Portland General Electric Company
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June 6, 2017

via email
puc.filingcenter@state.or.us

Public Utility Commission of Oregon
201 High Street, Ste. 100
P.O. Box 1088
Salem, OR 97308-1088

Attn: OPUC Filing Center

Re: **UM 1827 – PGE's Application for Deferred Accounting of Costs Associated with the PGE Demand Response Water Heater Pilot**

In a response to a request from the Commission Staff (Staff) during a meeting on May 12, 2017, Portland General Electric Company (PGE) submits the following:

- Supplemental information in support of PGE's application for deferred accounting of costs associated with the PGE Demand Response Water Heater Pilot; and
- The slide deck that PGE presented during the May 12th meeting with Staff.

Thank you for your assistance in this matter. If you have any questions or require further information, please call me at (503) 464-8937 or Alex Tooman at (503) 464-7623 Please direct all formal correspondence, questions, or requests to the following e-mail address pge.opuc.filings@pgn.com.

Sincerely,

Stefan Brown
Manager, Regulatory Affairs

Encls.

UM 1827 – Supplemental Information in Support of PGE's Application for Deferred Accounting of Costs Associated with the PGE Demand Response Water Heater Pilot

Background

Under the reference scenario in PGE's 2016 Integrated Resource Plan (IRP), PGE's goal is to obtain 74 MW summer and 78 MW winter demand response capacity by 2021. This is a cumulative demand response capacity goal across the residential, commercial, and industrial sectors and is set at a portfolio level. PGE expects some programs to outperform their capacity targets and others to underperform.

Water heating direct load control (DLC) has a target in the IRP reference scenario of reaching 1.6 MW summer and 3.4 MW capacity by 2021. PGE's Multifamily Residential Water Heater Demand Response Pilot intends to pursue and potentially exceed these MW capacity targets. PGE is planning to conduct this pilot in three phases; transitioning from pilot to program at the end of a 30-month period, with cost-effectiveness being demonstrated by the end of the pilot period.

Market Analysis

PGE has invested considerable time analyzing the residential water heater market and currently estimates the following market shares for electric water heaters:

- 37% in single-family residential (SFR) buildings – The market share for electric water heaters in SFR dwellings decreased significantly as conversion programs drove electric to gas in the 1990's and 2000's. The new construction market has also moved largely to gas during this time.
- 87% in multifamily residential (MFR) buildings – The market share for electric water heaters in MFR dwellings remains stable due to property owners'/managers' preference for decentralized systems (i.e., in an effort to avoid carrying utility costs, property owners/managers will invoice their tenants an allocation of the expected total centralized costs such as water, sewer, and garbage through their rent).

Assuming that PGE could enable up to 50% of all current residential water heaters with demand response DLC equipment, the maximum achievable potential would be 99 MW in MFR and 51 MW in SFR buildings.

Pilot Design

PGE issued requests for proposals (RFPs) for hardware and software vendors for water heater demand response equipment in June 2016. The submitted bids support the theory that the MFR market offers a cost-effective option for water heater demand response in PGE's service territory

today. The cost for equipment and labor to retrofit can easily exceed $350 per water heater, not inclusive of program management, software, and incentive costs. The reasons for high costs in SFR include: lack of a communications adapter on existing water heaters; high cost of labor and materials to enable water heaters; unreliable communications if customer Wi-Fi is used; and high cost of deploying reliable communications methods such as 4G LTE for individual water heaters. PGE expects fewer issues over time as water heaters move from electro-mechanical to digital thermostats and control boards.

PGE prepared multiple pilot design reiterations to bring the costs under the cost-effectiveness threshold. In order to achieve cost-effectiveness, the pilot requires the mass retrofit or enablement of multifamily water heaters to create economies of scale on hardware costs, software, and labor costs. It does not make economic sense to retrofit or enable water heaters with demand response capable technology on a one-off basis at this time. Lastly, it would be extremely difficult for this pilot to reach cost-effectiveness if designed as an opt-in program, given the high level of churn in the multifamily sector.

