

**PUBLIC UTILITY COMMISSION OF OREGON
STAFF REPORT
PUBLIC MEETING DATE: July 11, 2023**

REGULAR X CONSENT EFFECTIVE DATE July 12, 2023

DATE: July 3, 2023

TO: Public Utility Commission

FROM: Peter Kernan

THROUGH: JP Batmale and Sarah Hall **SIGNED**

SUBJECT: PORTLAND GENERAL ELECTRIC:
(Docket No. UM 1976)
Proposes detailed plans for two demonstration projects previously approved in Phase II of the Smart Grid Testbed.

STAFF RECOMMENDATION:

Approve detailed plans for the Multifamily Bundle and the Single Family Bundle, with enhanced Staff oversight.

DISCUSSION:

Issue

Whether the Public Utility Commission of Oregon (Commission) should approve Portland General Electric's (PGE or Company) detailed plans for two demonstration projects previously approved in Phase II of the Smart Grid Testbed.

Applicable Rule or Law

ORS 757.054 requires electric companies to plan for and pursue the acquisition of all available cost-effective demand response resources.

In Order No. 17-386, the Commission directed PGE to establish a Testbed to explore ways to accelerate development of cost-effective demand response to meet PGE's

capacity need. The Commission also directed PGE to convene a Demand Response Review Committee (DRRC) to provide guidance in developing the Testbed.¹

Analysis

Background

This Docket No. UM 1976 filing introduces two detailed project plans for Commission consideration within Phase II of PGE's Smart Grid Testbed (Testbed). Contingent upon Commission approval, PGE will submit an Advice filing to update Schedule 13 and implement the two projects. An Advice filing is expected later in 2023.

As context, in 2018, in accordance with Order No. 17-386, PGE formed the DRRC, a group of regional demand response experts.² The Company engaged the group in development of a Testbed proposal, which the Company filed with the Commission in October 2018.³ On April 9, 2019, the Commission approved a new Schedule 13 that launched the Testbed.⁴ The Testbed was initially comprised of geographically limited areas served by three substations in Milwaukie, Hillsboro, and North Portland that collectively serve approximately 20,000 PGE customers. The Testbed provides a venue for small scale, localized demonstrations of demand response offerings that have potential to scale. This approach provides rapid learnings at minimal cost.

The Testbed was designed with two phases. In Phase I, residential customers within the Testbed geography were automatically enrolled in the Peak Time Rebates pilot and received a pay-for-performance incentive when they voluntarily reduced load in response to a day-ahead notice from PGE. Phase I was designed with the recognition that acquiring demand response resources requires not just one-time customer acquisition, but ongoing customer engagement and motivation to ensure participation in utility-called demand response events. Phase I ended after 2021 and received its final evaluation in March 2022.

Phase II of the Testbed was approved in December 2021 with Order 21-444.⁵ The Phase II focus shifted to integrating customer-sited technologies into the Company's

¹ Docket No. LC 66, Order No. 17-386 at 9, issued October 9, 2017.

² DRRC membership includes but is not limited to Energy Trust of Oregon, Northwest Energy Efficiency Alliance, Pacific Northwest National Lab, Oregon Citizens' Utility Board, Oregon Department of Energy, Alliance of Western Energy Consumers, Northwest Power and Conservation Council Staff, and Commission Staff.

³ See Docket No. ADV 859, Initial Utility Filing, Attachment A, <https://apps.puc.state.or.us/edockets/edocs.asp?FileType=UAA&FileName=uaa173123.pdf>.

⁴ See Docket No. ADV 859, <https://apps.puc.state.or.us/edockets/DocketNoLayout.asp?DocketID=21643>.

⁵ See Docket No. UM 1976, Order No. 21-444, <https://apps.puc.state.or.us/edockets/orders.asp?OrderNumber=21-444>.

grid operations as a grid resource. Accordingly, the scope transitioned to testing discrete technology applications and outreach approaches. Some Phase II demonstration projects were no longer confined to the initial geographic constraints of the Testbed. PGE cited the narrow geography as limiting the ability to target certain learning objectives to specific populations and distribution feeders.

