under peak planning conditions). Figure 4 also shows how NW Natural's peak hour is typically the 7am hour during a weekday when residential customers are waking up and wanting their residences to be warm and businesses are heating up for the business day. It shows the hourly load profile of all firm load[6] in a target area during a typical summer day, a typical shoulder month day, a typical winter day, and under peak planning conditions. Looking at the 7am hour, nearly all of the differences between load during the typical July day and that under peak planning conditions is space heating load. As such, more than 80% of the peak hour load that the distribution system infrastructure is designed to serve in this area is from space heating. Therefore, the vast majority of the potential to reduce peak hour load with GeoTEE to defer supply-side distribution system reinforcement projects is reducing space heating load.

[6] Including load on both firm sales schedules and firm transportation schedules

Figure 4: Distribution System Area Hourly Flows under Different Weather



Addressing Distribution System Needs

There are two primary methods through which a need for distribution system support can be addressed: (1) distribution system capacities can be increased via a supply-side project; or (2) peak demand can be reduced via a demand-side project so that current system capabilities are sufficient for a longer timeframe.

Within each of these two broader categories there are a number of options considered by NW Natural, which are shown in Table 1.[7] This pilot is a research project to assess the feasibility of expanding the list of capacity resource alternatives evaluated to address weaknesses in the Company's distribution system to include GeoTEE.

[7] Note that a combination of alternatives can also be used together to address a weakness.

Table 1: Distribution System Capacity Resource Alternatives

Distribution System Alternatives			Considered when assessing need	Currently used option	Currently Evaluated Option
Supply-side Alternatives	Traditional Pipeline-related Capacity Options	Loop existing pipeline		✓	✓
		Replace existing pipeline		✓	✓
		Install pipeline from different source location into area		✓	✓
		Update existing pipeline infrastructure		✓	✓
		Add or upgrade regulator to serving area		✓	✓
		Gate station upgrades		✓	✓
	Add compression to increase existing pipeline capacity				✓
	Mobile/fixed CNG storage in area			✓	✓
	Mobile fixed LNG storage in area				✓
	On-system gas supply (e.g. renewable natural gas)				✓
	Underground storage in area				✓
Demand-side Alternatives	Demand Response	Interruptible schedules (DR by rate design)	✓	✓	✓
		Geographically targeted interruptibility agreements			✓
		Geographically targeted demand response programs			
		Time of use pricing			
	Energy Efficiency	Peak hour savings from statewide EE Programs	✓	✓	✓
		Geographically targeted energy efficiency (GeoTEE)			

Both demand-side and supply-side resources have the ability to meet demand and should be procured based on the least-cost and least-risk criteria applied consistently across demand-side and supply-side resources. In other words, if DSM results in one less therm demanded that means that one less therm needs to be provided by supply-side resources. Therefore, the distinction between demand-side and supply-side resources is extremely important and the details of the components that comprise each category, in order to value DSM appropriately. Table 2 summarizes these components, the timeframe for which each resource is planned and the types of customers each resource serves.

Table 2: Demand-side and Supply-side Resources

		Planning Timeframe	Customer Type	Description
Supply-side Resources	Commodity	Annual, Peak Day	Firm Sales, Interruptible Sales	The physical gas purchased by NW Natural at various supply basins (i.e., AECO, Sumas, Station 2, Rockies) or supplied by renewable natural gas (RNG) projects.
	Supply Capacity	Peak Day	Firm Sales	The capacity resources that bring gas onto NW Natural distribution system (e.g., pipeline capacity, Mist storage, LNG storage, on-system RNG) and when combined have the deliverability capability to the system to meet peak day demand.
	Distribution Capacity	Peak Hour	Firm Sales, Firm Transport	The distribution pipeline capacity necessary to meet peak hour demand by taking gas provided by the supply capacity resources and deliver that gas to specific areas within the Company's service territory.
Demand-side Resources	Demand Response	Peak Day, Peak Hour	Firm Sales, Interruptible Sales	Curtailment of customer service during peak demand periods to reduce demand.
	Energy Efficiency	Annual, Peak Day, Peak Hour	Firm Sales, Interruptible Sales	Incentivized measures focused on the adoption of more energy efficient end use products and smart energy management to reduce energy usage while still receiving the same energy services.

Supply-side Resources

Supply-side resources can be categorized into three different types of resources: commodity, supply capacity and distribution capacity. All three must be bundled together in order to serve load. The commodity resource is the physical gas that is purchased by NW Natural from suppliers in various supply basins.[8] Natural gas purchases are scheduled through a day-ahead market for a daily amount. NW Natural purchases gas for *sales* customers[9] throughout the year. Some of that gas is delivered directly to customers the following day and some of the gas is injected into storage, typically during the spring, summer and fall months, in order to be re-delivered to customers during winter.

[8] For a full discussion of supply-side resources, please see NW Natural's 2016 IRP, Chapter 3
[9] For a full description of the four different types of customers; firm sales, interruptible sales, firm transportation, and interruptible transportation, please see NW Natural's 2016 IRP, Chapter 2 or refer to NW Natural's Oregon and Washington Tariff Books located at www.nwnatural.com/AboutNWNatural/RatesAndRegulations.

Supply capacity refers to any resource that delivers gas onto the Company's distribution network. This currently includes interstate pipeline capacity, underground storage, liquefied natural gas (LNG) storage, and voluntary customer recall agreements. NW Natural's integrated resource planning ensures that the company has the supply capacity resources capable of delivering enough gas onto the distribution system to meet daily demand for firm sales customers during peak day conditions.[10] Supply capacity planning is focused on the daily deliverability of gas onto NW Natural's system. Since NW Natural's service territory is served by a single pipeline and with the flexibility to move gas where it needs to go, supply capacity planning is only focused on the aggregate amount of gas that can be brought onto the system regardless of location.

Distribution capacity resources refer the resources required to actually deliver gas to customers and into specific areas of the Company's service territory. Distribution resources include high pressure pipes (more than 60 psig), low pressure pipes (less than 60 psig), compressor stations, meters, and any other capital needed to hook up customers with a gas connection and maintain pressure. The Company plans the distribution capacity to be able to serve firm sales and firm transport customers at all times. Although the distribution capacity is designed to serve firm customers at any given instant, hourly data is the most granular data for firm customers in a given area and therefore, peak hour is the metric used for distribution system planning. Unlike supply capacity resources the location of distribution capacity resources is key to maintaining pressure in the pipeline in any given area.

All supply-side resources fall into at least one of these categories, but some assets can and do fall into multiple categories. For example, the LNG storage facilities are both a supply capacity resource and a distribution capacity resource. They are a supply capacity resource because they have the ability to deliver gas to the system to meet a peak day demand requirement. They are also considered a distribution capacity resource because when the gas is put onto the system at their location, this additional gas props up the pressure and supports the distribution of gas in the immediate area. Storage does not provide a commodity resource as the gas withdrawn from storage had to be purchased from a different location and injected into storage. An on-system RNG resource may fall into all three

[10] Corresponding to commodity scheduling, interstate pipeline capacity contracts, which reserve pipeline capacity to deliver gas between a receipt point and a delivery point are specified in daily capacity reservations. These interstate pipeline contracts make up a significant portion of the Company's supply capacity profile. Due to the day-ahead gas scheduling and volatility in day-to-day gas demand, supply capacity planning has evolved to focus on meeting a peak daily requirement.

categories as it provides the commodity (i.e., physical gas) onto the system, additional peak day capacity and supports the distribution system in the immediate area.

Demand-side Resources

Currently there are two main types of demand-side resources; demand response and energy efficiency measures. Unlike the supply-side resources described above, which must use all three resources to serve load, demand response and energy efficiency are independent and can be used jointly to effectively reduce load.

Demand response curtails customer use, typically through financial incentives, during periods of peak demand in order to reduce the demand requirement below the supply and/or distribution capacity constraint. Demand response has actually been a part of NW Natural's DSM for a long time through interruptible customers (typically larger industrial or commercial customers), who pay a lower rate for their gas with the understanding that their service can be interrupted if the available gas is needed to serve firm customers, which includes all residential customers. The future of demand response is evolving to include residential customers as the internet of things continues to grow. Electric utilities are able to cycle residential air conditioners on and off during peak demand periods in the summer. While not part of this pilot, a similar process for gas utilities could be implemented for furnaces during cold events and NW Natural is considering a separate pilot program for demand response.