Heat Pump Water Heaters

PGE considered allowing heat pump water heaters into the program. While PGE supports heat pump water heaters, PGE estimates the total number of heat pump water heaters joining the program to be too low to overcome the program overhead costs.[1] The location of water heaters in MFR is mostly in utility closets, which do not allow for the installation of a heat pump water heater today. PGE will include heat pump water heaters if, and when, PGE expands the program to SFR in the future. The hardware, software, and implementation infrastructure for MFR will support future efforts in SFR water heater demand response, if and when, the larger program reaches sufficient scale to achieve economies of scale.

Multifamily Market

In order to drive acquisition of demand response (DR) capacity and to achieve lower costs, PGE has determined that large-scale MFR water heater demand response offers the best opportunity. Housing complexes with 25 or more apartments at a single location define the target market. PGE has identified 95,000 apartments in its service territory that meet this criterion. PGE intends to rollout the pilot with selected property managers, sites, and demographics to ensure program success and minimize potential adverse effects.

The achievable potential (defined as 50% of market size) for our target market, large apartment buildings, is approximately 25 MW or 50,000 apartments. This pilot is budgeted for up to 8,000 demand response enabled water heaters over a 30-month period.

[1] Currently, PGE estimates an incremental cost of roughly $10,000 for integrating a heat pump water heater product into our demand response management system. Hardware costs would be similar to those for resistance units.

MFR water heater demand response will be implemented via an experienced implementation contractor. Among other things, this contractor will be required to source materials, track equipment, schedule installations, schedule service for equipment in the field, initiate and maintain the connection between water heaters and demand response management system, provide customer service, etc.

Pilot Operational Structure

PGE is responsible for overall program management and will manage the implementation contractor as well as evaluation contractors. PGE issued an RFP for an implementation contractor and is ready to award a contract to winning bidder(s) in June 2017. The contract is contingent upon Commission approval of the program tariff and deferred accounting treatment.

Retrofits

PGE has several options to enable water heaters with demand response capable technology. As a first option, PGE will contract with vendors to retrofit qualifying water heaters.[2] PGE has identified multiple hardware vendors for the water heater retrofit option. PGE's hardware RFP has shown that vendors of two-way communicating devices have rather low total sales for their retrofit switch and communications solutions (i.e., vendors range between 100-20,000 switches produced and installed in the field). To mitigate risk, PGE plans to move forward with a minimum of two retrofit switch providers at the start of the pilot. This would allow for lower risk should a vendor experience issues regarding supply, reliability, etc. PGE also plans to require the vendors to provide access to the IT-management system for their switches in case of vendor insolvency. Due to cost-effectiveness issues, PGE plans to use simple two-way retrofit switches (power only) and some smart-retrofit switches (including temperature switch and/or leak detection) that will provide some indication of the amount of hot water available in the tank.

New Water Heaters

The second option to enable water heaters involves the early replacement of existing, but aging tanks (greater than 10 years old). Based on discussions with two water heater manufacturers that offer smart water heaters with communication adapters, PGE discovered that both manufacturers offer only their premium water heaters with the digital controls and communications hook-up. This increases the costs of such water heaters to an incremental level of up to $300 above the basic 6-year warranty electric resistance water heater that landlords typically purchase. In addition, the $300 price differential does not include the communications module needed to connect the water heater to demand response management software. Consequently, PGE is continuing discussions with the manufacturers to bring this technology to 6-year warranty tanks

[2] Eligible tanks are defined for this program as resistance tanks less than 10 years old in good working order. Utilities have been controlling water heaters via legacy systems over the past three decades.

at a reduced incremental cost. If PGE cannot overcome the cost differential, we will reduce or eliminate the early water heater replacement option for the pilot program.

Demand Response Management System (DRMS)

PGE is in the process of selecting a DRMS for the MFR Water Heater Demand Response-Pilot. Vendor negotiations are ongoing, but expected to conclude by mid-June 2017. PGE plans to reduce vendor-specific risk in a similar manner as with hardware vendors, namely by implementing a pay-for-performance structure, as well as mandating access to software controls.

Implementation Contractor

The implementation contractor will run day-to-day operations for the pilot and will perform the following:

- Recruit, enroll, and manage pilot participants including monitoring customer move-ins and move-outs and providing customer service;
- Enable and commission hardware, software, and communications equipment;
- Identify and address water heater issues[3]; and
- Service control and communications equipment in the field.