The Phase II Proposal presented six new demonstration projects and included detailed budgets and strategies for only three of the six projects that were launched in 2022. In October 2022, PGE filed Advice No. 1437 amending Schedule 13 and implementing Phase II activities for two of those three approved projects.⁶

Consistent with the example above, Testbed Phase II project plan approval and implementation has operated in a two-step process. First, detailed project plans are reviewed by Staff and approved by the Commission in Docket No. UM 1976. Second, once PGE is prepared to implement the demonstration with customers, the Company submits an Advice filing to amend Schedule 13 accordingly. Staff's expectation is that the Company update demonstration project scope and Schedule 13 incrementally, in a manner that will broadly allow for the demonstration projects without multiple revisions.⁷

Summary of Proposed Changes

In this filing, PGE introduces project plans and additional project-level budget details for the Multifamily Bundle and Single Family New Construction Bundle (Single Family Bundle). Staff summarizes these Phase II budget changes and discusses each demonstration project below.

1. Reallocate approved budgets between demonstration projects

PGE provides an update to its budget forecast and proposes to reallocate \$250,000 from the Managed EV Charging/V2X demonstration project to the Multifamily Bundle. This proposed change has no impact on the previously approved Phase II budget of \$11 million. PGE states that the change allows better resourcing of the Multifamily Bundle without compromising the research outcomes of the Managed EV Charging/V2X demonstration. In addition to the reallocation, PGE also requests Commission approval of a combined \$1.75 million budget for Single Family Bundle and Multifamily Bundle demonstration projects. With this filing, PGE will have requested \$4.6 million of the total \$11 million budget. Table 1 summarizes the previously approved Phase II budget, the revised Phase II budget proposal, and the amount of budget that has been requested for approval to date.

⁶ The third demonstration, Flexible Feeder is a longer-term study which is still in development.

⁷ See Docket No. UM 1976, Staff Report, page 10,

<https://apps.puc.state.or.us/edockets/edocs.asp?FileType=HAU&FileName=um1976hau114337.pdf>.

Table 1. Budget Overview for Phase II Demonstrations

Research Area	Initial Budget Approved in Order 21-444	Revised Budget Proposal	Budget Requested to Date
1. Flexible Feeder	\$4,500,00	\$4,500,00	\$985,000
2. Managed EV Charging/V2X	\$2,500,000	\$2,250,000	\$872,200
3. Solar Smart Inverters	\$1,000,000	\$1,000,000	\$1,000,000
4. C&I, Municipal Flexible Load & Resiliency	\$1,500,000	\$1,500,000	\$0
5. Multifamily Bundle	\$1,000,000	\$1,250,000	\$1,250,000*
6. Single Family New Construction Bundle	\$500,000	\$500,000	\$500,000*
Total	\$11,000,000	\$11,000,000	\$4,607,200

*Denotes new amounts requested in this filing.

Staff recommendation: Staff finds the budget modifications appropriate and resulting in no overall increase to the Phase II budget. Staff appreciates the reallocation of resources to better understand additional flexible load benefits to multifamily buildings, including equity outcomes. Staff does not believe the reallocation will undermine learnings from the Managed EV Charging/V2X demonstration. Staff discusses the multiple, valuable research components of the Multifamily Bundle below.

2. Implement Multifamily Bundle (Existing Affordable Housing and New Construction Heat Pump Water Heater Systems)

PGE’s goal with the Multifamily Bundle is to assess how to scale the existing multifamily water heater offer and expand products, bundles, and engagement strategies. The Company’s expansion strategy seeks to increase adoption across multiple flexible load technologies within the multifamily segment.