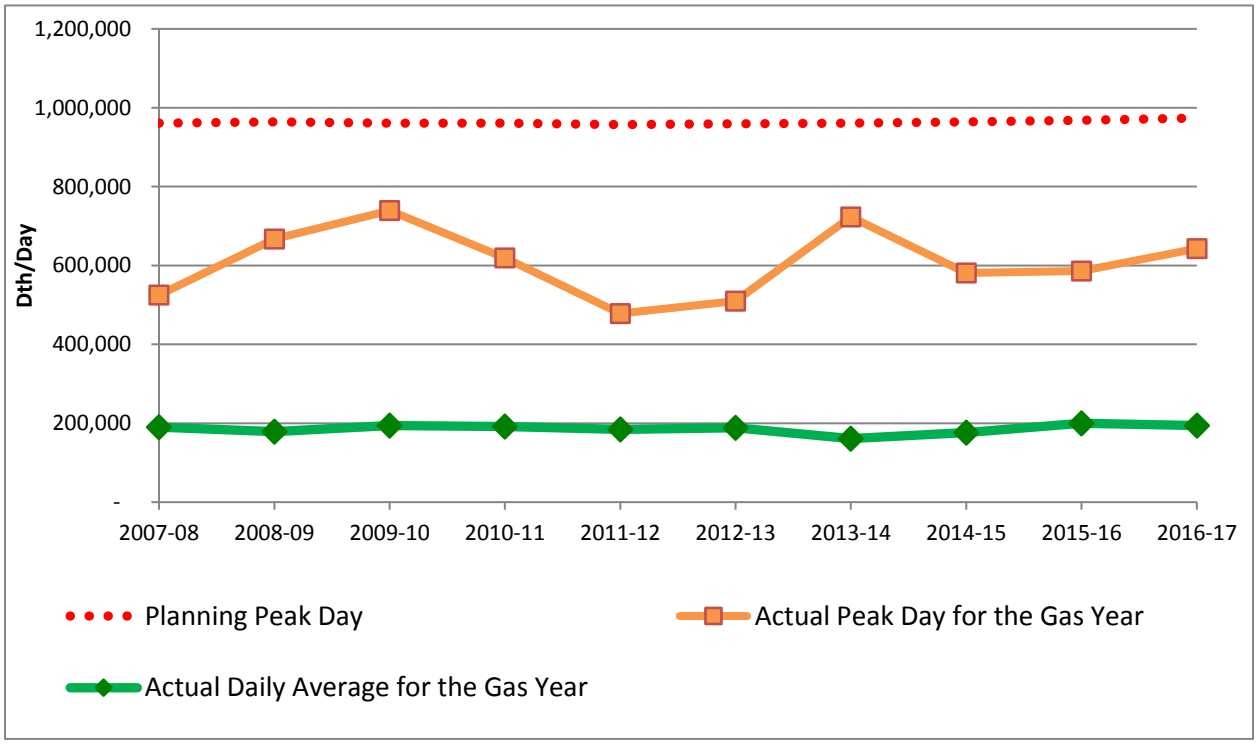
Energy efficiency measures are cost-effective ways to reduce load through improved end-use efficiency and smart energy management. NW Natural has partnered with Energy Trust for more than a decade to acquire cost-effective energy savings that reduces the gas consumption of its customers while still providing the same level of energy services. The cost-effectiveness tests used by Energy Trust in selecting which measures to deploy and to what extent compare their associated costs to rate payers with their lifetime value, as defined by the Company's estimated avoided costs of serving the marginal unit of demand with a supply-side alternative.[11] The value of the *annual* energy savings from such measures is self-evident: decreasing the average energy consumed by space heating, water heating, and cooking appliances translates to a substantial reduction in demand for natural gas at upstream wellheads. However, lower overall usage is accompanied by a less obvious benefit for ratepayers –

[11] This includes the commodity, supply capacity and distribution capacity resources. For a full discussion and derivation of avoided costs, please see NW Natural's 2016 IRP, Chapter 5. Also see UM 1893, Investigation into the Methodology and Process for Developing Avoided Costs Used in Energy Efficiency Cost-Effectiveness Test

decreasing energy consumption during periods of peak load – which can also reduce the need for additional supply capacity (e.g., securing upstream pipeline capacity) and improvements to the local distribution system.

Figure 5 illustrates the relationship between average firm sales load, historical peak day sales load and NW Natural's design peak day sales load used for supply capacity resource planning. Daily expected demand (akin to the lowest curve, in green) drives the Company's acquisition gas from upstream basins on a given day. Daily peak demand drives the amount of supply capacity that the Company must acquire to ensure an adequate supply of gas can reach the Company's local distribution systems during extreme conditions.

Figure 5: NW Natural Firm Sales Loads



The full value of DSM can thus be seen as a function of both seasonal and daily timing. That is, the utility holds a portfolio of assets sufficient to cover a peak demand event, but only utilizes those necessary for the day's (or hour's) actual load. One therm saved through energy efficiency during a warm summer month mainly avoids the cost to the utility of purchasing and transporting the commodity; the same therm saved during the peak day (or hour) of the heating season could help avoid or defer the costs to acquire and hold the marginal capacity resource itself. Given a supply capacity or

distribution capacity resource constraint, the value from DSM of avoiding or deferring a supply capacity resource or a distribution capacity resource[12] may dwarf the corresponding commodity cost savings for ratepayers.

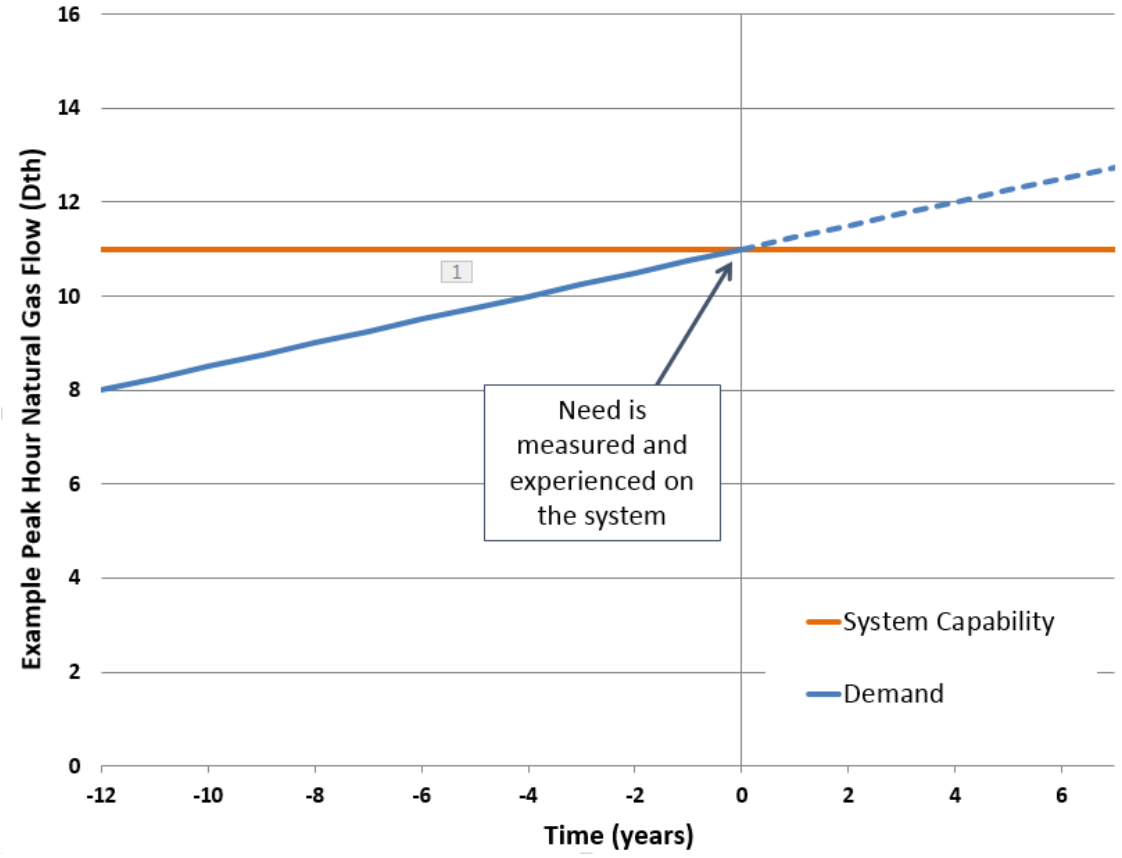
Forward-Looking Distribution System Planning

Historically, NW Natural has taken a measurement approach to distribution system planning, where distribution system projects are planned when a weakness is measured in the distribution system during cold events. However, given that some options to address distribution system weaknesses, including GeoTEE, likely have longer lead times to have the desired impact, the Company is transitioning to a more forward-looking distribution system planning process. Just-in-time distribution system planning identifies a need for a solution once there is a measured weakness on the distribution system and is depicted in Figure 6 which illustrates a hypothetical example of how demand growth surpasses system capability and when the need for a solution is required. [13]

[12] Although distribution capacity resources includes all the capital needed to bring the gas to the customer, DSM only avoids the distribution capacity resources associated with system reinforcement expenditures (e.g., a compressor station or pipeline uprate). The cost of distribution resources needed regardless of the level of DSM, for example meters, and are not included in the avoided distribution system costs.