Property Managers

The property owner's/manager's role will be to: 1) to enroll properties into the pilot; 2) support DR enablement by providing access to properties, as well as facilitating tenant communications; and 3) receive monetary and non-monetary incentives as well as incremental costs for smart water heaters (see "New Water Heaters", above).

Phased Approach

PGE's goal is to transition the MFR Water Heater Demand Response Pilot to a program by the end of the 30-month period. A cap of 8,000 DR-enabled water heaters in place is not the only control threshold. PGE also identified the need to build a flexible, scalable infrastructure in order to provide economies of scales to reduce hardware, software, communications, labor, and management costs over time.

PGE plans to conduct this pilot in three phases:

Phase I: Launch. The pilot launch will focus on installing equipment, setting up communications, operationalizing the system, and establishing best practices. PGE's goal is to identify any significant issues at this stage and try to reduce/eliminate the occurrence of these

[3] Property managers may receive water heater reports identifying leaking tanks and defective equipment (assumes these reports are economical to develop). If we do opt to provide these reports, they would be provided by the implementation contractor.

issues in order to drive efficiencies for Phase II. PGE plans to enable 1-2 properties with up to 150 apartments in this phase, which is scheduled to begin in Q3, 2017.

Phase II: Limited roll out. The purpose of this phase is to establish a delivery infrastructure that allows for the efficient delivery and maintenance of equipment in the field. The implementation contractor will be responsible for key customer management and acquisition. Similarly, PGE expects subcontractors to be in the field retrofitting existing water heaters with switches and communications modules. The pilot will require daily communications with property managers, residential customers, and contractors during this phase. Equipment tracking and maintenance become important management items given increased scale and complexity. PGE also plans to continue to look at ways to increase program efficiency to lower delivery costs. This phase is scheduled to run from Q4, 2017 to Q3, 2018

Phase III: Scaling. The purpose of this phase is to expand the pilot in way that will lead to an eventual program if the pilot demonstrates that a full program can be cost effective. This phase may launch as early as Q2, 2018 and run through Q4, 2019, and will include:

- Substantially higher purchase orders for hardware;
- Contractors receiving substantial work orders to install equipment in the field;
- PGE allowing more property managers to participate in the program; and
- Continued focus on optimizing the pilot by selectively choosing property managers and properties, making sure to work with parties with reputable business practices.

PGE believes this pilot will be scalable and resilient to vendor risk. By engaging separate vendors at the hardware, software, and implementation levels, we can absorb any issues with a vendor or solution without compromising the program as a whole. However, this risk mitigation does not come without cost. If PGE were to engage in a turnkey solution, the costs may be lower, but the program would suffer from single vendor risk. This could impair the ability for the program to adjust to new cases and could put the program at higher cost risk in the medium to long-term. This approach not only allows us to mitigate risk, but also allows PGE to build a foundation upon which we can scale this and other programs. This will help PGE move programs from pilot to program more rapidly, supporting PGE's push to scale our DR portfolio quickly to meet capacity needs identified in the IRP.

Timeline

PGE expects to have all contracts with relevant parties executed by July 2017. Once contracts have been established, PGE will recruit for Phase I and Phase II of the project. The initial integration of hardware and software will be the focus in Q4, 2017. The pilot will run through 2019. Table 1 shows the program timeline in detail.

Table 1. Pilot Timeline

Multifamily Water Heater Demand Response Timeline

	2017								2018												2019											
	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Multifamily DR Water Heaters																																
Establish Implementation contract																																
Establish Hardware contracts																																
Establish Software contract																																
Recruitment Phase 1 - up to 150 units total																																
Installation Phase 1																																
Recruitment Phase 2 - up to 1,500 units total																																
Installation Phase 2																																
Recruitment Phase 3 - up to 8,000 units total																																
Installation Phase 3																																
DRMS Integration																																
Market Research																																
Joint Evaluations																																
Preliminary evaluation																																
Final evaluation																																

Legend

- Contracting
- Support work
- Hardware and software installations & integrations
- Reporting to commission

Program delivery will benefit from additional market research scheduled for June 2017. Market researchers will focus on messaging water heater demand response with multifamily property managers and residential customers in PGE service territory. Market researchers will continue to check-in with participating residential customers who have a demand response enabled water heater installed in the field in Phase I of the pilot.