For context relative to the goal of scaling connected water heaters in multifamily buildings, PGE has operated a Demand Response Water Heater Pilot under UM 1827 since summer of 2017. This pilot had successes in enrolling 13,433 water heaters across 112 distinct sites, yet experienced significant challenges to device connectivity and subsequently to the pilot’s cost effectiveness.⁸ The pilot transitioned to a maintenance mode for 2023, while considering a redesign. An expected code change in Oregon starts July 1, 2023, which requires all new electric water heaters be CTA-2045-

⁸ See Docket No. UM 1827, page 2, <https://edocs.puc.state.or.us/efdocs/HAQ/um1827haq143014.pdf>.

enabled. CTA-2045 is expected to have superior connectivity performance to the wi-fi and cellular signal switches used to date. The Phase II proposal identified those challenges and proposed the Multifamily Bundle would focus on new products (CTA-2045), bundles, and engagement strategies. Staff support these research objectives in the pursuit of improving connected water heater cost effectiveness.

The Multifamily Bundle concept was introduced in the Testbed Phase II Proposal, which was previously approved by the Commission.⁹ PGE emphasized the importance of multifamily buildings in the Company's flexible load strategy and highlighted the sector's importance to both flexible load potential as well as the equity benefits of reducing costs for occupants who are disproportionately lower income or otherwise underserved compared to single family residential customers.

PGE provided project plans for the Multifamily Bundle in Appendices F and G to this filing, separating the research into two separate demonstrations:¹⁰

- Multifamily Existing Affordable Housing (Multifamily Existing)
- Multifamily New Construction Heat Pump Water Heater (HPWH) Systems (Multifamily New Construction)

PGE requests a budget increase from \$1,000,000 to \$1,250,000 to implement the combined Multifamily Bundle including both demonstrations. Below, Staff addresses key project elements of the Multifamily Existing and Multifamily New Construction demonstrations.

Multifamily Existing Affordable Housing

For the Multifamily Existing demonstration, PGE will work with affordable housing owners and operators to select and enroll efficient, flexible load capable systems, specifically water heating and HVAC. PGE will work with building operators to target planned and unplanned replacements of water heating equipment, lowering the cost of client acquisition by ensuring new devices come flexible load enabled and are enrolled at time of replacement. PGE will also work with regional partners to understand the product landscape for equitable and efficient cooling technologies such as saddle window heat pumps, and whether those can be flexible load enabled.

PGE will work with affordable housing providers and other community partners to enroll a study population of at least 200 units. The units are expected to be found in multifamily buildings between 50-100 units per building. PGE is not constraining participation to a particular geography as project learnings are focused on the

⁹ See Docket No. UM 1976, page 36, <https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf>.

¹⁰ See Docket No. UM 1976, <https://edocs.puc.state.or.us/efdocs/HAH/um1976hah92111.pdf>.

enrollment process and customer education rather than grid impacts. If opportunities exist in one of the three the SGTB, PGE will seek to enroll units in that study area.¹¹

The project's learning objectives are to:

- Understand processes and behaviors of multifamily affordable housing owners regarding mechanical system maintenance and replacement;
- Characterize and evaluate the performance of CTA-2045 technology in existing multifamily buildings;
- Understand HVAC control options for equitable cooling initiatives; and
- Strengthen relationships with key stakeholders in the affordable housing community for future program and customer engagement.

PGE requests a budget of \$500,000 for the two and one-half year Multifamily Existing demonstration. The budget request covers PGE incremental staffing, hardware and software controls, customer incentives, customer recruitment and outreach, and a third party evaluation.

Multifamily New Construction Heat Pump Water Heater Systems

The Multifamily New Construction demonstration explores scaling flexible load hot water systems in two separate tasks. The goal of the first task is to identify barriers and develop solutions for installing central HPWHs in low- to moderate-income multifamily housing projects. In the second task, the Company will work with market actors to design and install unitary HPWH in individual units of a market-rate multifamily new construction project.

