

**PUBLIC UTILITY COMMISSION OF OREGON
STAFF REPORT
PUBLIC MEETING DATE: November 30, 2021**

REGULAR X CONSENT _____ EFFECTIVE DATE _____ N/A _____

DATE: November 22, 2021

TO: Public Utility Commission

FROM: Kacia Brockman

THROUGH: Bryan Conway, JP Batmale, and Sarah Hall **SIGNED**

SUBJECT: PORTLAND GENERAL ELECTRIC:
(Docket No. UM 1976)
Proposal for Phase II of Smart Grid Testbed.

STAFF RECOMMENDATION:

Approved Portland General Electric's (PGE or Company) proposal for Phase II of the Smart Grid Testbed (Testbed).

DISCUSSION:

Issue

Whether to approve PGE's Testbed Phase II Proposal to conduct new small-scale demand response/flexible load demonstration projects over the next five years to accelerate the growth and performance of PGE's flexible load resource portfolio.

Applicable 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

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

Analysis

Summary

PGE seeks Commission approval of the Testbed Phase II Proposal, which presents six new demonstration projects as part of a five-year, \$11 million effort. The proposal includes detailed budgets and strategies for three of the six projects for immediate launch in 2022. In this memo, Staff provides background on the Testbed, a summary of the Phase I research, and a brief description of the six new demonstration projects. Staff then reviews the proposed budget and cost recovery, which will be addressed in PGE's Flexible Load Multi-Year Plan, and staffing additions. Finally, Staff summarizes the three initial demonstration project proposals and discusses stakeholder input.

Background

In 2018, in accordance with Order No. 17-386, PGE formed the DRRC, a group of regional demand response experts.² That same year, PGE engaged DRRC members in the development of a Testbed proposal, and filed that proposal with the Commission in October 2018.³ In April 2019, the Commission approved a new Schedule 13 that launched the Testbed.

The Testbed is comprised of geographically limited areas served by three substations in Milwaukie, Hillsboro, and North Portland that serve approximately 20,000 PGE customers. It 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 were automatically enrolled in the Peak Time Rebates (PTR) pilot and received a pay-for-performance incentive when they voluntarily reduced load in response to a day-ahead notice from PGE. PGE studied the performance of this opt-out model and explored how different customer value propositions motivated customers to participate in the pilot. 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 when the utility calls demand response events. Phase I ends after 2021 and will receive its final evaluation in Q1 2022.

² The DRRC membership includes 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 Conservation Council Staff, and OPUC Staff.

³ See Docket No. ADV 859, PGE Advice No. 18-14, Attachment A, filed October 26, 2018.

Beginning in Q4 2020, PGE engaged DRRC members in establishing the priorities for Phase II of the Testbed through a series of three facilitated workshops and one-on-one meetings. PGE filed the Testbed Phase II Proposal on October 1, 2021, after review by the DRRC.⁴ PGE's focus in Phase II will shift to integrating customer-sited technologies into the Company's grid operations in order to use them as a grid resource.

Phase I Project Research Areas

For the primary research in Phase I, PGE studied the success of five different messaging campaigns in increasing participation levels of residential customers enrolled in PTR and in converting customers from the PTR behavioral pilot to the higher-impact residential direct load control thermostat pilot. Each summer and winter demand response season, PGE changed its messaging to promote a different customer value proposition, ranging from monetary to environmental benefits. Much of this messaging included education about how load shifting helps the utility transition to clean energy sources.

Phase I included additional research efforts described below.

- Small and medium business outreach: PGE tested a variety of outreach channels to recruit small and medium business participation in the non-residential direct load control thermostat pilot and conducted focus groups with small business decision makers.
- Technology demonstrations:
 - PGE and Energy Trust of Oregon (Energy Trust) are jointly studying the potential combined value of demand response and energy efficiency for ductless heat pumps controlled by smart thermostats.
 - PGE is evaluating different communications options for direct load control of water heaters.
- Diversity, Equity, and Inclusion (DEI): Dedicated community outreach consultants engaged Environmental justice (EJ) community members in each Testbed neighborhood in year-long DEI workgroups that provided insights into how PGE can better serve EJ communities through its program offerings, including an equity lens checklist. These learnings have cross-cutting value to all PGE product teams.