PGE will provide evaluation reports to the Commission in September 2018 and September 2019.

Customer Experience

Dispatch events should have a minimal impact on participating customers. Using two-way communicating switches and customer-level analytics at the DRMS level, curtailment will be performed in such a way that it would not reduce the level of hot water service to the customer. The program will utilize the storage capacity in the tank to ensure hot water is ready when the customer typically needs it. Ideally, customers will not perceive any change to their hot water (we will verify this through evaluation).

PGE plans to keep customer impact caused by the pilot to a minimum. At the time of equipment installation, PGE will provide property owners/managers and customers with program and contact information. Marketing materials will also be provided to property owners/managers for them to include with any move-in materials in the case of a change in tenants. Due to the low

impact to tenants, tenants will be auto-enrolled into the water heater pilot. Tenants, however, will have an opportunity to opt out at their discretion and PGE plans to move customers to a less aggressive dispatch schedule (e.g., shorter dispatch windows or less frequent events), if they express discomfort caused by events. Participating customers will annually receive local retail coupons, which PGE has successfully used in the residential pricing pilot (Schedule 6) and other renewable programs.

Dispatch and Use Cases

The primary objective of MFR Water Heater DR Pilot is to provide load shedding during peak demand periods throughout the year. Load shedding is the only component used to justify the cost-effectiveness for the pilot. The program value is traditionally in peak shaving at the system level, but PGE plans to test the ability to shave locational peaks (at the substation level) as well.

A secondary objective is to provide daily load shifting capabilities. The MFR Water Heater DR pilot will address the daily morning and late afternoon/evening loads. Daily load shifting will mimic response to time-of-use rates such as those being test in the residential pricing pilot, with the aggressiveness of the shifting tailored to customer-specific needs.[4]

The tertiary objective of the MFR Water Heater DR Pilot is to allow for fast response cases such as load following and/or ancillary services. PGE is considering this functionality for the future. The DRMS as designed allows for this functionality, but integration with the necessary enterprise system may not be possible over the timeframe of the pilot.

PGE does not plan for any arbitrary limitations regarding the dispatch of DR events. PGE intends to dispatch multiple times per day and to dispatch each water heater as an individual connection point. PGE plans to optimize the dispatch based on the customer's water use pattern as well as charge status (availability of hot water). Each event may last as long as six hours, though at this length it would be a duty cycle (not a full curtailment).

Water Heater Communications

PGE will schedule and control all DR dispatch via the DRMS. PGE plans to send information and signals via two-way communications between DRMS and individual water heaters. 4G LTE wireless broadband will transfer the data to and from the DRMS to a PGE-owned, local router installed at the multifamily facility. Each router will accumulate data for a minimum of four water heater control switches via Wi-Fi. A control switch will then execute the commands sent by the DRMS cycling each of the water heaters on and off. The DRMS is fully scalable to any number of water heaters.

[4] The DRMS vendor will use usage data reported from control equipment to tailor controls to individual usage patterns.

PGE considered using direct Wi-Fi as well as 700MHZ radio. PGE considers customer Wi-Fi too unreliable and it would be too costly if the pilot had to pay for Wi-Fi connections operated by the program. The 700MHZ radio opportunity may have promise in the future (and the program design is flexible to its potential inclusion), but the cost to install dedicated towers for this pilot far exceeds the costs of using 4G LTE.

Cost Effectiveness – Sensitivity Analysis

On May 3, 2017, PGE provided a memo to Staff with detail on the inputs, assumptions, and methodology used to assess the cost-effectiveness of a water heater DR program from a total resource cost (TRC) perspective. The main drivers of program cost include the high upfront cost to purchase and install retrofit equipment and ongoing costs to maintain control software and communications.

Table 2 provides the sensitivity on cost effectiveness in 5% increments, if program costs were to increase or decrease in 10% increments for hardware costs and administrative costs. Table 2 shows relatively low impacts on cost effectiveness supporting the notion that MFR water heater DR is the best option to deliver a cost-effective water heater DR program at this time.