PGE anticipates customer participation of at least 50 units in each of the two tasks, resulting in over 100 multifamily units served via a central or unitary HPWH. PGE will work closely with the Northwest Energy Efficiency Alliance (NEEA) to develop this demonstration. NEEA is a leader in HPWH research and has led and contracted research for both central HPWH and unitary HPWH in confined spaces. NEEA will work with the contractor (Ecotope) to design, engineer, implement, and evaluate these demonstrations.

¹¹ See Docket No. UM 1976, <https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf>. The initial Flex Feeder scope and first two years' budget was approved in Order 21-444. The Flex Feeder project has a constrained geography in North Portland and seeks a high penetration of DERs to understand capabilities of a virtual power plant.

The project's learning objectives are to:

- Understand processes and behaviors of multifamily housing developers related to mechanical system design and water heating equipment selection; and
- Characterize and evaluate the performance of CTA-2045 technology in new multifamily buildings.

PGE requests a budget of \$750,000 for the 2.5 year Multifamily New Construction demonstration. The budget is split between the two tasks of a central system HPWH and unitary HPWH systems, \$385,000 and \$365,000 respectively. The budget request covers: PGE incremental staffing; subcontracting to NEEA; equipment, software, and controls; customer incentives; third party engineering support; and a third party evaluation, report, and consulting support.

Staff recommendation: Staff supports approval of the detailed project plans for the Multifamily Bundle. Staff highlights the considerable collaboration with regional partners such as NEEA to advance important existing and emerging technologies for multifamily flexible load. Staff appreciates the learning objectives related to working directly with affordable housing providers and installing CTA-2045 communication devices on water heaters.

3. Implement Single Family New Construction Bundle

The Testbed Phase II Proposal previously introduced the Commission to the concept of PGE working directly with project developers to provide upfront incentives for builders to build flexible load enabled homes. PGE provided key, detailed information in this filing by utilizing the demonstration project review template, provided as Appendix E.¹² Below, Staff highlights important demonstration elements from Appendix E for Commission consideration.

This filing's proposed Single Family Bundle seeks to build on previous work by exploring opportunities to ensure that efficient, flexible load-enabled technologies are installed in new construction projects. The pilot also seeks to increase enrollment of new homes in PGE flexible load programs by influencing the "as-built" conditions of the home.

¹² See Docket No. UM 1976, Appendix E, <https://edocs.puc.state.or.us/efdocus/HAH/um1976hah92111.pdf>. Note: Appendices A-D were project plans which were included as part of PGE's initial Phase II Proposal. PGE views each project plan as an appendix to the Testbed Phase II Proposal.

The demonstration project is designed to layer onto existing programs (such as those from Earth Advantage and Energy Trust) in the single family new construction space, by offering new incentives in two distinct pathways to promote this outcome:

- Builder-based incentives to reduce cost burdens for selecting and installing flexible load enabled equipment; and
- Customer-based incentives to encourage enrollment upon move in and continued participation in flexible load programs.

Builder participation in the Single Family Bundle requires five technologies or building practices and encourages three others. Table 2 outlines each of the technologies or practices in the demonstration.

Table 2. Required and Encouraged Technologies and Building Practices

Technology/Building Practice	Project Requirement?
Homes receive an Energy Performance Score from Energy Trust of Oregon	Required
Air Source Heat Pump with connected qualifying Smart Thermostat	Required
Level III Heat Pump Water Heater	Required
Solar + Storage Ready (Alternatively, Solar Ready + smart electric panel installed)	Required
Electric Vehicle Ready	Required
Solar + Storage Installed	Encouraged
Electric Vehicle Service Equipment (EVSE) Installed	Encouraged
Electric Appliances Installed (Induction cooktop, electric fireplace, etc.)	Encouraged

PGE will recruit one to two new construction builders that have a track record of implementing some or all the required technologies. PGE anticipates working with builders developing communities of fewer than 15 homes with no model home, or communities of more than 15 homes with a model home. In total, PGE anticipates participation and incentivization of between 25 and 150 homes. In communities with a model home, PGE may consider additional incentives to install solar + storage and electric vehicle charging equipment to market the potential of these two additional flexible load technologies to other homes in that community.