[13] Note that the trajectory of peak hour demand in Figure 6 is a dynamic depiction of the dashed line in Figure 5 indicating the design peak hour load.

Figure 6: Just-in-time Distribution System Planning

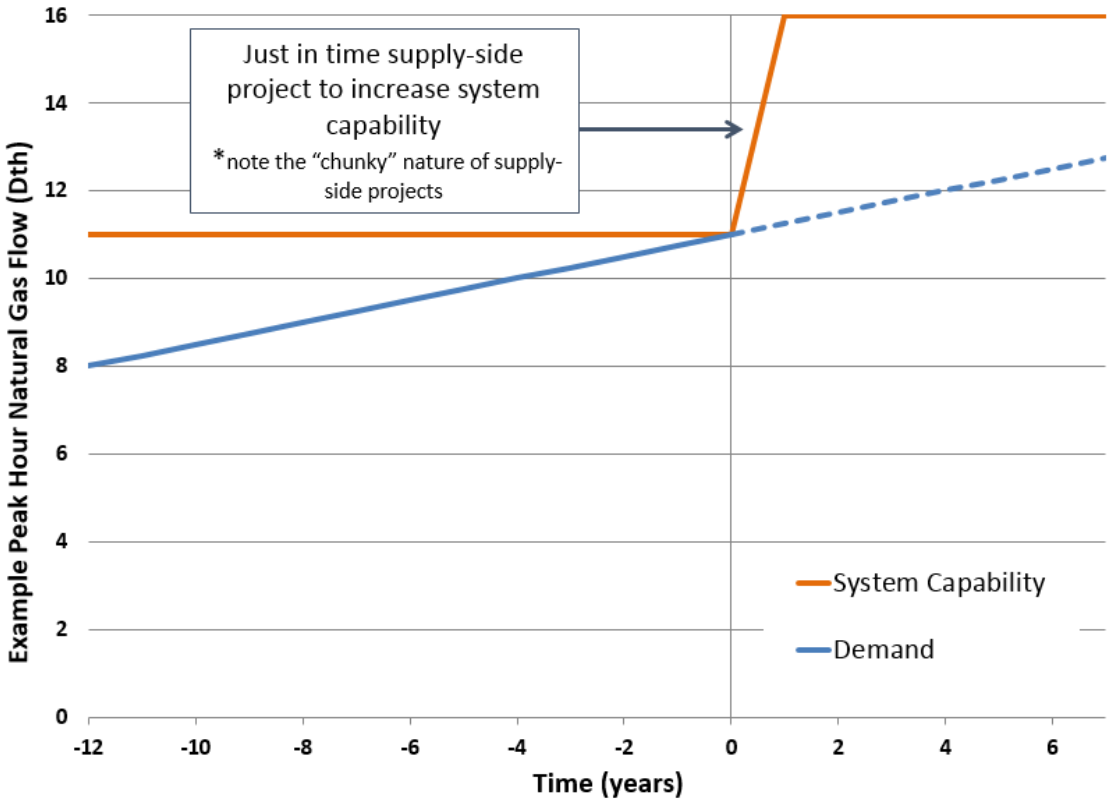


At "time 0" a solution is needed in order to continue to reliably serve load. Ideally the Company might forecast the need at "time 0" before it occurs.[14] This would allow the appropriate amount of lead time necessary to implement a supply-side solution (i.e., system reinforcement).[15] Figure 7 shows how a system reinforcement project would increase the system capability at time 0.

[14] System capabilities are also not a hard set amount, but measured by the pressure drop in the pipeline. A 40% pressure drop is sufficient to require the need for a solution. The risk of losing customers increases continuously as pressure drops increase above 40%. The system capability shown in these graphs represents the level at which the Company would see critical drops in pressure that would trigger a solution.

[15] Realistically, given demand volatility in demand this measured need is hard to predict. Often pressure drop criteria thresholds are violated and system reinforcement projects are scheduled to be constructed as soon as possible and prioritized by the severity of the observed drop in pressure.

Figure 7: Just-in-time Supply-side Distribution System Reinforcement Project

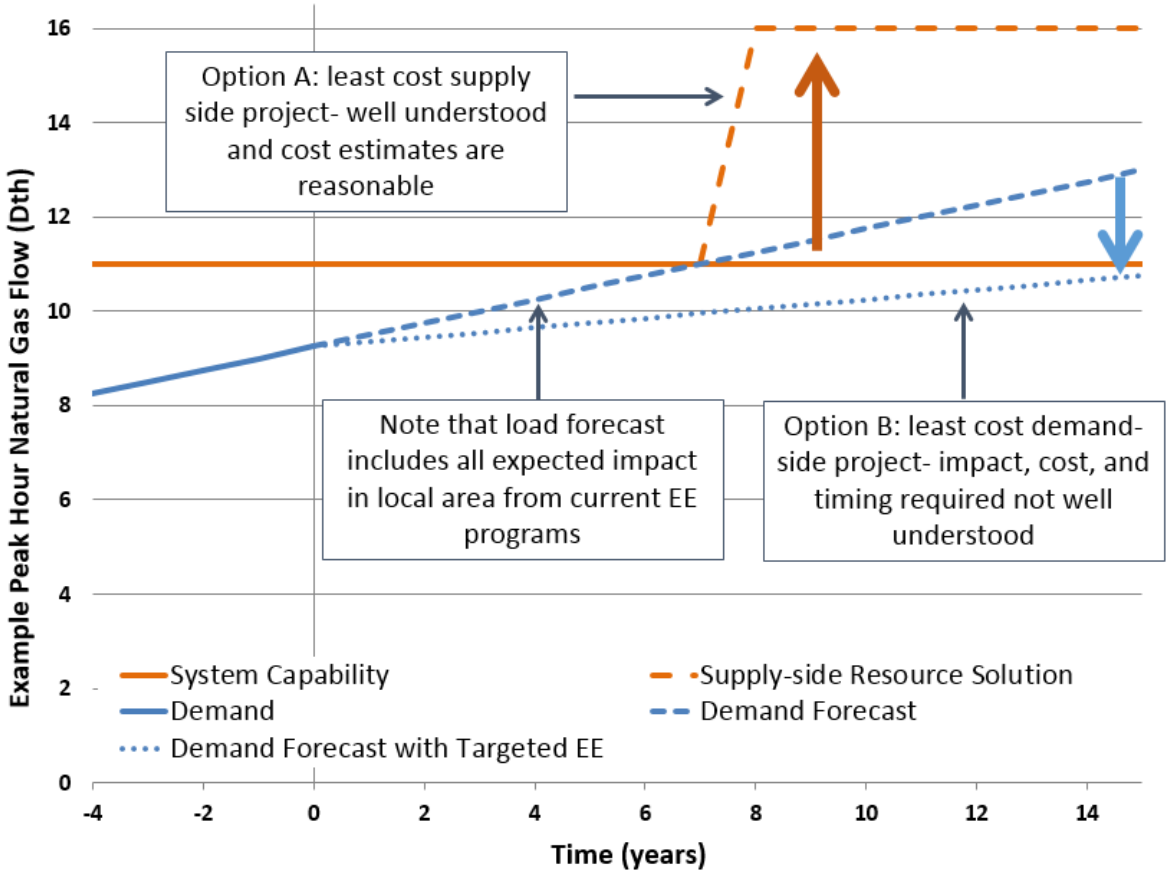


A key understanding from Figure 7 is that supply-side resources (system reinforcement projects particularly) are typically "chunky," where the increase in capability is sufficient to avoid an additional project for a number of years into the future (shown by the large step up in system capability at time 0). It would not be cost-effective to complete system reinforcements in the same area year after year to better align system capabilities with gradually increasing demand.[16]

Figure 8 illustrates two options for reliably serving customer peak loads: "Option A," the supply-side system reinforcement project shown in Figure 8; and "Option B," a demand-side project that slows the trajectory of peak load increase so current system capabilities remain sufficient for a number of years.

[16] The bulk of the costs for system reinforcement projects are in construction (e.g., digging a trench for the pipe). The material costs between different sizes of pipe is relative very small, such as a 4 inch or an 8 inch pipe. Often it is cost-effective for customers to over-size the pipe and have a real option to meet future growth, rather than needing to replace the pipe in the near future due to unexpected growth and incur construction costs for a second time.

Figure 8: Comparing Demand- and Supply-Side Options to Address Distribution System Weaknesses



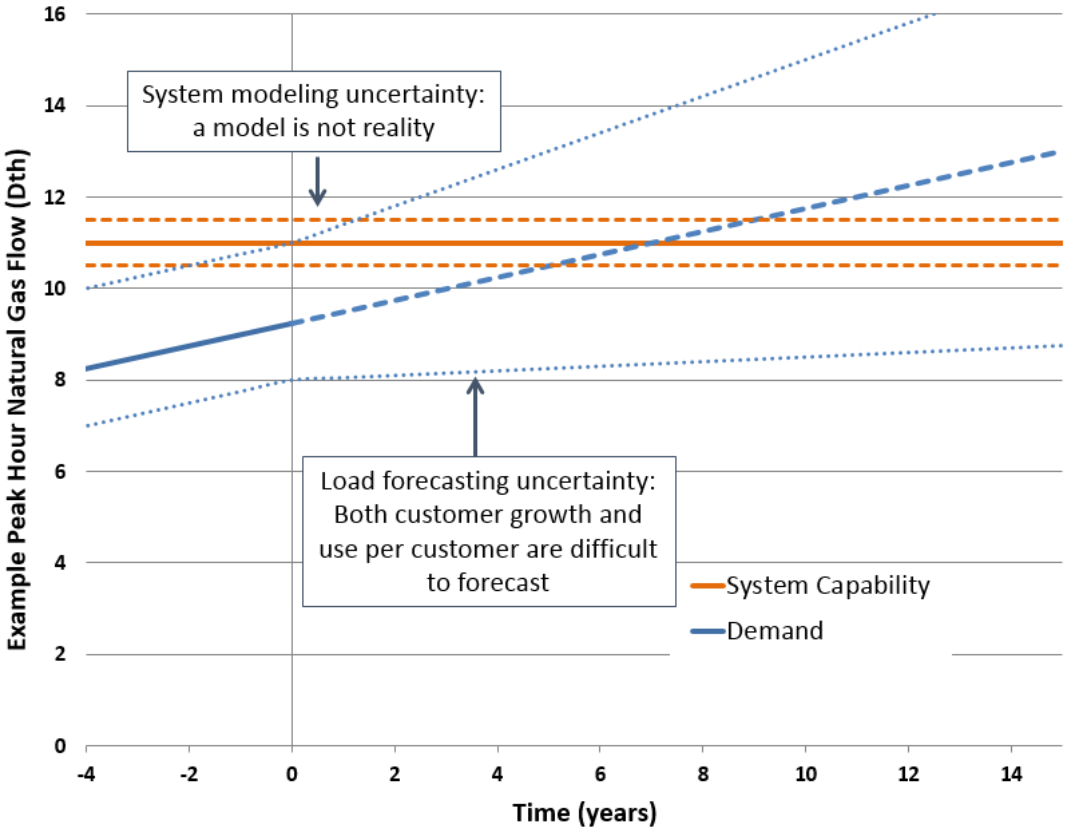
It is presumed that GeoTEE will have a longer lead time than most supply-side reinforcement projects, so in order for GeoTEE to be successful, efforts would need to begin well in advance of when demand outstrips system capability. If it is measured that the current capabilities of the system are currently insufficient, it will be too late to implement a GeoTEE program. In order to incorporate capacity resource options that have longer lead times NW Natural will need to transition from a measured just-in-time approach to distribution system planning to a more forward looking one based upon a forecasted peak hour demand.

The second step is to fully understand how effective GeoTEE efforts are at reducing load, the time it takes to be effective and the costs associated with those targeted measures. Whereas the costs and timing impacts of building a supply-side resource are fairly known and predictable based on past experience, these same aspects of GeoTEE are unknown to both Energy Trust and NW Natural. This pilot aims to obtain the information such that these costs, timing, and impact are knowable and can be applied systematically to other locations within the Company's service territory.

Sources of Uncertainty and Associated Risks

There are several sources of uncertainty that must be taken into consideration when transitioning from a just-in-time distribution system planning to a forward-looking planning process necessary to incorporate GeoTEE as a resource. Figure 9 shows that there is uncertainty in the load forecast with increasing uncertainty the further into the future. NW Natural's system modeling is still a model and therefore not a perfect representation of reality. It is possible that system capability could be higher or lower than what is modeled.

Figure 9: Uncertainty in Both Load Forecasting and System Capability Modeling



Whereas NW Natural understands the uncertainty inherent in pipeline solutions, the uncertainties in a GeoTEE program are not well understood. There are two primary risks that can be analyzed after GeoTEE is ultimately evaluated and implemented: costs risk and insufficient supply capability risk. As demand-side and supply-side resources are evaluated consistently, given uncertainty in costs, there is a risk that the least cost option was not selected to meet demand. The second risk is a potential that the energy efficiency peak savings acquired is significantly less than the forecasted amount and there is

insufficient supply capability to serve the growing load. There is far less uncertainty with just-in-time distribution planning, although not zero uncertainty.

The Need for GeoTEE

DSM as a potential distribution system capacity resource is an intuitive concept – demand side measures such as recall agreements, interruptible rate schedules, and energy efficiency clearly reduce the load on the Company's distribution system in addition to their contribution to peak supply capacity. The Company's distribution system planning process is also being improved in ways that will make equal-basis cost comparisons between infrastructure and demand-side investments more achievable, and provide critical lead time to project analysis. However, many questions remain to be answered before the two alternative investment types can be fully integrated.

At a high level, answering these questions entails developing a "supply curve" for DSM savings during peak events, relating the cost of potential DSM measures that target specific distribution system needs to their expected benefit in the form of avoided system infrastructure costs. When complete, such a supply curve would offer a selection of demand-side alternatives to system reinforcements. Because distribution system requirements are location specific, DSM alternatives would need to be similarly targeted to customers within relatively small geographic areas.

This constraint presents a few key challenges related to GeoTEE program design and implementation. First, in administering NW Natural's energy efficiency programs, Energy Trust uses the Company's avoided cost calculated at the state level. The costs avoided as a result of a GeoTEE effort could significantly diverge from statewide averages; the estimated benefits of a demand-side measure used for Energy Trust's cost effectiveness tests would therefore need to be location specific. Acquisitions that are found to be cost effective in this manner (but not necessarily cost effective relative to statewide avoided cost estimates) are sometimes referred to as "enhanced" DSM. Similarly, localized DSM efforts may meet a statewide cost effectiveness threshold, but be unviable as alternatives to distribution system projects that result from a relatively condensed planning timeline under the current model for identifying, designing and executing energy efficiency measures. Where the energy efficiency acquisition timeline can be likewise condensed (through the use of targeted or focused marketing or increased incentives), such efforts are called "accelerated" DSM.

Whether GeoTEE efforts be enhanced or accelerated relative to NW Natural and Energy Trust's current joint process, the concept requires significant investigation before it can be utilized as a reliable tool in

utility distribution system planning. For the Company's resource planning purposes, this pilot would provide the information necessary to evaluate DSM measures on a comparable basis to other system investments. As the eventual administrator of potential GeoTEE programs, Energy Trust will need to develop processes to identify, evaluate, and acquire GeoTEE savings. Together, both organizations will need to learn how to successfully integrate GeoTEE efforts by Energy Trust with NW Natural's relatively dynamic distribution system project queue, and conversely, NW Natural's current process for estimating localized system needs and avoided costs with the lead planning Energy Trust must do to prepare and execute programs.

Other outstanding questions about a GeoTEE program for gas customers relate to its social desirability along a more qualitative axis. First is the potentially sensitive matter of incentives that are available only to a specific subset of customers residing within an affected area of the gas distribution system. GeoTEE programs could give rise to particularly visible cases of unequal treatment between – and perhaps even within – neighborhoods. Before such programs are widely deployed, it will be important to understand the potential concerns of customers with regards to fairness and equity across utility territories.

Pilot Study Proposal and Desired Outcomes

This proposal outlines the parameters, research questions, and desired outcomes of an enabling study of the potential of GeoTEE efforts. The ultimate goal of this Pilot is to better serve utility customers by creating a viable path for energy efficiency as an alternative distribution system capacity resource.

The Pilot's objectives are multifold. First, as discussed above, the study would provide the data (and data collection process) needed to construct an actionable supply curve for GeoTEE peak savings that serve as an alternative to traditional options to address specific weaknesses in the natural gas distribution system. This information would answer several key questions[17]:

- What amount of peak hour savings do different measures provide?
- How firm/reliable and long lasting are the acquired GeoTEE peak hour savings?
- What is the cost of acquiring GeoTEE savings?

[17] Several additional questions, specific to the marketing and administration of energy efficiency programs are discussed in depth in Energy Trust's attached program proposal.

- What cost-effectiveness framework is appropriate for evaluating GeoTEE initiatives?
- What effect do changes in NW Natural's expected load or distribution system reinforcement process have on the identified GeoTEE savings?

In addition to informing both NW Natural and Energy Trust's processes, the data and learnings produced by the pilot would be relatively generalizable, and the two organizations would plan on sharing them with other utilities and stakeholders.

A second objective of the pilot would be to address to what extent, if GeoTEE measures are determined to be a least-cost/least-risk alternative to distribution system infrastructure projects, they represent a socially desirable tool for a natural gas utility. Important risks in this regard include the increased resources required of both a utility and Energy Trust for developing and implementing such a tool, and the equity issues described above. The data generated by this pilot project may not fully address these issues, and some impacts might fall outside the pilot study period. They will require close monitoring and ongoing evaluation during and after the pilot program.

Finally, a key objective of this pilot would be to develop guidance on the appropriate funding mechanism for GeoTEE (if it is found to be a socially desirable and least cost option). While pipeline project costs are collected over the life of the asset, ratepayers currently pay for EE up front and those costs are not spread over time. However, because GeoTEE would be a direct replacement of a distribution system project it may make sense for ratepayers to spread out the GeoTEE payments over a longer time horizon than traditional EE. This would ultimately help mitigate rate volatility which is desirable by customers. Due to the small scale of the pilot the impact on rates from the pilot will be inconsequential, however, if shown to be cost effective the incremental costs of deploying GeoTEE as a demand-side option for large areas of the system could be significant. The above considerations should inform NW Natural, Energy Trust, and other stakeholders, as they discuss how GeoTEE is financed on a system level.

Additional considerations, as well as detailed project scope, plan, and budget for the Energy Trust team's work on the pilot program, are attached in Energy Trust's program proposal.

Conclusion

The principles of integrated least-cost planning lie at the heart of utility regulation, and demand side resources such as energy efficiency have become increasingly viable alternatives to traditional supply

side options in the planning process. In order to fully integrate energy efficiency into distribution system planning – much as it has become integrated into supply side planning – NW Natural (and other utilities) requires improved system planning processes, as well as full and reliable knowledge regarding potential demand side options targeted at specific system weaknesses. NW Natural's proposal to work with Energy Trust of Oregon to scope a GeoTEE pilot program to address this need was acknowledged by the OPUC as part of the Company's 2016 IRP Action Plan. Since acknowledgement, the two organizations have collaborated with stakeholders to refine plans for the program and prepare for the initial phases of baseline data gathering. The findings of this pilot are intended to be generalizable, and thus of value to the greater regulatory and utility community as the focus on fully integrated distribution system planning intensifies in the quickly evolving energy landscape.

NW Natural's 2018 Integrated Resource Plan (IRP) Update

LC 71

Attachment 2
Targeted Load Management Pilot

April 17, 2019

A Targeted Load Management Pilot:

Building a gas energy efficiency peak supply curve through geographically targeted energy efficiency strategies

February 15, 2019

Energy Trust of Oregon

Table of Contents

1. Executive Summary

This pilot will help develop cost, savings and timing estimates for peak-hour gas geographically targeted energy efficiency strategies to help NW Natural plan for future capacity constraints and learn whether equity issues arise and how best to manage them. The pilot builds on expertise within Energy Trust program delivery and lessons learned from similar efforts. It will test the results gained through a range of delivery strategies, including but not limited to targeted marketing, targeted delivery, and increased incentives. The pilot team will investigate the costs of these specific strategies that could help determine a specific cost-per-therm for geographically targeted energy efficiency offerings.

Pilot Team and Timing

Sponsors:	Steve Lacey, Director of Operations, Energy Trust of Oregon
Project Manager:	Quinn Cherf, Energy Trust of Oregon
Energy Trust of Oregon:	Andrew Hudson, Planning Project Manager Adam Bartini, Sr. Program Manager, Industrial Alex Novie, Sr. Project Manager, Commercial Mark Wyman, Sr. Program Manager, Residential Phil Degens, Evaluation Manager Shelly Carlton, Sr. Marketing Manager - Communications and Customer Service Susan Jowaiszas, Marketing Lead – Energy Programs
Pilot Duration:	Aug 2019 – December 2022

Budget and Outputs

Energy Trust Total Budget: ~$1.5 million

Outputs:

Pilot Implementation Plan
The implementation plan will identify the activities, stakeholders, marketing, customer outreach and staffing plan for the pilot.

Final Report
NW Natural will submit a final report incorporating Energy Trust's results from the pilot, detailing methodology, results, key recommendations and next steps.

Evaluation Report
Energy Trust and NW Natural will retain third-party evaluators to evaluate the pilot's design, implementation and outcomes. Their report will identify and clarify results so that Energy Trust and NW Natural can adjust strategies for future planning.

2. Background

National context

Across the country, electric and gas utilities face growing pressure on transmission and distribution due to aging and inadequate infrastructure, regulatory requirements such as the continued establishment of grid reliability standards, a shift from coal to natural gas for electric generation, and accelerated population growth. Capital upgrades estimated at $880 billion ($5.4 billion on the west coast alone) over the next 20 years could increase costs for utilities and their customers (Harris Williams & Co, 2014)[1].

Local governments and utilities are seeking peak-demand reduction to defer or avoid these investments in targeted locations. Targeted load management (TLM) options such as geographically targeted energy efficiency and renewable energy, localized demand-response initiatives and solar plus storage options are potential ways to accomplish this at least-cost.

A number of electric utilities, including Pacific Power here in Oregon, are piloting targeted energy efficiency and distributed renewable generation to address electrical grid constraints. To date, no gas utility has completed a pilot to test energy efficiency for peak-demand reduction to defer or avoid investments in distribution infrastructure. However, in September 2017, Consolidated Edison filed a suite of options to defer supply side investments with the New York State public service commission, including the use of targeted energy efficiency. In 2015 Enbridge, an Ontario electric and gas utility, proposed a comprehensive demand-side management plan to test the use of TLM to defer future capital investments.

[1]https://www.harriswilliams.com/sites/default/files/industry_reports/ep_td_white_paper_06_10_14_final.pdf?cm_mid=3575875&cm_crmid=e5418e44-29ef-e211-9e7f-00505695730e&cm_medium=email

Local Oregon Context

Energy Trust of Oregon, NW Natural and the Oregon Public Utility Commission (OPUC) are committed to acquiring all cost-effective energy efficiency. Where a distribution system project is forecasted to be necessary to maintain firm service, additional targeted energy efficiency savings should be considered along with other alternatives, such as distributed renewable generation. For any capacity resource to be considered in an alternatives analysis, however, the utility must have an estimated cost and estimated capacity of the resource. The OPUC has asked NW Natural and other utilities in Oregon to evaluate geographically targeted energy efficiency as an alternative to distribution system pipeline improvements, most recently in Avista's 2016 rate case.[2]

The Opportunity

NW Natural designs their gas distribution network to deliver gas to all firm sales and firm transport customers during a peak demand event. Over time, pressure and flow constraints along parts of the network can arise due to changes in gas demand. When these constraints occur, NW Natural considers a menu of options (e.g., pipeline reinforcement, satellite LNG, new pipeline) to ensure reliable service for customers. From these options, NW Natural chooses the least cost and least risk option. The opportunity for this pilot will be to provide the needed information to evaluate targeted energy efficiency as an option for meeting demand in a constrained area, possibly delaying, or in lieu of, capital projects.

With support from the OPUC, NW Natural has chosen to develop a filing for a pilot with Energy Trust to test geographically targeted energy efficiency as a TLM strategy to address peak-demand and inform future utility resource planning.

Since 2004, Energy Trust has developed and delivered energy efficiency programs for NW Natural customers, resulting in cost-effective savings. This proposed pilot builds on lessons learned from electric TLM initiatives in Oregon and elsewhere, Energy Trust's track record with successful efficiency program delivery, and NW Natural's expertise in gas system planning.

The Question

> How can we determine peak-hour energy-efficiency savings estimates, including cost and timing estimates, with a reasonable degree of certainty for a variety of customers to compare geographically targeted energy efficiency against other capacity resource options to meet distribution system needs going forward?

Additional questions to investigate through the pilot include:

1. How will localized avoided costs impact cost effectiveness of program offerings?
2. What criteria are used to establish a portfolio of measures to reduce demand?
3. How do Energy Trust and NW Natural conduct market and resource assessments to identify peak therm loads in a given targeted area?
4. How do geographically targeted energy efficiency efforts integrate with current Energy Trust activities in the market?
5. How do customers respond to targeted offerings?

[2] Docket No. UG 288, Order No. 16-109 at 14 (Mar 15, 2016)

3. Objectives

1. Determine the supply curve for the cost per peak therm for geographically targeted energy efficiency strategies to evaluate whether it is the least-cost option to reduce peak-demand.
2. Estimate customer adoption rate curves of geographically targeted energy efficiency solutions.
3. Assess whether implementing targeted solutions is socially desirable to customers.

4. Pilot Design Process

To test targeted gas energy efficiency strategies, the pilot team must select a test market and identify key assumptions and potential data limitations.

The following section details the process that NW Natural and Energy Trust will follow to develop a comprehensive resource assessment, pilot design and methodology, establish success metrics and document results for the pilot. It will include information on project management and evaluation methods, the proposed schedule and budget.

As the project progresses and at conclusion, NW Natural and Energy Trust will share the lessons learned with other gas utilities and efficiency program administrators facing similar challenges.

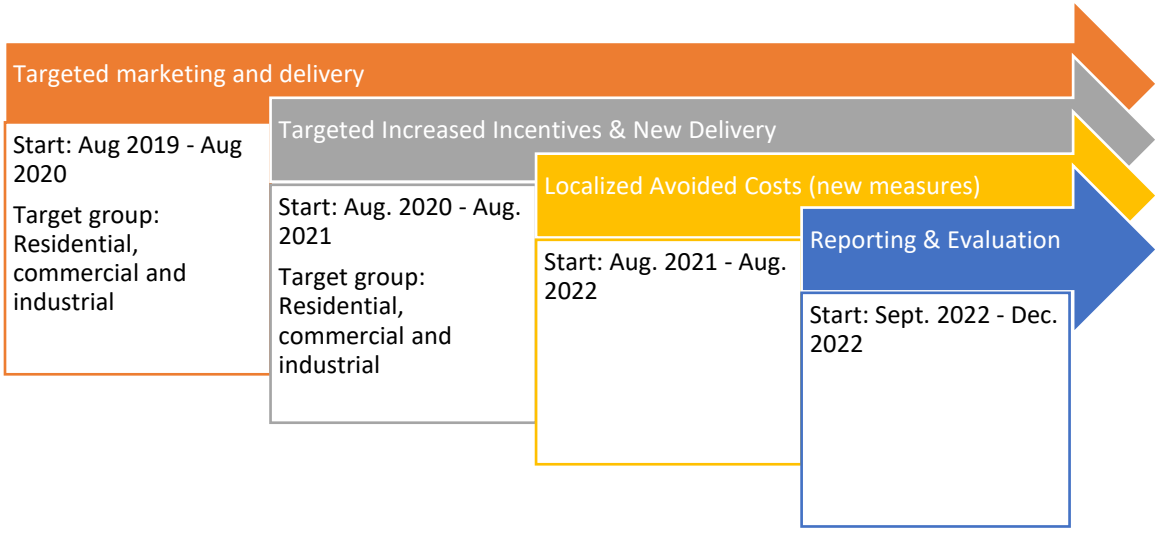
Framework

This pilot intends to test geographically targeted energy efficiency as a strategy to reduce peak-demand and consequently defer capital investments related to distribution constraints.

As proposed, this pilot features a layered framework to allow the project team to investigate the cost, timing and savings attributable to different combinations of incentives, marketing and outreach strategies. Based on Energy Trust's experience in program delivery, including TLM work with Pacific Power in the North Santiam Canyon area, the team believes that the best approach is to focus on specific peak-use measures through a progression of increasing incentive offers, supported by a matched effort of targeted marketing and outreach. The options will follow a path from lowest to highest cost and least aggressive intervention to most aggressive intervention, as visualized below. More details on the three phases are included in section 5: Project Management.

To take this pilot to market, Energy Trust will assign delivery tactics to Program Management Contractors, with oversight from internal program management, outreach and marketing teams. NW Natural's major account representatives will provide support on a community level and work with larger customers that may be involved in the pilot.

Figure 1: Geographically Targeted Energy Efficiency Pathway Framework



Peak Hour Demand

Peak hour demand is the maximum hourly demand expected under peak planning conditions. NW Natural plans their distribution system to meet the peak hour demand of their customers on Firm rate schedules. Unlike electric utilities which have load profiles based on extensive metering data, gas utilities do not typically have end-use metering data that provides information on how space and water heating loads affect system peak. Therefore, NW Natural has developed peak-hour/annual load coincident factors for gas end uses that correspond to existing Energy Trust measures. This chart is included in Appendix A. The project team will use these data to quantify the fractional amount of annual savings potential available for acquisition during a peak-hour event.

Identifying potential or ideal measures and interventions

Energy Trust provides comprehensive energy efficiency programs to NW Natural customers in Oregon and Southwest Washington. The OPUC measures the success of these programs in annual therms of natural gas saved through the efficient and effective delivery of services to customers.

Based on analysis of data on gas usage by NW Natural customers, measures targeting space heating have the greatest impact to reduce peak demand. Key gas space heating measures could include furnaces, boilers, building controls (including smart thermostats) in homes and business facilities, insulation and operations and maintenance in commercial/industrial facilities. Secondary opportunities include water heating in homes and businesses, and commercial foodservice equipment in business or institutional facilities.

As part of the pilot implementation plan, Energy Trust will complete an in-depth resource assessment specific to the proposed interventions in the selected pilot area.

Selecting a Pilot Site

For this pilot, NW Natural investigated seven potential test locations and, working with Energy Trust staff, narrowed the options to three areas. A summary of the analysis is in Appendix B.

Using a weighted average approach, the pilot team identified key criteria for potential pilot locations and scored each location:

- Configuration of distribution infrastructure (end of the line, etc.)
- Mix of residential, commercial and industrial customers
- Measurable peak demand/usage with adequate data to establish a credible baseline
- Majority of customers are firm customers
- Ability to install feeder line meters
- Strong past participation in Energy Trust programs indicating that customers would be responsive to energy efficiency opportunities in their homes and businesses.
- Ability to install high-frequency meters and develop load profiles for commercial and industrial customers.
- Demographics of community are reasonably typical of other areas of NW Natural's service territory, making the strategies tested in the pilot replicable in other areas.

Selected Community

The pilot team determined that Silverton, Oregon, with a population of around 10,000, was the optimal area to test geographically targeted energy efficiency. Silverton is located ten miles east of the Salem metro area and is served by both NW Natural and Portland General Electric. Customers in Silverton are eligible for both electric and gas incentives through Energy Trust. Silverton sits at the end of the gas feeder line, with only one input. It's a growing community, with a surge of new home construction in the past several years. There are just over 2,250 unique residential customers. The commercial and industrial base of the community is limited, with approximately 235 commercial businesses, and 20 industrial and agricultural businesses[3] served by the feeder line.

The project team has taken a preliminary look at overall participation in Energy Trust programs for residential customers in Silverton. It is important to note that the highest participation rates for Silverton's residential customers is in lighting, mostly through Energy Saver Kits. Where these customers have gas space heating, it is more likely that they have worked with Energy Trust in the past and may have more of a relationship with the program and/or their trade ally. Approximately 6% of Silverton homes have installed a high-efficiency gas heating system (~145 furnaces) through Energy Trust while only 15 homes have engaged in water-heating upgrades. This leaves an adequate number of likely residential participants for this pilot.

Key Stakeholders

Energy Trust and NW Natural will work together to define a comprehensive list of stakeholders to engage during the pilot implementation. The team will utilize an influence and interest matrix to determine how to keep stakeholders engaged and informed throughout the process.

[3] The unique customer count estimates are calculated with 2016 account data received from NW Natural that was compared to Energy Trust UCI data for Silverton.

5. Project Management

5.1 Developing the implementation plan

The implementation plan has three phases – 1) coordination, methodology, development and guidance, 2) pathway implementation and 3) monitoring and evaluation – to ensure that the outcomes of the pilot achieve the goal and objectives approved by the OPUC. The project team will design the complete pilot based on the framework and test assumptions about targeted measures, customers and success metrics. Described below are key actions to develop a comprehensive implementation plan for the pilot.

Establishing pilot target audience

Silverton's profile is largely residential, so the pilot team estimates that at least 70 percent of the peak-demand reduction will be achieved in homes, with the remaining 30 percent in commercial and industrial facilities. As a result, most pilot delivery work will focus on residential customers. The project team will determine the extent to which marketing and outreach will be delivered to businesses as part of the planning phase.

Identifying measures, new incentives, local costs

Targeted measure assumptions:

As noted earlier, the pilot team believes that residential space heating is the most likely strategy to reduce peak demand, based on available data and market characteristics. In addition, there may be peak therm savings opportunities with larger commercial and industrial facilities depending on their rate and operation profile. The peak usage period for space heating is the weekday morning from 6-8 a.m. during the winter heating season. Tapping the local contractor community to promote Energy Trust's geographically targeted energy efficiency offers will be a key piece of the pilot delivery. There are approximately 70 contractors in Energy Trust's trade ally network based in Marion County providing services to residential and business customers.

As a first step after approval, the project team will complete an in-depth resource assessment to refine measures and determine metrics for each. The team will use previous Energy Trust program participation usage data from NW Natural, and regional data sources as the key elements to develop this assessment. This assessment will estimate:

- Homes that have low-efficiency furnaces
- Homes with potential for smart thermostats
- Homes with potential for insulation upgrades
- Developers to engage for new energy-efficient home construction
- Commercial and industrial facilities with gas space heating opportunities for upgrades
- Industrial and agricultural sites with significant gas process heat demand during peak hours.
- Institutional or commercial kitchens and restaurants with gas foodservice equipment usage during peak hours.

Establishing incentives and determining costs:

Energy Trust's planning group calculates the cost-effectiveness of each Energy Trust offer to ensure that incentives meet OPUC cost effectiveness and utility IRP guidelines. As is the norm in resource acquisition programs, Energy Trust goes to market with the lowest possible incentive that results in an action by a customer. In addition to allowing the programs to acquire efficiency at lower cost, it allows Energy Trust to increase the incentive to provide additional encouragement to customers if market conditions require it.

NW Natural and Energy Trust will also examine a new area for geographically targeted energy efficiency by analyzing the avoided cost for the pilot site location. Cost-effectiveness is typically calculated across the whole territory served by the programs, creating a statewide average for the cost-effectiveness of each measure. It is the hypothesis of the project team that statewide average costs will differ from costs calculated within a specific area. Energy Trust planners will review targeted space-heating measures to determine whether this approach provides another path to savings for customers in Silverton.

Determining targeted marketing and outreach strategies:

As with incentives, Energy Trust also seeks to acquire savings at the lowest marketing cost. The phased/layered approach to marketing and outreach is designed under this assumption. In the planning phase, the marketing team will identify the optimal marketing channels for the targeted customers and develop an approach that maximizes marketing investments for the various phases of the delivery.

As a small community, Silverton has limited local media outlets. This makes direct marketing – direct mail, email, digital advertising and local print media – a more appealing option for reaching NW Natural customers. Radio may be added to the mix, based on more research of local stations and on the measures and target audiences identified in the pilot.

Identifying targeted delivery strategies:

From the literature review of similar projects conducted by Energy Trust, electric utilities used direct-install delivery models to gain key peak savings in targeted locations. Building on this delivery approach and Energy Trust experience with direct-install offers for furnaces and thermostats, the project team will put out a public solicitation for a direct-install offer to assess the costs and potential results from this higher-cost intervention strategy. Typically, these offers have a higher cost, and lower cost-effectiveness, than trade ally-delivered measures. This strategy requires a significant marketing and outreach campaign to reach customers and gain their participation within the time limits of the offer. Because these offers are typically delivered through a single contractor, there is a risk that this could create dissatisfaction with NW Natural and Energy Trust among local trade ally contractors.

5.2 Implementing the Plan

The pilot team proposes a phased approach that moves from low-touch to higher-touch strategies, conducted over a period of months (see figure 1). Program delivery would begin before peak usage periods to allow customers to learn about and act upon geographically targeted energy efficiency offers.

- *Phase I: Targeting marketing and delivery.*
    - Marketing: Use Energy Trust and NW Natural existing marketing channels to reach customers with actionable information on existing Energy Trust offers. These channels include direct email, direct mail, and digital ads. Existing marketing materials will be used, but they will be deployed in a more concentrated campaign. The pilot has identified a specific budget for marketing to cover these activities.
        - Targeted marketing tactics will be deployed across all phases of the pilot, but messages will vary as new incentive offers are introduced.

    - Delivery: Engage local trade allies, NW Natural account managers, program management contractors and program delivery contractors to reach out to customers through meetings and events to promote existing Energy Trust incentive offers.
- *Phase II: Targeted Increased incentives (using current statewide avoided costs) and new delivery options for the targeted area.* Offer time-bound, "bonus" incentives for existing, cost-effective measures. A direct-install program featuring key peak measure(s) may also be launched in this phase. The project team would accomplish this through a public solicitation for a third-party implementer. This offer would be time-bound; significant marketing and outreach investments would be made during a "blitz" campaign to install equipment at no or low cost to customers, and potentially including financing.
- *Phase III: Localized Avoided Costs.* The final phase of the pilot would test the effectiveness of time-bound incentives using a local avoided-cost calculation which incorporates the value of deferring or avoiding the cost of NW Natural's capital investment.

5.3 Monitoring and Evaluation

Evaluation is integrated into the planning and implementation phases of the pilot. During planning, evaluation representatives will be involved in reviewing the pilot progress indicators and assist in the selection of data-gathering methods that will support the tracking of these indicators. The evaluation may also gather specific data elements that are not being collected as part of the program. Energy Trust and NW Natural will conduct a competitive solicitation to select the most qualified vendor to support the evaluation process. Energy Trust will manage the contract with NW Natural insight and support.

The evaluation staff representatives will be involved in the review and analysis of some of these data elements and provide feedback to the pilot team on how the pilot is progressing to meet its goals and objectives. These evaluation activities will be reported on an annual basis and integrated into a final report at the end of the pilot.

Evaluation Framework

Appendix E includes a more detailed framework.

The evaluation will include both process and impact evaluation components to understand how the pilot is progressing to meet its goals and objectives as well as obtain recommendations on possible changes to the pilot's design and implementation.

Evaluation goal

Determine to what extent geographically targeted energy efficiency can complement system planning for distribution constraint.

5.4 Pilot Energy Trust Team

Energy Trust built a cross-functional team composed of three distinct groups to implement this pilot. Appendix C includes a diagram of the pilot team.

- *Planning and Evaluation.* This group will be heavily engaged during the planning and evaluation phases of the pilot. They will provide key data inputs, metrics and monitoring frameworks to ensure we are achieving pilot goals.
- *Efficiency Programs.* This group includes experts from the residential, commercial and industrial sectors. They are heavily involved in identifying targeted delivery options and engaging with program implementers.
- *Marketing and Outreach.* Energy Trust has experienced marketing experts to help with our targeted marketing efforts in the Silverton area. This group will work throughout the pilot planning and implementation phases to ensure our message is driving customers to act.

5.5 Reporting

Energy Trust will report on pilot progress biannually to both the OPUC and NW Natural. This report will provide updates on the key performance indicators of the pilot and narrative around current lessons learned. Energy Trust will integrate pilot reports into the annual reporting cycle. The project team is also available for meetings by phone or in-person, at OPUC request.

6. Risk and Mitigation Strategies

In any pilot, expecting the unexpected is part of the plan. In preparation for the more detailed pilot planning that will follow OPUC approval, Energy Trust and NW Natural completed a high-level risk and mitigation analysis, which is included in Appendix D. To ensure pilot success, the project team identified potential risks and mitigation plans for the pilot. Risks range from unpredictable market factors such as low customer or contractor interest to technical challenges such as ability to gather all required data to make cost per peak therm estimates.

7. Energy Trust Pilot Budget

A preliminary pilot budget (Table 1) reflects the overall costs for this four-year pilot. This budget is based on other pilots Energy Trust and NW Natural have implemented. Upon pilot approval, the pilot team will develop a final pilot budget to reflect the resource assessment findings and key strategies.

Table 1: Geographically Targeted Energy Efficiency Draft Budget

NWN TLM Project Budget (incremental to business as usual)

Activity	Q1-Q2 2019	Q3-Q4 2019	Q1-Q2 2020	Q3-Q4 2020	Q1-Q2 2021	Q3-Q4 2021	Q1-Q2 2022	Q3-Q4 2022	Total
Project Specific Meetings	$16,294	$16,294	$12,919	$12,918	$12,919	$12,919	$11,044	$11,043	$106,350
PM & Planning Lead costs	$31,860	$31,860	$28,665	$28,665	$28,665	$28,665	$28,665	$28,665	$235,710
Staff Time beyond Business as Usual	$12,263	$12,262	$7,838	$7,837	$7,838	$7,837	$2,250	$2,250	$60,375
Travel (Outreach & Marketing)	$1,000	$5,000	$2,000	$4,000	$5,400	$5,400	$7,800		$30,600
Targeted Marketing and Outreach		$15,000		$25,000		$25,000	$10,000		$75,000
New RES Measure Development Costs - ETO			$10,296	$10,296					$20,592
New RES Measure Development Costs - PMC			$19,800	$19,800					$39,600
New COM Measure Development Costs - ETO			$12,775	$12,775					$25,550
New COM Measure Development Costs - PMC			$26,562	$26,562					$53,124
Direct Install Program Administration	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	$0
Additional Incentives *	N/A	N/A	N/A	N/A	$171,250	$171,250	$125,000	N/A	$467,500
Third-Party Evaluator Costs – Process	$10,000	$20,000	$25,000	$10,000	$25,000	$10,000	$10,000	$25,000	$135,000
Third-Party Evaluator Costs - Impact		$50,000	$25,000	$25,000	$25,000	$25,000	$50,000	$25,000	$225,000
Contingency/Reporting	$250	$250	$250	$250	$250	$250	$750	$750	$3,000
Total	**$71,667**	**$150,666**	**$171,105**	**$183,103**	**$276,322**	**$286,321**	**$245,509**	**$92,708**	**$1,477,401**

* Additional incentives include increased incentives and local avoided costs incentives

2019 Activities:	Project planning, design of targeted marketing and delivery approach, marketing in local area
2020 Activities:	Plan increased incentives, corresponding measure development work, plan new delivery approach
2021 Activities:	Plan local incentives, corresponding marketing materials, measure development work, on the ground implementation costs
2022 Activities:	Evaluation and reporting

Appendix A

Table 2: Peak Hour Usage Coefficients (provided by NW Natural)

Peak HOUR Usage to Normal Weather Annual Usage Factors for DISTRIBUTION System Costs	
Residential Space Heating	**0.00102**
Hearths	**0.00051**
Commercial Space Heating	**0.00123**
Water Heating	**0.00026**
Food Service	**0.00071**
Large Commercial and Industrial Process Load	**0.00011**

*Space Heating includes thermostats and weatherization

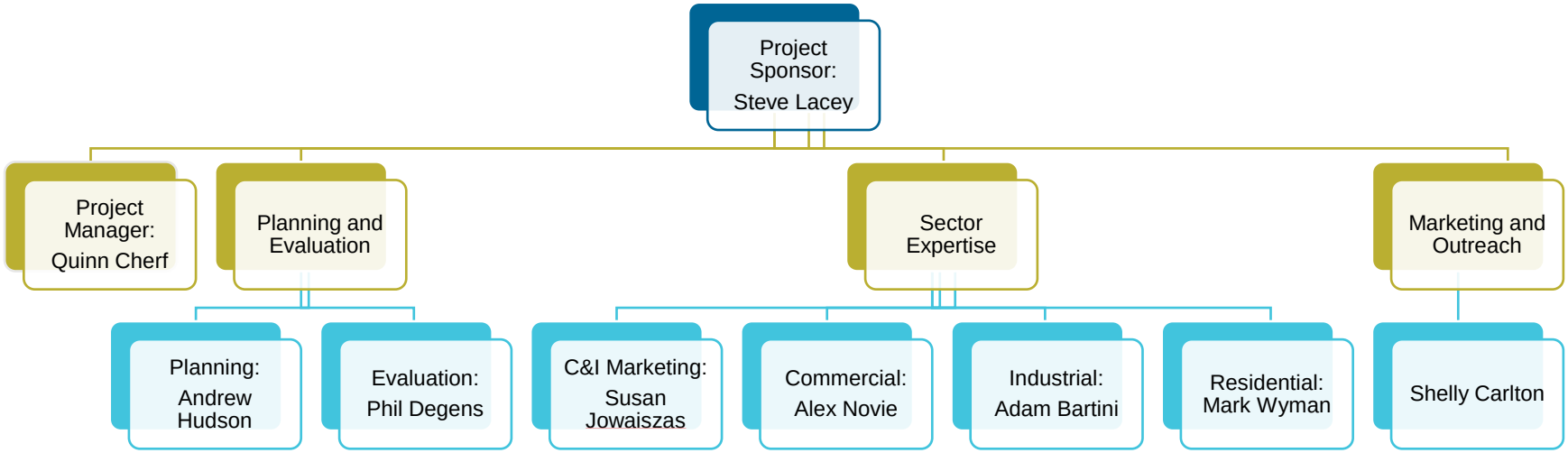
Appendix B

Table 3: Pilot Location Scorecard

Criteria	Silverton	Sweet Home	Sandy	Weighting
Mix of customers by Sector	5	4	5	15%
Potential system access	5	5	3	10%
Single Feeder	5	5	3	15%
Proximity to Portland	5	4	5	5%
All-time gas savings	5	5	5	5%
Participation by sector	5	4	5	10%
Remaining load to impact	5	5	5	10%
Average consumption per resident	5	5	5	5%
Current projects in Energy Trust pipeline	5	3	5	10%
Learnings likely to be replicable	5	4	3	15%
Total:	5.00	4.35	4.20	

Appendix C

Figure 2: Pilot Team Structure



Appendix D

Table 4: Risk and Mitigation Analysis (preliminary)

No.	Potential Risk or Failure Modes	Potential Impact or Failure Effect	Recommended Mitigation Plan
1	Lack of interest from customers to participate in geographically targeted energy efficiency	Not enough impact to measure	Utilize the alternative strategies, utilize the phased approach, monthly updates from PMCs/PDCs to track progress closely.
2	Cost-effectiveness continues to be a challenge as gas prices continue to decrease	Current acceptable energy efficiency measures may not exist in the future, reducing the pool of potential measures.	Receive OPUC approval prior to pilot to ensure that a list of potential gas savings measures will be considered.
3	Inequitable distribution of incentives to targeted customers in pilot area creates tension in other locations	Customers not receiving targeted incentives are upset and angry at Energy Trust and NW Natural. Press gets involved creating a public relations emergency. This impacts both communication teams and trade allies.	Communication plan designed to address these questions and the key talking points prior to pilot beginning.
4	Natural disaster impacts current pipeline capacity	Causes disruption in pipeline and a capital investment has to occur to meet energy needs	Identify potential locations outside of hazard zone to switch pilot to
5	Marketing capability is limited in non-metro areas	Increased costs associated with marketing. Limited to small number of channels. Could become annoying.	Use specific targeted marketing approaches. Track contacts.
6	Pilot timeline is too long; lost opportunities in the future because pilot has taken too long.	Does not allow us to test all potential pathways (load growth, economic impacts, etc.). Increased costs with longer pilot timeline.	Build in flexibility in the length of testing the different phases. Can activate another layer quickly to shorten timeframe. Could add in additional location to ensure testing of key pathways.
7	Load growth beyond projections (shocks).	Requires the construction of a new pipeline to meet immediate demand growth	Ensure that market research and planning was conducted prior to anticipate these changes in the pilot location.

8	Contractor confusion over different messaging that may occur with increased incentives.	Customers participating in the program are beyond the pilot boundary.	Ensure comprehensive training and resources for contractors as they work within the pilot location.
9	Potential fuel-switching messaging could exist because of the focus on gas in the targeted pilot location.	OPUC regulations are not adhered to.	Provide reminders to contractor staff about implications and a refresh training about the messaging.
10	OPUC does not approve the use of local incentives based on localized avoided costs	Unable to test different incentive levels for key measures that currently do not meet the cost-effectiveness requirements.	Use all other pathways as key options and work to increase incentives to max level to simulate the use of incentives based on localized avoided costs.
11	Data is not granular enough.	Unable to build cost per therm supply curve for future distribution planning for NW Natural.	Gather data continuously throughout the first six months to ensure that results are robust. Change data discovery plan after six months if data outputs are not useful.
14	No opportunities exist to reduce or fix the peak load.	Geographically targeted energy efficiency is not a viable option for distribution planning.	Recommend to NW Natural to utilize DR as a key solution to test as part of the mix of opportunities.
15	Resource constraints (human, financial) occur.	Pilot design is not as thorough as it could be. Results lose validity and NW Natural does not want to use them for future pilot planning.	Build-up real activity budget that allocates total costs accurately and time needed of staff. Gain approval from OPUC prior to implementation.
16	Some trade allies are not supportive of the direct delivery RFP Approach.	Undermines relationships with trade allies support of our program efforts.	As we engage in more targeted work, we need to communicate with trade allies our need to be able to establish more control over price, installation requirements, and timing.

Appendix E

Evaluation Framework

Evaluation goal

Determine to what extent targeted load management (TLM) can complement gas system planning.

Questions to be answered:

- What are the benefits to a TLM project of the implemented energy efficiency measures (e.g. cost-effectiveness, coincident load impacts, cost and ease of deployment, time needed to deploy, large potential savings, etc.)?
- What are the annual gas savings of these measures?
- What are the peak load impacts of these measures? What are the peak load impacts under projected peak day conditions? How reliable are the loads?
- What are the successful marketing and implementation approaches? What are their costs? How long do they take to implement?
- What marketing and implementation approaches should be considered in future TLM projects?
- Equity issues – how do customers respond to offerings that are available to only some customers in specific areas?

Process Evaluation Methods:

- Review of pilot documents
- Interviews with NW Natural and Energy Trust staff
- Interviews with program/project implementers/customers

Impact Evaluation Methods:

- Pre-post billing analysis of participants and nonparticipants in the targeted area by sector
- Collect and analyze pre and post Energy Trust program participation data
- Analyze NWN feeder pre and post load data and integrate billing analysis results
- Collect secondary end use load data to develop measure level load factor
- Estimate load impacts of installed measures

Phased Evaluation Schedule

- Pre-pilot Evaluation (2019):
  - Process evaluation:
    - Document review
    - Interviews with pilot implementors:
      - Goals
      - Roles
      - Schedule
  - Impact evaluation:
    - Data collection and analysis plan review
    - Review of savings methodology
  - Deliverables:
    - Interim Evaluation report: June 2019

- Evaluation 2020:
  - Process evaluation:
    - Data collection and reporting review
    - Interviews with pilot implementors
    - Interviews with key pilot contractors
    - Interviews with key trade allies/customers
  - Impact evaluation: Review of savings methodology and savings estimates
  - Deliverable: Evaluation report 1: July 2020

- Evaluation 2021/2022:
  - Process evaluation:
    - Data collection and reporting review
    - Interviews with pilot implementors
    - Interviews with key pilot contractors
    - Interviews with key trade allies/customers
  - Impact evaluation: Review of savings methodology and savings estimates
  - Deliverables:
    - Evaluation report 2: July 2021
    - Evaluation report 3: July 2022