Table 2. Cost-Effectiveness Sensitivity Analysis

		Administrative Costs						
		-20%	-15%	-10%	0%	10%	15%	20%
Equipment Costs	-20%	1.22	1.18	1.15	1.09	1.03	1.01	0.99
	-15%	1.19	1.15	1.12	1.07	1.01	0.99	0.97
	-10%	1.16	1.13	1.10	1.04	0.99	0.97	0.95
	0%	1.11	1.08	1.05	**1.00**	0.96	0.94	0.92
	10%	1.07	1.04	1.01	0.97	0.92	0.90	0.88
	15%	1.04	1.02	0.99	0.95	0.91	0.89	0.87
	20%	1.02	1.00	0.98	0.93	0.89	0.87	0.86

As noted above, some pilot components that could move costs are related to using multiple hardware vendors. Using single vendors could reduce costs, but would also expose the pilot to the risk of unusable equipment as well as supply chain issues (due to limited stock) that could threaten the speed of obtaining DR capacity.

Evaluation Plan

To ensure that this pilot yields sufficient actionable insights, PGE proposes to include both impact and process evaluations in its plan. We propose third-party evaluation by one of the contractors (i.e., The Cadmus Group and Navigant) identified in our 2015 evaluation services RFP process.

Similar to the smart thermostat pilot, our proposed impact evaluation framework uses a randomized control trial framework within the group of customers recruited for the water heater pilot. Before each season, we will divide the customers into a "Group A" and a "Group B" at random and test for comparability. On a given day in which we call a demand response event, we will only send a signal to devices in one of the groups (e.g., Group A). Thus, Group B will serve as the control group for that day. By calling events on Group B on other days, we can get two treatment and control datasets, thus providing unbiased estimates of the energy use impact of control strategies. Although the capacity impact is the primary benefit of this program as quantified at this time, we plan to measure other impacts as well, such as daily valley-filling or opportunistic load increases at times of low-priced power. These will be evaluated using a similar approach to peak shaving.

Because of the importance of the ongoing relationship with property owners/managers and tenants in this pilot, we will place special emphasis on process evaluation. We plan to include customer surveys and interviews with property owners/managers, implementers, program staff, and/or electricians as data sources for the process evaluation.