The project is not constrained to the geography of the initial Testbed, because the geographic constraints may not overlap with where new single family construction will occur. Staff finds this reasonable and in alignment with expectations for research goals outlined in the Phase II proposal. PGE will partner with Energy Trust to leverage existing efficiency incentives, and to define equipment installation requirements and verify builder compliance per existing programs.

PGE's builder-based incentives include three distinct mechanisms to support research objectives. 1) A model home incentive may be used to incent encouraged technologies in just the model home to demonstrate capabilities and features to other homes in the community. 2) PGE may co-develop customer-facing marketing materials that highlight the benefits of flexible load enabled technologies and PGE programs with Energy Trust and builder support. 3) PGE may consider incremental cost-per-home incentives to nudge contractors to meet the building requirements where the current practice includes a non-qualifying technology due to lower cost.

The Company states that the project's learning objectives are to:

- Understand builders' motivation in selecting certain technologies whether flexible load enabled or not;
- Understand customer receptiveness to flexible load enabled technologies in new construction;
- Determine whether up-front customer engagement is more effective than marketing to existing homeowners;
- Establish communications between PGE and residential construction market actors; and
- Determine the most impactful form of incentives (monetary, marketing, etc.) to achieve demonstration goals.

PGE requests a budget of \$500,000 for the 2.5 year Single Family Bundle. The budget request covers PGE incremental staffing, software and controls, builder-based and customer-based incentives, contractor support, and a third party evaluation.

Staff's Analysis of Single Family New Construction Bundle

Staff considered whether PGE's Single Family New Construction Bundle could constitute a promotional concession within OAR 860-026-0015(2)(d),¹³ specifically with the requirement that builders install a level III heat pump water heater and air source heat pump. However Staff finds the limited application of the demonstration study, and

¹³ Under OAR 860-026-0015(d) a promotional concession include: "[f]urnishing consideration to any dealer, architect, builder, engineer, subdivider, developer, or other person for the sale, installation or use of any appliance or equipment."

the goals of flexible load pilots to find more effective pathways for deeper penetration of programs that shift energy use in the name of system optimization, are a reasonable basis to exclude the Single Family Bundle from the application of consideration of a promotional concession as described under Section OAR 860-026-0020.

With regards to the issue of electrification of load as embodied within the broader context of the Single Family Bundle, Oregon has set multiple ambitious targets for decarbonization, which may require greater electrification of residential load to be achieved. While it is unclear how such things as future building code cycles and Climate Protection Plan (CPP) compliance periods will drive larger policy decisions around fuel choice for residential loads, Staff finds the timing and learnings of this pilot to align with the need for information on the efficacy of pathways for implementing decarbonization policy in the future.

In terms of additionality, Staff finds encouraging builders to install a suite of electric appliance technologies may be necessary given market conditions. According to Energy Trust's Energy Performance Score (EPS) data, natural gas remains the predominant heating fuel in Oregon with a market share of EPS homes around 80 percent for the past three years.¹⁴ Water heating in EPS homes is a roughly 50/50 split between gas and electric end uses, with gas and electric space and water heating are often mixed.¹⁵ Due to the existing market practices, it cannot be assumed that even "green" builders will choose all electric appliances. Thus, contractor selection is a key factor in whether participating builders' fuel choice for space and water heating is influenced by the demonstration project. Staff and the DRRC will be consulted during program implementation to understand the extent to which additionality exists, while acknowledging that the primary learning objectives are related to having multiple connected flexible end uses in new homes.