An interim Testbed Phase I evaluation was conducted in Q1 2021. The evaluation measured performance of the opt-out PTR pilot, results of the first three customer value proposition campaigns, and initial findings from the small and medium business

⁴ See Docket No. UM 1976, PGE Smart Grid Testbed Phase II Proposal, filed October 1, 2021.

outreach and the DEI community outreach.⁵ The last two customer value proposition campaigns and the technology demonstrations will be reviewed in the final Testbed Phase I evaluation in Q1 2022.

Additionally, the Testbed was used as a venue for the following research activities that were funded outside of the Testbed.

- Locational value analysis: Kevala studied the Testbed's three substations and ten feeders to estimate the potential value for Distributed Energy Resources (DER) to be aggregated as a locational asset that can be dispatched by PGE to solve distribution constraints.
- Customer asset inventory: Bidgely's predictive model that uses Advanced Metering Infrastructure (AMI) data to determine whether a home has electric heating, air conditioning, electric water heating, and electric vehicle charging was validated with Testbed customers and subsequently applied to 500,000 single family customers territory-wide. The resulting asset inventory will inform future market potential studies, targeted marketing, and product development priorities.
- Clean Fuels Program electric vehicle telematics: PGE is using vehicle on-board communications and diagnostics to evaluate how time-of-use incentives affect electric vehicle charging patterns of customers in the Testbed.

Phase II Goals

PGE describes the following goals for Phase II of the Testbed:

1. Carry forward and apply "at scale" the customer-centric strategies learned in Phase I;
2. Demonstrate enhanced value of flexible load/DER technologies as a grid resource, including planning and operations; and
3. Support the development of the product portfolio through testing of new technologies and program design, including pricing strategies, gamification, transactive control, etc.

Phase II Demonstration Projects

Guided by input from the DRRC, PGE established six demonstration projects for Phase II that will be rolled out over time. PGE proposes to launch the first three projects immediately upon approval. More details on those three demonstration projects are provided later in this memo. For some of the projects listed below, PGE plans to expand

⁵ See Interim Evaluation Report of the Smart Grid Test Bed Project, prepared by Cadmus, filed in Docket No. UM 1976 on January 29, 2021.

the Testbed boundary as needed to encompass a target population or a target distribution feeder that may not existing in the current Testbed geography.

1. “Flexible Feeder” – This project will test the ability to rapidly deploy high levels of dispatchable DERs in a targeted geographic area to reduce localized demand on utility systems at peak times, and to dispatch those DERs through PGE’s recently deployed Advanced Distribution Management System (ADMS) and Distributed Energy Resource Management System (DERMS).
2. Managed EV Charging/Vehicle-to-Grid (V2G) – This project will initially build on the existing managed charging pilot by driving increased adoption on already high-penetration feeders and evaluating customer acceptance of time and location-based price signals that optimize charging around grid needs. The project may be expanded in the future to test utility dispatch of stored energy from vehicle batteries for grid benefit.
3. Solar Smart Inverter – This project will test the readiness of existing DERMS platforms to use inverter-based controls to deliver distribution operations value such as Volt/VAR support, address hosting capacity limitations, and capture real-time distributed solar generation data that will inform PGE’s planning. This project will also inform the PUC’s interconnection reform Docket No. 2111.
4. Commercial, Industrial (C&I), and Municipal Flexible Load and Resiliency – In this project, PGE will promote non-residential measures that combine benefits of energy efficiency, flexible load, and resiliency, and test engagement strategies and incentive structures that maximize value to the customer and the utility.
5. Multifamily Bundle – This project will build on the existing multifamily water heater demand response pilot and seek ways to increase participation in the multifamily sector through new engagement strategies, additional DER technology options, and whole-building load management.
6. Single Family New Construction Bundle – In this project, PGE will partner with residential developers to explore collaboration strategies and incentive design for a measure bundle that supports all-electric, flexible new homes.

PGE’s Testbed will likely serve a venue for testing Non-Wires Alternatives (NWA) that are identified by PGE’s Distribution Resource Planning as part of the Company’s Distribution System Plan.⁶ The design of the demonstration projects may be adapted, such as targeting a particular feeder, in order to obtain learnings that can inform the Distribution System Planning process.

⁶ PGE’s compliance with the Oregon PUC’s Distribution System Planning requirements is tracked in Docket No. UM 2197.

PGE commits to continue to report to the DRRC quarterly on Testbed project activity throughout Phase II.

Budget and Cost Recovery

After final accounting, Phase I is expected to cost \$2.9 million over its 2.5-year duration. This is less than the original Phase I budget of \$5.9 million, largely due to a proposed water heater demonstration that did not launch because of delayed market deployment of the CTA-2045 communication standard, and also due to lower-than-expected participation in PGE's large commercial demand response program by large customers in the Testbed.

The Phase I costs are being deferred annually and recovered through Schedule 135 as an automatic adjustment clause. Recovered cost categories include marketing, research and evaluation, staffing, materials and equipment, and program incentives. For Phase II, PGE proposes a budget cap of \$11 million over five years for the six research areas, as shown in Table 1. PGE will estimate an additional cost for the NWA activities when the Company proposes those activities in the future. PGE proposes to spend \$2.857 million to launch the first three demonstration projects in 2022. Of that amount, PGE expects to incur \$2.26 million during the first two years. PGE has included \$2.26 million for Testbed Phase II spending in 2022-2023 in the company's overall Flexible Load Multi-Year Plan cost recovery proposal, which will be considered for approval by the Commission in January 2022.⁷

Table 1. Proposed Testbed Phase II Budget

Project Research Area	5-year Budget	Initial Funding Request
1. Flexible Feeder	\$4,500,000	\$985,000
2. Managed EV Charging	\$2,500,000	\$872,200
3. Solar Smart Inverter	\$1,000,000	\$1,000,000
4. C&I, Municipal Flexible Load and Resiliency	\$1,500,000	\$0
5. Multifamily Bundle	\$1,000,000	\$0
6. Single Family New Construction Bundle	\$500,000	\$0
Total	\$11,000,000	\$2,857,200

Staffing

The Testbed is supported by a combination of PGE staff that is incremental to Testbed work and an array of employees throughout the organization. In Phase I, there were

⁷ PGE filed the Flexible Load Multi-Year Plan in Docket No. UM 2141 on November 3, 2021. See Chapter 8 for cost recovery proposal and Appendix C for budgets.

five-and-a-half incremental Testbed staff including a Program Manager, a Project Manager, three DEI Community Outreach Consultants, and a half-time Program Marketer. As of 2021, all five of those staff have been moved from the Testbed deferral into base rates in recognition that these positions are part of PGE's larger program development process and may support work both within and outside of the Testbed.

To support the expanded scope of Phase II, PGE will add two Testbed staff positions in base rates: a second Project Manager focused on project delivery, and a Standards Engineer focused on technology integration. In addition, PGE will add three new incremental staff: two Project Coordinators and a Program Analyst. The costs for these three incremental staff are included in the proposed five-year budgets shown in Table 1 above for the Phase II project research areas. PGE will seek cost recovery of these three incremental staff as part of the overall Testbed project costs through the Flexible Load Multi-Year Plan, separate from base rates. The three incremental positions are not included in base rates because they are limited-duration positions dedicated to the Testbed. This approach is consistent with PGE's staffing request in the 2021 general rate case.⁸

Demonstration Project No. 1: Flexible Feeder

PGE will partner with Energy Trust to drive high levels of energy efficiency and DER adoption to test the value of a concentration of customer-sited DERs as an operational grid asset. PGE expects to demonstrate both bulk services, including energy and capacity, and distribution services, congestion relief and power quality. DERs will include smart thermostats, smart water heaters, solar with smart inverters, battery storage, and EV charging. The deployment will occur in a historically underserved neighborhood in the North Portland portion of the Testbed. Community Energy Project (CEP) will be contracted to convey the value of the project to customers.

PGE was awarded a \$6.65 million U.S. Department of Energy (USDOE) grant for the Flexible Feeder project. The USDOE grant will fund activities of PGE's project partners including Energy Trust, Northwest Energy Efficiency Alliance (NEEA), CEP, and the National Renewable Energy Lab (NREL). NREL will provide technical assistance on valuation of benefits, distribution system modeling, and DERMS integration.

⁸ In PGE's response to OPUC Staff Data Request 300 in Docket No. UE 394 (PGE's 2021 general rate case), PGE indicated that all labor costs associated with the Flexible Load Plan are included in base rates, with one exception:

"To address temporary resource needs, such as the following examples, PGE would rely on contractors or outside services:

- Expansion of flexible load programs to address future IRP goals; and
- Short-term demonstration activity."

PGE indicates that the incremental Testbed staff are needed to support short-term Phase II demonstration activity.

The project's learning objectives include:

- Identify technical potential of flexible load resources in the Flexible Feeder project area;
- Learn which measures/packages deliver the greatest flexibility value and co-benefits;
- Learn how to engage and train contractors to support flexible load development; and
- Identify effective strategies for delivering combined energy efficiency and DERs in underserved communities.

PGE plans to implement the Flexible Feeder project in two phases, beginning with scoping and launch in years 1-2, followed by implementation in years 3-5. PGE requests a budget of \$985,000 for the project scoping phase during the first two years. This budget covers PGE incremental staffing, customer awareness and campaign launch, low-income customer engagement, Energy Trust collaboration, and vendor contracts for grid modeling and DERMS command development. After the scoping phase is substantially complete, PGE will submit a subsequent proposal for funding the implementation phase in years 3-5 of the project. PGE estimates the total five-year budget for this project to be \$4.5 million, separate from the USDOE grant funding.

PGE committed to engage the DRRC in reviewing results from the scoping phase and planning the implementation phase.

Demonstration Project No. 2: Managed EV Charging

Initially, this project will focus on managed charging. V2G will be tested in the future. PGE will test high concentration of EV charging to demonstrate the impacts of managed charging on power quality, reliability, and operational flexibility of the grid. This demonstration seeks to add 800-1200 participants on two to three feeders with already high EV penetration. PGE will actively control the time, rate, and/or duration of EV charging to best respond to grid considerations while ensuring vehicles maintain minimum charge needed by participants. Grid considerations may include wholesale prices, bulk generation emissions, bulk capacity needs, distribution congestion, and transformer loading. This project will build on the current Clean Fuels Program telematics project and test more sophisticated controls and charge management strategies.

The project's learning objectives include:

- Assess the capability of telematics-based EV charge management to provide value in grid operations;

- Gain insight into impact of different EV application programming interface structures on vehicles' value in grid operations;
- Compare the technical requirements, costs, and benefits of telematics-based vs. EV service equipment-based charge management; and
- Gain insight into user acceptance of telematics-based EV charge management and incentive structures that would be required to scale this type of offering.

PGE requests an initial budget of \$872,200 for this three-year managed charging demonstration project. The initial budget request covers PGE incremental staffing, licensing for the telematics platform and vehicle control, customer incentives, simulation of dispatch value based on grid conditions, customer recruitment, and third-party evaluation. The remainder of the forecasted budget of \$2.5 million for this project may be tapped when PGE proposes a V2G demonstration in the future.

Demonstration Project No. 3: Solar Smart Inverter

This project will test the grid support functions, such as voltage regulation, frequency support, and ride-through capability, available from the latest smart inverter standard (IEEE 1547-2018). Solar Edge and Enphase inverters will be used. PGE seeks to recruit 500 new and existing customers with smart inverters, totaling over 4 MW of capacity in aggregate. These customers will be located on three feeders: two rural feeders at or near hosting capacity limits, and one urban feeder with power quality issues. The two rural feeders are located outside of the current Testbed boundary since no feeders within the Testbed are at hosting capacity limit. PGE will contract with Energy Trust to train contractors, recruit customers, and deliver customer enrollment incentives.

PGE will review existing tariffs, customer agreements, and regulations related to interconnection and solar net metering to determine if any changes are required. This information will inform the PUC's interconnection reform Docket No. UM 2111.

The project's learning objectives include:

- Validate the extent to which smart inverters integrated with DERMS can provide PGE with real-time operational data on PV generation output in support of distribution system planning;
- Test the capability of smart inverters to throttle or curtail generation, or limit the need for throttling/curtailment, thereby potentially replacing the two-meter solution on generation-limited feeders;
- Quantify the value smart inverters can provide in supporting distribution operations such as providing Volt/VAR support; and

- Document the technical requirements and costs to integrate smart inverters into the utility DERMS platform.

PGE requests a budget of \$1,000,000 for this three-year demonstration project. This budget covers PGE incremental staffing, a contract with NREL for national smart inverter expertise, inverter manufacturer fees for DERMS integration and cloud service, a contract with Energy Trust for project management, customer incentives, customer recruitment, and third-party evaluation.

Stakeholder Feedback

Staff solicited feedback on PGE's Testbed Phase II Proposal from stakeholders in the Distribution System Planning Docket No. UM 2005 and the Flexible Load Plan Docket No. UM 2141. No comments were received. Although no stakeholders submitted comments, Staff feels confident that PGE developed the Testbed Phase II plan with significant stakeholder input through proactive engagement with the DRRC, as described in the Background section of this memo. DRRC members were also given the opportunity to review and comment on the draft Phase II Proposal prior to filing.

Future filings

PGE expressed interest in revising the Testbed Pilot Schedule 13 in a manner that will broadly allow for the six project research activities to be conducted without multiple amendments to the tariff over the five-year course of Phase II. Staff withholds any recommendation on that approach until PGE elaborates on the concept or shares draft tariff revisions with Staff for review. In the meantime, Staff is comfortable with PGE filing updates to Schedule 13 or other relevant existing tariffs as needed to facilitate each approved demonstration project.

Conclusion

Staff finds that the Testbed provides a platform for innovation and rapid learning with minimal cost risk to ratepayers. Phase I provided important learnings about how to engage customers equitably and how to motivate them to enroll and then actively participate in flexible load program. Phase II promises to address technical questions to allow PGE's flexible load portfolio to expand to include new technologies and to derive new grid benefits.

Staff appreciates the process PGE used to solicit input from regional experts on the DRRC to develop the Testbed Phase II Proposal. Staff also appreciates the level of detail PGE presented in the proposal. Staff is encouraged to see a high degree of collaboration with Energy Trust in the delivery of the proposed demonstration projects.

Staff finds that:

- The six proposed Phase II project research areas and the NWA project are reasonable and worth pursuing;
- \$11 million is a reasonable cap on the proposed five years of activity, reserving the question of prudence for cost recovery, which will be handled through the Flexible Load Multi-Year Plan; and
- \$2.875 million in start-up costs is reasonable for the three initial demonstration projects: Flexible Feeder, Managed EV Charging, and Solar Smart Inverters.

Therefore, Staff recommends the Commission approve PGE's proposal for Phase II of the Testbed.

PROPOSED COMMISSION MOTION:

Approved PGE's proposal for Phase II of the Smart Grid Testbed.