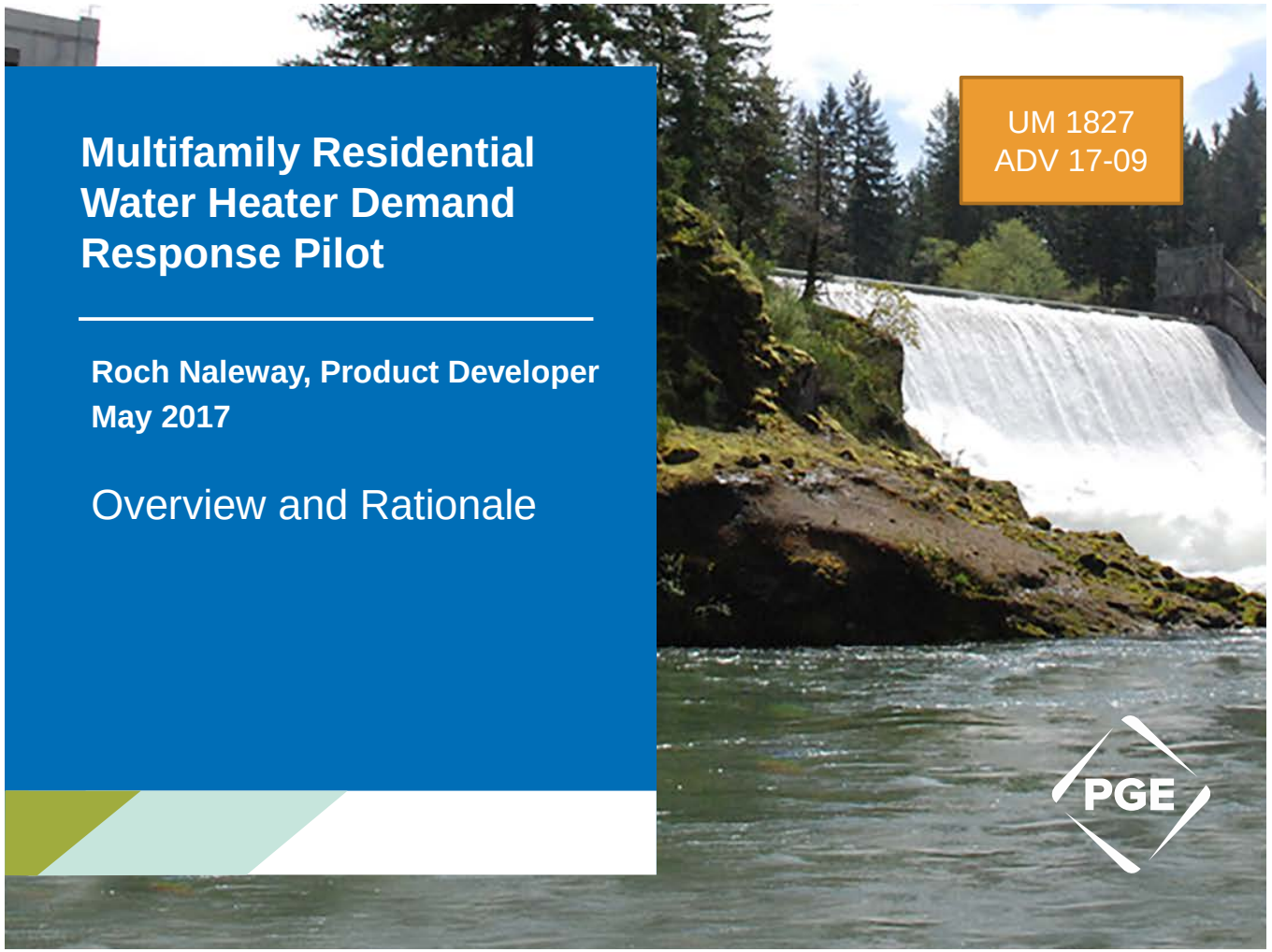
Pilot-to-Program Success Criteria

The following are criteria for success that will allow MFR Water Heater DR Pilot to move from a pilot to a program:

- Adoption by 10% of the top 50 largest MFR companies in PGE's service territory;
- Communications up-time of 80%+ during pilot;
- Control equipment defects of less than 5% annually;
- Verification of capacity at 0.5 kW per water heater per event or better;
- Cost effectiveness achieved at completion of Phase III (or earlier);
- Stable customer satisfaction ratings with residential customers in participating multi-family residences;
- Increased customer satisfaction among multi-family management companies (business customers); and
- 4.0 MW capacity with 8,000 participating electric water heaters.

To the extent that it appears that PGE will not meet one or more of these criteria, we will adjust the program design accordingly.

PGE appreciates the inquiry and input from Staff related to this pilot.


UM 1827
ADV 17-09
Multifamily Residential Water Heater Demand Response Pilot
Roch Naleway, Product Developer
May 2017
Overview and Rationale
PGE

Today's agenda

- Demand response in PGE's IRP
- Market analysis
- Program design
- Pilot objectives, approach and cost
- Metrics for moving from pilot to program

Demand Response in PGE's IRP

- 2021:
  - 78 MW (Winter)
  - 74 MW (Summer)
- 2035:
  - 197 MW (Winter)
  - 182 MW (Summer)

Class	Program	Delivery Type	Summer	Winter
Residential	Behavioral DR	Opt-out	26.0	36.8
Residential	Water Heating DLC	Opt-in	1.6	3.4
Residential	TOU	Opt-in	0.8	1.0
Residential	PTR	Opt-in	1.1	1.3
Residential	BYOT - AC	Opt-in	11.3	0.0
Residential	BYOT - Space Heating	Opt-in	0.0	1.9
Residential	BYOT - AC/Space Heating	Opt-in	2.4	3.5
Small C&I	AC DLC	Opt-in	0.3	0.0
Small C&I	Space Heating DLC	Opt-in	0.0	0.1
Small C&I	Water Heating DLC	Opt-in	0.0	0.0
Small C&I	AC/Space Heating DLC	Opt-in	0.1	0.1
Small C&I	PTR	Opt-in	0.0	0.0
Medium C&I	Curtailable Tariff	Opt-in	0.9	0.9
Medium C&I	Third-Party DLC	Opt-in	11.2	11.0
Large C&I	Curtailable Tariff	Opt-in	3.2	2.6
Large C&I	Third-Party DLC	Opt-in	15.1	15.3
Total			**74.2**	**78.0**