Staff finds the larger fuel switching risks to be low given the small volume of participating builders and homes allowed to participate. Staff highlights two important learning outcomes of this pilot, integrating multiple flexible load technologies and reducing customer acquisition cost. Multiple flexible loads introduce an opportunity to enroll new homeowners in multiple programs and have increased flexibility within single sites. Separately, customer acquisition can be a high cost for flexible load programs. The Single Family demonstration moves upstream to work with builders, potentially lowering the upfront cost of ensuring multiple flexible loads exist in a single residence.

¹⁴ Data accessed May 31, 2023. <https://insider.energytrust.org/eps-new-construction-data/>. EPS homes do not represent all single family new construction in Oregon. Energy Trust reported 2022 was the highest participation with 38% of new construction participating. EPS data is considered in this instance because PGE intends to work with builders who already participate in the EPS program.

¹⁵ Data accessed May 31, 2023. <https://insider.energytrust.org/eps-new-construction-data/>.

Once constructed, PGE will have an opportunity to enroll multiple devices with one new customer during initial account setup.

Regardless of the agreed-upon benefits of the learnings from the Single Family Bundle, Staff requires additional involvement and requirements to proceed with approval. Staff requests additional layers of insight. First, Staff requests active involvement in Evaluation, Measurement, and Verification (EM&V) activities related to this demonstration. This includes early engagement with solicitation for an EM&V contractor and design of the evaluation to capture savings and impact metrics related to fuel choice. Second, to better inform the impact of electric, flexible load-enabled homes on decarbonization, Staff requests explicit reporting on the emissions intensity of PGE's system and the market price of MID-C electricity during each hour of flexible load events and identification of which generating resources at what cost were on the margin. Staff finds the enhanced oversight of EM&V activities to reflect adequate involvement given risks.

Ultimately, Staff recognizes that the primary goal of this pilot is to inform PGE's flexible load potential with multiple technologies installed in single family new construction homes. Electric space and water heating are necessary to understand PGE's flexible load capabilities in that market. Staff recommends approval of PGE's project plan for the Single Family Bundle. Additionally, Staff notes here that any potential future scale-up of this demonstration project will most likely require a discussion including a broad set of stakeholders at the OPUC.

Stakeholder Feedback and Involvement

PGE coordinated extensively with the DRRC to develop and design Phase II demonstration projects, as the Company has since 2018, and per the Phase II Testbed Proposal approved in Order No. 21-444. Example topics of DRRC coordination include marketing strategies, vendor partnerships, technology systems, eligibility conditions, and budget modifications. The DRRC, including OPUC Staff, provided feedback on draft project plans for the Single Family Bundle and Multifamily Bundle in December 2022 and April 2023.

Conclusion

Staff supports and recommends approval of the budget modification, the project plans for the Multifamily Bundle demonstrations, and the project plan for the Single Family Bundle with the following conditions. Staff finds the limited application of the demonstration and the goals of flexible load pilots to shift energy use in the name of system optimization indicate the Single Family Bundle is excluded from promotional concession. In addition, Staff supports the building technology requirements in the

Single Family Bundle but requests PGE file additional specificity around the role and impact of PGE in influencing fuel choice for the participating builders due to the sensitivity of fuel choice in single family residential building. Due to this sensitivity and the connection to Oregon climate policy, Staff requests additional oversight for this pilot. These include Staff participation in the design and implementation of EM&V, and additional Company reporting of carbon and cost with flexible load events.

The Testbed continues to be an important tool for testing new technologies, engagement strategies, and market interventions that may ultimately migrate to programs in PGE's Flexible Load Portfolio. The Testbed is thus the best place to start learning about electrification, carbon, and cost related to flexible loads. Staff is encouraged to see continued collaboration with members of the DRRC and leveraging of resources with regional partners. Finally, PGE notes and Staff supports research into how efficient, electric flexible load enabled technologies in residential buildings support the greenhouse gas reductions goals.

PROPOSED COMMISSION MOTION:

Approve detailed plans for the Multifamily Bundle and the Single Family Bundle, with enhanced Staff oversight.