Appendix B. Detail on Smart Grid Testbed Activity

B.1 Testbed EV Charging Study

The goal of this study is to better understand how and when customers charge their vehicles, and how PGE can collaborate with customers to optimize charging schedules in alignment with the needs of the distribution system. The study will explore how PGE can ensure vehicles are charged at optimal times for customers and the energy grid while always delivering the desired state of charge to the customer when they need it.

The study began in 2023 and is limited to 250 participants who receive a $20 monthly bill credit for participation in addition to the one-time $50 incentive upon enrollment and $25 seasonal participation for PGE's smart Charging Program.

PGE will continue operation of this study, including project management, deployment of customer incentives, collaboration with the existing PGE Smart Charging Program, data analysis, and evaluation. PGE is conducting this study in partnership with WeaveGrid who we use to set and communicate charge schedules to participating customer vehicles. Study is set to conclude December 31, 2024. Specific activities include:

- Complete testing of use cases by end-of-year 2024
- Ongoing data collection, review, and analysis
- Administer mid- and post-study participant survey
    - Contract and administer EM&V

For a more detailed review of these activities please see PGE's 2021 SGTB Phase II Proposal.[86]

B.2 Testbed Smart Solar Study

The goal of this study is to better understand how customer-owned solar systems can help contribute to a stronger and more reliable electricity grid. Currently, smart inverters can communicate with utility signals; this study will explore how PGE can optimize that connectivity to benefit the surrounding community.

The study began in 2023 and is limited to customers who live within our Testbed Smart Solar boundary and have a qualifying solar inverter.[87] Participants receive a $250 check upon enrollment delivered by mail from Energy Trust of Oregon plus a $10 monthly bill credit for ongoing participation.

PGE will continue operation of this study, including project management, deployment of customer incentives, collaboration with study stakeholders, data analysis, and evaluation. PGE is conducting this study in collaboration with Enphase, a smart inverter manufacturer, to develop customized inverter settings and apply them to participating customer systems. Study is set to conclude December 31, 2024. Specific activities include:

[86] PGE (2021). *Smart Grid Testbed Phase II Proposal*, Sections 2.2.3.5 and Appendix B. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.
[87] Further detail on the PGE Testbed Smart Solar Study page: https://portlandgeneral.com/smart-grid-test-bed-solar-study.

- Complete testing of use cases by end-of-year 2024
    - Assess feasibility of testing 2030.5 functionality
- Ongoing data collection, review, and analysis
- Inform UM 2111 discussion and decision of standardized inverter settings[88]
- Contract and administer EM&V

For a more detailed review of these activities please see PGE's 2021 SGTB Phase II Proposal.[89]

B.3 Testbed Multi-family Bundle (New Construction)

While the multi-family market represents a major opportunity for demand flexibility and is critically important from an equity perspective, it presents programmatic challenges. This planned project seeks to explore how flexible load in the multi-family market can be unlocked and scaled by focusing on new products, bundles, and engagement strategies to increase adoption and participation.

Multi-family housing developers, design firms, and Mechanical, Engineering and Plumbing professionals determine water heating equipment type primarily based on building operating costs under their management, which is particularly critical in affordable housing developments. By providing these market actors with information, efficient water heating solutions, and cash incentives, PGE can guide them towards decisions that financially benefit building owners and tenants while also contributing operational value to the grid.

In this demonstration, the Testbed team will work with Energy Trust and the NEEA to provide information that will help developers select and install efficient and Flex Load capable domestic hot water systems. The grid assets will be incorporated into PGE's fleet of Distributed Energy Resource assets, with Heat Pump Water Heater (HPWH) systems joining the existing Multi-family Water Heater program portfolio. The installed DERs will be used in both traditional DR event calls and in specialized use cases focused on advanced grid services.

The demonstration seeks to enroll a "central" HPWH project that serves 50 or more units in new affordable multi-family housing and another "in-unit" HPWH project that serves 50 or more units in new multi-family housing and is expected to run for 18 months.

PGE will continue the full range of implementation activities, including project management, approval of and deployment of customer incentives, customer engagement, partnerships, and evaluation. Specific activities include:

[88] OPUC Docket No. UM 2111, *STAFF INVESTIGATION INTO INTERCONNECTION PROCESS AND POLICIES*, retrieved from https://apps.puc.state.or.us/edockets/docket.asp?DocketID=22475.
[89] PGE (2021). *Smart Grid Testbed Phase II Proposal*, Sections 2.2.3.3 and Appendix C. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.

- Complete contracting process with NEEA
- Complete participant recruitment and customer agreement process
- Develop best practice guide for installing HPWHs in multi-family applications
- Purchase and procure universal communication module (UCM) devices
    - Establish device communication pathway and platform
- Schedule demand response events via existing multi-family program

For a more detailed review of these activities please see PGE's 2021 SGTB Phase II Proposal and the subsequent supplement.[90]

B.4 Testbed Single Family Bundle (New Construction)

This planned demonstration will explore the opportunities available for collaborating with residential new construction builders to ensure qualifying Flex Load-enabled technologies are installed and that homebuyers are adequately educated on the benefits of the technologies and the associated PGE DR programs. To achieve these goals, the project will explore leveraging incentives via two discrete but overlapping pathways: builder-based incentives and customer-based incentives. The builder-based incentives will be used to reduce the cost burden builders may face for installing qualifying equipment, whereas the customer-based incentive will be used to encourage enrollment and continued participation in DR programs.