Water Heater Demand Response

Market Analysis

Electric water heaters:

- 37% single family residential
- 87% multifamily residential

Achievable potential for all residential water heater demand response:

- 199,000 electric water heaters in single family residential (99.5MW)
- 102,500 electric water heaters in multifamily (51.25MW)

Market Summary

The multifamily residential market offers the only option for cost-effective water heater demand response today

Target Market Features

95,000 Large multifamily residential apartments

Achievable potential = 50,000 at scale (25MW)

Go-to-Market Strategy

- Outsource to experienced integrator
- Focus on top 50 property managers and an all-unit retrofit or replace enablement approach

Program Operational Structure

PGE

- Program management

Program Integrator

- RFP completed
- Multiple hardware vendors to reduce risk
- Contractual access to operating software if vendor(s) default(s) (Enbala and switch vendors)
- Manage customer recruitment, enrollment and moves, enablement and support (service and issue resolution)

Program Evaluation

- Customer surveys; measurement and verification;

Phased Approach Mitigates Risk

Phase 1: Launch (Q3 2017)

Install equipment, set-up coms, operationalize, establish best practices, identify issues, optimize

Goal: 100-150 water heaters (1-2 properties)

Phase 2: Limited roll out (Q4 2017 – Q3 2018)

Build installation & maintenance infrastructure, learn key customer management, learn to deal with complexity, identify issues, optimize

Goal: ~1,500 water heaters (30-60 properties)

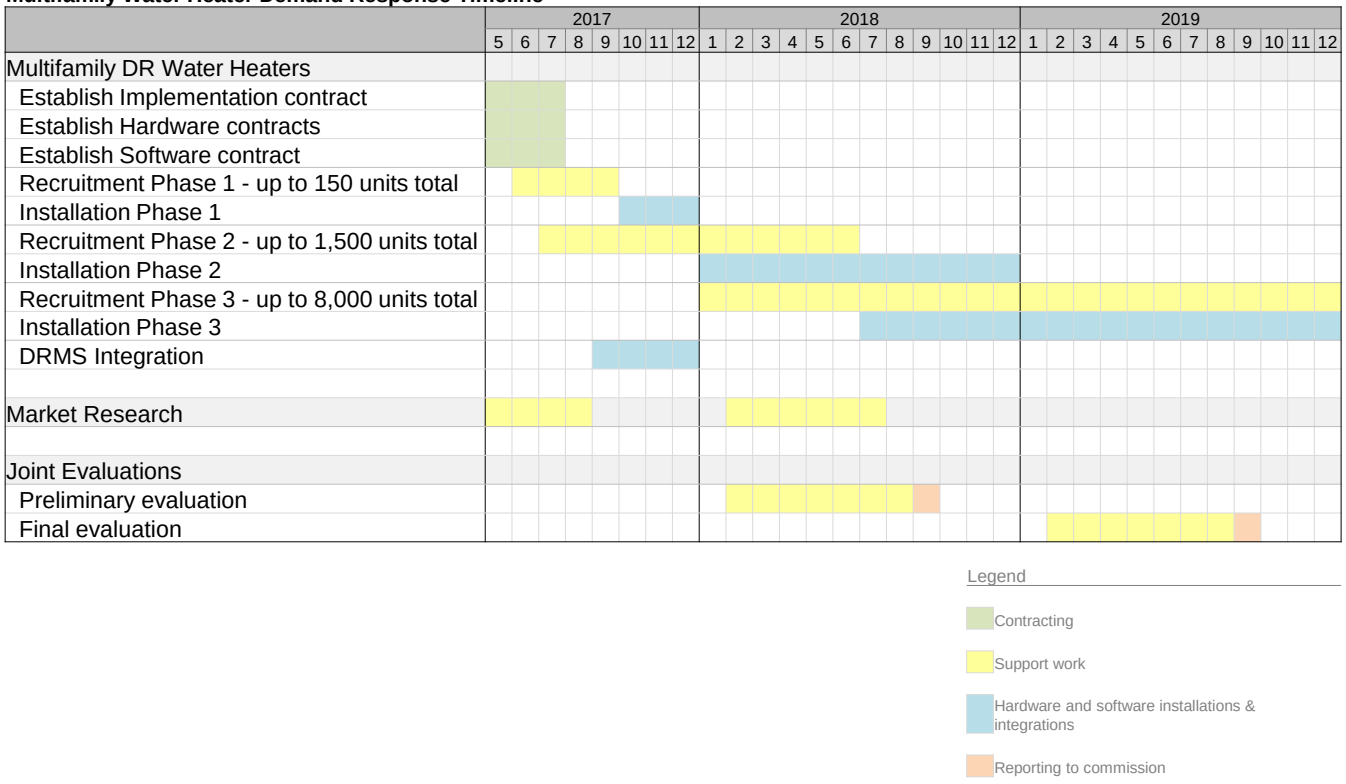
Phase 3: Scaling (Q2 2018 – Q4 2019)

Build economies of scale, become more efficient: labor, materials, program management. Prepare to turn into program.

Goal: ~8,000 water heaters (160-320 properties)

Planned timeline for the pilot

Multifamily Water Heater Demand Response Timeline



Customer Experience Design

Program Implementer

Recruiting & Enrollment

Enablement

- Commission new installations

Management

- ID & report water heater issues
- Fleet Service
- Customer management

Service Issues

- Call center

Property Managers

Enrollment

- Contracting with PGE

Enablement

- Access to apartments
- Tenant communication

Incentives

- $20/water heater/year
- Green marketing
- Incremental cost for smart water heater upgrade covered

Issues

- Water heater reports development

Tenants

Enrollment

- Automatic; opt out available

Incentive

- Local retail coupons

Events

- Minimal impact

Event Overview

Purpose

- Dispatched for load shedding, daily load shifting, load following
- Fast DR-dispatch possible, unlimited events

Frequency

- Multiple times each day. Determined by charge status of specific water heater.

Duration

- Maximum of 6 hours

Cost Effectiveness

Sensitivity Analysis

Shifts in hardware costs and ongoing administrative costs impact the program cost effectiveness.

Hardware Costs \ Administrative Costs	-20%	-15%	-10%	0%	10%	15%	20%
-20%	1.22	1.18	1.15	1.09	1.03	1.01	0.99
-15%	1.19	1.15	1.12	1.07	1.01	0.99	0.97
-10%	1.16	1.13	1.10	1.04	0.99	0.97	0.95
0%	1.11	1.08	1.05	**1.00**	0.96	0.94	0.92
10%	1.07	1.04	1.01	0.97	0.92	0.90	0.88
15%	1.04	1.02	0.99	0.95	0.91	0.89	0.87
20%	1.02	1.00	0.98	0.93	0.89	0.87	0.86

Using multiple hardware vendors increases costs, but lowers risks RE: stranded assets, product availability, supply chain issues…

Budget

30-month pilot

Program Components	Costs
Hardware and software	$2,192,500
Operations	$1,925,000
Incentives	$400,000
Marketing	$200,000
Research and evaluation	$410,000
Total	$5,127,500

Program start: 06/01/2017
Program end: 12/31/2019

Budget by phase

Program Components	Phase 1*	Cumulative Phase 2*	Cumulative Phase 3*
Hardware and software	$400,000	$1,315,000	$2,192,500
Operations	$385,000	$1,155,000	$1,925,000
Incentives	$7,500	$67,500	$400,000
Marketing	$50,000	$100,000	$200,000
Research and evaluation	$102,500	$410,000	$410,000
Total	$945,000	$3,047,700	$5,127,500

* Estimate

Pilot-to-Program Success Criteria

- Adoption by 10% of the top 50 largest MFR companies in PGE service territory
- Communications up-time of 80%+ during pilot.
- Control equipment defects of less than 5% annually
- Verification of capacity at 0.5kW/water heater or better
- Cost effectiveness reached when Phase 3 is completed or earlier
- Stable customer satisfaction ratings with residential customers in participating MFR
- Increased customer satisfaction among MFR management companies (business customers)
- 4.0MW capacity with 8,000 electric water heaters.

Request

We ask the OPUC staff to approve the tariff and deferral that would allow PGE to execute on the design and approach for this multifamily residential water heater demand response pilot.

Contact Information

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