The demonstration is projected to begin Q4-2024 upon identification of an eligible builder with an upcoming community in the design phase and has an enrollment target of 25-150 participating homes.

PGE seeks to continue the full range of implementation activities, including project management, approval of and deployment of customer incentives, customer engagement, partnerships, and evaluation. Specific activities include:

- Establish customer recruitment strategy and enroll eligible builders
- Develop builder-based marketing materials of flex-load-enabled homes
- Enable requisite DR technology connectivity pathways for load control
- Establish customer awareness pathway of existing PGE DR programs
- Schedule DR events via existing programs

For a more detailed review of these activities please see PGE's 2021 SGTB Phase II Proposal and the subsequent supplement.[91]

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[90] PGE (2021). *Smart Grid Testbed Phase II Proposal*, Sections 2.2.3.4. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.
PGE (2023). *Smart Grid Testbed Phase II Proposal: Single Family and Multi-Family Demonstration Supplement*, Sections 1.2.2 and Appendices F and G. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.

[91] PGE (2021). *Smart Grid Testbed Phase II Proposal*, Sections 2.2.3.1. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.
PGE (2023). *Smart Grid Testbed Phase II Proposal: Single Family and Multi-Family Demonstration Supplement*, Sections 1.2.1 and Appendix E. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.

B.5 Testbed Flexible Feeder

The goal of the Flexible Feeder project is to demonstrate the value of distributed energy resources—including smart thermostats, storage, electric vehicle charging, and smart water heaters—to support grid operation. The project also examines the co-benefits of flexible load and efficiency, including how they can be jointly deployed to increase their impact, cost-effectiveness, and customer satisfaction. The project's linkage with PGE's Department of Energy (DOE) Connected Communities grant[92] provides a significant opportunity—and also complexity—allowing an increase in project scope and learning and supporting the continuation of key workstreams.

In addition to SGTB funding, the project leverages the $6.6M award from the DOE Connected Communities program for the SALMON project.

PGE will continue the full range of implementation activities, including project management, approval of and deployment of customer incentives, customer engagement, partnerships, special projects, contractors, and evaluation. Specific activities include:

- Launched general awareness campaign, marketing, and outreach
- Completed contracting for delivery of flexible feeder-specific work
- Conducted neighborhood canvassing and awareness campaign
- Ran a Solarize campaign that included targeted education and delivery strategy with Energy Trust-approved contractors, including increased incentives for participants in the project area
- Conducted Contractor engagement and training
- Delivering Home Energy Scores
- Implementing customer upgrade projects
- Conducting pre-implementation surveys

For a more detailed review of these activities please see PGE's 2021 SGTB Phase II Proposal and the subsequent supplement.[93]

B.6 Testbed Vehicle-to-Everything (V2X)

In May 2024, the Commission adopted Staff's recommendation to approve the V2X project plan for Demand Response Review Committee approval and PGE filed an accompanying update to Schedule 13[94].

This demonstration seeks to perform managed charging of electric vehicles using onboard telematics. It seeks to optimize vehicle charging around grid considerations and utilize the V2X capabilities to shift and reduce customer load during peak times and also provide advanced grid

[92] Detail on U.S. Department of Energy's *Connected Communities Funding Program* available at https://www.energy.gov/eere/solar/connected-communities-funding-program.
[93] PGE (2021). *Smart Grid Testbed Phase II Proposal*, Sections 2.2.3.6 and Appendix A. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.
PGE (2023). *Smart Grid Testbed Phase II Proposal: Flexible Feeder Demonstration Supplement*. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.

[94] PGE Schedule 13 *Opt-Out Residential Demand Response Testbed Pilot* available at https://assets.ctfassets.net/416ywc1laqmd/1FXchtG1UCoqK74YIOWBoF/699972c24ae1b34287acf24744206db9/Sched_013.pdf.

services during Peak Time Events. The demonstration will leverage the vehicle manufacturer's charge management software capable of sending customized vehicle charge/discharge signals to participant vehicles optimized to align with distribution grid benefit.

In this demonstration, PGE will enroll participants in time varying rates and will influence the timing of EV charging while ensuring that vehicles meet the operational needs of participants and will communicate optimal times for participant vehicles to provide whole home backup to reduce on-peak consumption. Additionally, the demonstration will leverage the format established by the Smart Battery Pilot where participating customers will be compensated for kWh exported from their vehicle batteries during specified periods aligning with Peak Time Events. The objective is to better understand how managed charging can reduce the negative impacts of high EV adoption rates and turn them into an operational asset.

PGE will recruit customers with compatible electric vehicles (those sold by participating vehicle manufacturer with V2X functionality) and who have installed the required charge management equipment. The V2X demonstration will be small (less than 20 participants) and aims to lay the foundation for PGE to understand the capabilities of V2X charge management, identify vehicle battery potential and review/approval within PGE's interconnections process, and establish a precedent for vehicle-to-grid export across the utility meter.

For a more detailed review of these activities please see PGE's 2021 SGTB Phase II Proposal and the subsequent supplement.[95]

[95] PGE (2021). *Smart Grid Testbed Phase II Proposal*, Sections 2.2.3.6 and Appendix A. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.
PGE (2023). *Smart Grid Testbed Phase II Proposal: Flexible Feeder Demonstration Supplement*. Available at https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf.