



Portland General Electric

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March 28, 2024

Via Electronic Filing

Public Utility Commission of Oregon
Attention: Filing Center
201 High Street SE, Suite 100
Salem, OR 97301
P.O. Box 1088
Salem, OR 97308-1088

Re: UM 1976 – Portland General Electric Company’s Smart Grid Testbed Phase II Proposal

Dear Filing Center:

As described in Portland General Electric’s (PGE) approved Smart Grid Testbed (SGTB) Phase II proposal, SGTB is a collaborative research program focused on accelerating the development of distributed energy resources (DERs) and demonstrating their capabilities as grid resources. Phase II, which began in 2022, is focused on resource development, DER deployment, and operationalizing DERs to demonstrate their viability as resources capable of meeting customer and grid needs.

As Phase II research areas are scoped, PGE submits implementation plans for review by the Public Utility Commission of Oregon (OPUC or the Commission). This filing provides the plan for the Vehicle-to-Everything (V2X) research area. The plan provides the implementation details and associated budget for the demonstration, consistent with the original SGTB Phase II proposal. This plan was developed in close coordination with stakeholders and vetted through the Demand Response Review Committee (DRRC) stakeholder review process, as described in this document.

Should you have any questions or comments regarding this filing, please contact Sam Newman at 503-464-2112. Please direct all formal correspondence and requests to pge.opuc.filings@pgn.com.

Sincerely,

/s/ Riley Peck

Riley Peck
Senior Manager, Regulatory Strategy
Regulatory Affairs & Strategy



Smart Grid Testbed Phase II Proposal

V2X Demonstration Supplement

March 2024



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Smart Grid Test Bed Proposal Update

1.1 Update Context and Overview

PGE submitted a proposal for Phase II of Smart Grid Testbed (SGTB) implementation on October 1, 2021.¹ The proposal provided the overall framework for SGTB activities and presented a five-year budget of \$11 million for all testbed activities.

The Phase II proposal provided detailed plans for \$2.9 million of the total budget, associated with the first three demonstrations and the first 2-3 years of implementation. The Phase II proposal indicated that PGE would follow up with detailed plans for subsequent demonstrations aligned with the research areas and objectives described in the proposal as implementation progressed. PGE submitted a first addendum in May 2023 and a second addendum in September 2023, which provided project plans for additional research areas.

This supplement to the Phase II proposal provides the project plan for the Vehicle-to-Everything (V2X) demonstration. As with previous plans, plan details have been shared with the Demand Response Review Committee (DRRC)² and updated to incorporate feedback received and ensure efficient use of Testbed funds. Appendix I of this filing contains the detailed plan.

For consistency, Table 1 below provides an update to the Table 1 provided with the original Phase II proposal and breaks out the total project budget, previously requested and approved implementation budget and requested budget inclusive of this addendum.

¹ See OPUC Docket No. UM 1976, "PGE's Smart Grid Test Bed Phase II Proposal," available at <https://edocs.puc.state.or.us/efdocs/HAD/um1976had145212.pdf>.

² The DRRC was created by Commission Order 17-386.

Table 1 – Proposed Smart Grid Testbed Phase II Budget (March 2024 Update)

Research Area	Expected Budget	Previous Requests (Approved by Orders 21-444, 23-258 & 23-376)	Updated Request (Total)
New Construction Bundle	\$500,000	\$500,000	\$500,000
C&I, Municipal Flexible Load & Resiliency	\$1,727,450	\$0	\$0
Distributed PV/Smart Inverters	\$1,000,000	\$1,000,000	\$1,000,000
Multifamily Bundle	\$1,250,000 ³	\$1,250,000	\$1,250,000
Managed Charging/V2X	\$2,250,000 ⁴	\$872,200	\$1,242,200
Flexible Feeder	\$4,272,550 ⁵	\$4,272,550	\$4,272,550
Non-Wires Alternative	\$0	\$0	\$0
Total	\$11,000,000	\$7,894,750	\$8,264,750

As shown in Table 1, project funding requested by PGE for the “Managed Charging / V2X” research area falls below the proposed Phase II budget approved by OPUC in 2021. PGE intends to revisit further research needs with the DRRC, including OPUC Staff, later this year to inform a decision on whether to bring forward additional proposals as part of Phase II. If PGE does not identify a compelling opportunity to test additional use cases, customer segments and/or equipment types within the SGTB “Managed Charging / V2X” research area, the actual budget will come in below the expected budget shown in Table 1, resulting in overall cost savings versus approved levels.

This update is not intended to modify elements of the approved Phase II plan related to program scope, staffing or other topics not specifically addressed below. PGE expects Schedule 13 to continue to serve as the primary tariff covering SGTB activities. Proposed updates to the tariff to add provisions specific to the new demonstration projects will be filed with OPUC in advance of implementation.

PGE requests the following action:

- Approval for an additional \$370,000 above the previously authorized “Managed Charging/V2X” amount of \$872,200 to be used for the V2X project. If approved, project expenditures will begin in 2024 and continue through 2025 as described in the project plan.

³ Budget reflects funds reallocated per Order 23-258.

⁴ Budget reflects funds reallocated per Order 23-258.

⁵ Budget reflects funds reallocated per Order 23-376.

1.2 Process for Project Development, Review and Approval

1.2.1 Project Concept Development

As with other SGTB projects, PGE has sponsored the V2X project's presentation to the DRRC through the project development process. DRRC input has been sought at quarterly meetings, including the 2023 Q3 and Q4 meetings, held on September 21 and December 14 respectively. DRRC members reviewed and submitted feedback on the project plan, which was circulated to DRRC members in December 2023 and re-circulated in March 2024.

PGE made significant updates to the project scope in response to suggestions from DRRC members, including OPUC Staff. Specific changes include the following: 1) adjustment to the incentive methodology, amounting to a 25% reduction in total project budget; 2) clarification that incentives will be issued to installation contractors in order to reduce direct customer costs; 3) updates to the planned marketing approach; and 4) expansion of the research objectives to consider the value proposition to customers in Public Safety Power Shutoff (PSPS) areas.

1.2.2 Project Review

For the development and refinement of project plans, PGE uses the demonstration project review template developed through collaboration with OPUC Staff during SGTB Phase I. The format includes the following elements:

- An overview of key information including the number of customers, the technology of market intervention being tested, funding source(s) and amount(s), the period of performance, as well as any contractor(s) and/or partner(s) supporting the effort.
- A narrative description of the planned activities, including among other things the project goals, research questions, as well as roles and responsibilities of partner organizations.
- The target population for project, specifying the targeted customer segments, enrollment goals, and the reasoning behind these selections.
- A discussion of optional activities and the alternatives considered.
- Information on how the project fulfills the goals of the Testbed and informs product development, including the long-term transition to Pilot and/or Program.
- Total Costs and funding sources, with anticipated Operation and Maintenance (O&M) expenses and revenues broken down by FERC account, capital costs, and the number of full-time employees (FTEs) and contractors.
- A timeline of activity, milestones, risks, and a risk mitigation plan.
- A description of benefits to customers and ratepayers, including how the plans contribute to environmental, emissions, and community impact objections in support of [Executive Order 20-04](#).
- The evaluation strategy and performance metrics on which the effort will be measured.

1.2.3 Project Approval

Appendix I includes the detailed V2X project implementation plan for Commission consideration and approval. Additional work to be completed in SGTB Phase II – specifically in the Commercial & Industrial research area – is not outlined here. Future research area work will first be scoped and reviewed with the DRRC as SGTB continues. This will ensure alignment with approved portfolio goals before submission to the OPUC through the proposal template.

Appendices

This proposal serves as an addendum to PGE’s original SGTB Phase II proposal and previous addendums, in which Appendices A through H have already been used.

Appendix I Demonstration Project Activity: Vehicle-to-Everything (V2X) Demonstration

I.1 Summary of Project Dashboard

Number of Customers Involved	Technology Being Tested	Funding Source	Funding Amount	Time Period	Contractor and/or partner
10 - 20 customers	Bi-directional vehicle charging to include home back-up and grid export (specific to the Ford F-150 Lightning)	SGTB Phase II Funding	\$370,000	May 2024 - December 2025	Ford

I.2 Glossary

Ford Home Integration System (HIS): Proprietary Ford equipment to enable two-way power flow between the vehicle and the customer’s home. The HIS is required to enable the Intelligent Power Mode and Grid Export modes.

Ford Charge Station Pro: Proprietary Ford 80-amp Level II electric vehicle charging equipment. The Ford Charge Station Pro is required to enable the Intelligent Power Mode and Grid Export modes.

Bi-directional Charging: The capability of an electric vehicle or the associated charging equipment to provide charge to the vehicle's battery and to discharge energy from the vehicle's battery upon command.

Bi-directional Charging Equipment: Within this demonstration, the Ford Home Integration System and the Ford Charge Station Pro are designated as the bi-directional charging equipment.

Intelligent Backup Power Mode: A functionality offered standard by all Ford F-150 Lightning vehicle models where backup power can be provided from the vehicle to the home if an

outage is detected. This operating mode will only provide backup power when a utility outage is detected.

Intelligent Power Mode: A functionality offered by all Ford F-150 Lightning vehicle models through an over-the-air software update where the vehicle battery can be leveraged to provide power to the home on demand but will not allow power to be exported to the grid (Grid parallel non-export).

Grid Export Mode: A functionality offered by all Ford F-150 Lightning vehicle models through an over-the-air software update where the vehicle battery can be leveraged to provide power to the home with the capability of exporting power across the meter to the utility grid (Grid parallel export).

Time of Day: a rate schedule where the cost per kWh consumed depends on the time of day. Time of Day pricing is less than the PGE Basic Service for all hours and days except for the On-peak timeframe of 5-9 p.m. weekdays (excluding holidays).

Residential Battery Energy Storage Pilot, or Smart Battery Pilot: Operated under Schedule 14, PGE engages with customer-owned battery energy storage devices to charge or discharge during peak times. PGE notifies customers of a scheduled Peak-Time Event where they can participate with their committed capacity or opt out of the event. Customers are incentivized by applying a \$1.70 per kWh on-bill credit calculated based on how much of their battery they have elected to commit and how much power was dispatched during the Peak-Time Events for that month.

I.3 Description of Demonstration Project (Statement of the Research Question)

PGE seeks to explore the bi-directional charge functionality available to Ford F-150 Lightning owners who have the Ford Home Integration System (HIS) and Ford Charge Station Pro equipment installed. PGE will seek to determine the flexible load potential available to PGE via the ability to manage electric vehicle (EV) charging to shift customer demand, leverage vehicle-to-home (V2H) power to reduce demand during peak times, and to export power across the meter through their vehicle-to-grid (V2G) functionality during Peak-Time Events (PTE).

PGE will leverage the three operating modes available in Ford's F-150 Lightning:

- Intelligent Backup Power Mode,
- Intelligent Power Mode, and
- Grid Export Mode.

Presently, F-150 Lightning owners can utilize the Intelligent Backup Power Mode, which provides automatic backup power to the customer's home only when a utility power outage is detected. Within this demonstration, PGE will collaborate with Ford to leverage the Intelligent Power Mode to provide V2H power supply with non-grid export during on-peak times (weekdays 5-9pm), and to leverage the Grid Export Mode to discharge from the vehicle's battery during Peak-Time Events to power the home and export the excess power across the meter to the grid.

In implementing this demonstration, the project team will coordinate across PGE teams and programs to maximize the effectiveness of the study. Upon enrollment in the demonstration, customers will be enrolled in a Time of Day (TOD) rate structure that will optimize the customer bill savings for using their vehicles to power their home fully or partially during on-peak times. Prior to managing participant's charging, the testbed team will establish a baseline for each customer based off their standard charging practices. The V2X Demonstration will leverage existing incentive payment pathways and notification structures implemented in the Smart Battery Pilot to communicate Peak-Time Event and to compensate customers for the kilowatt hours (kWh) dispatched from their vehicles during the designated periods.

Currently, Ford F-150 Lightnings and the associated bidirectional charging equipment is available to PGE customers to purchase and install. As of Q1 2024 PGE records, there are a total of 365 Ford F-150 Lightnings in PGE service territory, with 55 of those being located in zip codes associated with [Public Safety Power Shutoff \(PSPS\) zones](#). Conversely, primarily due to the high cost of purchasing and installing the bidirectional charging equipment, there are only 2 Home Integration Systems purchased and installed in PGE's service territory. By conducting this demonstration now, PGE will be better prepared on how to plan for the increased adoption of these systems, account for them in the interconnections workflow, assign a planning value for their use within the virtual power plant, assist with customer inquiries about bidirectional charging, and understand the benefits of bidirectional charging that might be leveraged by future PGE pilots and programs.

Equipment Installation Funds & Customer Incentives

The total purchase and installation of the bidirectional charging equipment can exceed an amount of \$10,000 to be paid by the customer, with the Ford equipment solution roughly costing \$5,000.⁶ For the purposes of stimulating installs to be used in this demonstration and to meet the associated demonstration timelines, PGE proposes reducing the cost burden to customers of installing the required equipment by providing an Equipment Installation Incentive. Recognizing that customers at the edge of our distribution network, specifically those in PSPS areas, can benefit from leveraging vehicles' bidirectional charging capabilities for whole-home backup during power outages, our team proposes that we implement two equipment installation incentive pathways within this demonstration: a \$2,500 equipment installation incentive for standard customers and a \$5,000 equipment installation incentive for customers located in PSPS areas. This funding is to be applied by the installation contractor to the customer's bill to offset the equipment purchase and installation costs of the bidirectional charging equipment (the Home Integration System and the Ford Charging Station Pro).

Participating customers will then be eligible to receive the Monthly Participation Incentive and a Peak-Time Event Participation Incentive alongside additional Ford-based incentives. The proposed structure is as follows:

⁶ The purchase and installation costs of the proprietary Ford-based solution are approximately \$9,000 more than the cost of a Level 2 charger, with further detail available in Table 2 of Xcel Energy's 2023 article: [The Potential of V2X \[xcelenergy.com\]](#)

Table 2: PGE and Ford Demonstration Incentives

Incentives	Incentive Amount
PGE (Upfront)	
Standard Customer Installation Incentive	\$2,500
PSPS Customer Installation Incentive	\$5,000
PGE (Ongoing)	
Monthly Participation Incentive	\$50/month
Peak-Time Event Participation Incentive	\$1.70/kWh dispatched from vehicle during PTE
Ford	
Ford F-150 Lightning Vehicle Buydown	\$1,000
Waitlist Prioritization	N/A

PGE incentives will be handled as follows:

- Equipment Installation Incentive: to be paid to the electrical contractor responsible for installing the required bi-directional vehicle charging equipment. The incentive is intended to partially offset equipment purchase costs and installation costs of the bidirectional charging equipment (the Home Integration System and the Ford Charging Station Pro).
- Monthly Participation Incentive: to be paid via monthly on-bill credit to the customer for their ongoing participation in the demonstration. Monthly Participation Incentives will begin when PGE receives notification that a customer’s bi-directional charging equipment has been successfully installed and will continue throughout the duration of the demonstration.
- Peak-Time Event Participation Incentive: to be paid via on-bill credit to the customer at the rate described in Table 1 based on the total number of kWh dispatched from the vehicle during the Peak-Time Event that occurred during that month’s billing period. Ford will provide PGE monthly data reports of the total kWh dispatched per participating vehicle during each Peak-Time Event, which PGE will use to calculate the incentive. Additionally, as implemented in the Smart Battery Pilot, customers will receive the net metering rate per kWh exported across the meters when dispatched by PGE during peak events.

Ford Incentives will be handled as follows:

- Ford F-150 Lightning Vehicle Buydown: At time of vehicle purchase, Ford will apply the purchase discount to the total cost of the vehicle.
- Waitlist Prioritization: Customers on Ford’s waitlist to purchase a Ford F-150 Lightning can be prioritized to receive their vehicle sooner if they choose to enroll in this demonstration and intend to install the required charging equipment.

Demonstration Charge Management Structure

Within the V2X Demonstration, PGE will utilize the three Ford F-150 Lightning operating modes by testing the following Use Cases:

Table 3: V2X Demonstration Use Cases

Use Case	Description
1. Peak Time Avoidance	Charge cessation signal applied to participant vehicles during mid- and on-peak times
2. Peak Demand Load Reduction	Participant vehicles set to dispatch power to home with grid-export disabled during on-peak times.
3. Peak Time Event Grid Export	Participant vehicle to dispatch at max capacity (9.6kW) to power home with grid-export enabled during specified Peak Time Events.
4. Pre-Charge Response to PGE Alert	When PGE issues an alert, Ford will remove all charge management schedules applied to participant vehicles and will notify customers to charge vehicles to max SOC during off-peak times. Default to Intelligent Backup Power Mode if outage is detected.

Participant charge preference will always be prioritized, allowing customer ability to override the applied charging schedule to receive charge whenever requested. Customers will never receive PGE-based signal to charge during on- or mid-peak times.

During the Customer Recruitment & Enrollment phase, customers will be enrolled in TOD pricing and will be added to the Peak Time Avoidance charge management structure. Within this structure, participant vehicle charging will be set to occur during the lowest cost times, avoiding charging weekdays during mid-peak and on-peak pricing times. This use case is intended to test the Ford-owned and operated vehicle charge signal management software platform, FordPass, and will be implemented after customer recruitment is conducted, after the required charging equipment is installed by the customers, and after the baseline is established.

Once enrollment goals are met (or the enrollment phase is determined to be closed) and participating customers have had the required bi-directional charging equipment installed, the three additional Use Cases will be conducted concurrently for all participants. To accomplish the Peak Load Demand Reduction use case, participating customer vehicles will receive a command from Ford that sets their vehicle to dispatch power in Intelligent Power Mode during times of on-peak pricing, resulting in reduced kW demand from the grid. Customers will have the ability to override the setpoints of when their vehicles are set to dispatch and how much of their vehicle's battery they opt to use for powering their home (i.e., if a customer sets the minimum state of charge to 60%, the vehicle will only dispatch if the state of charge is in excess

of 60%). For example, the participant electric vehicles are set to utilize the Intelligent Power Mode during peak times, allowing the vehicle battery to discharge to their homes if plugged in weekdays from 5p.m. - 9p.m. so long as the vehicle battery is above a pre-designated state of charge.

To accomplish the Peak-Time Event Grid Export use case, the project team will leverage the same structure as the Smart Battery Pilot, which only allows grid export from the battery if called upon by PGE. PGE will use the same Peak-Time Event signals leveraged by the Smart Battery Pilot to notify Ford, who will then send a customer notification stating when their vehicle will receive a dispatch command that will provide power from the EV to the home and will export any excess power across the meter to the grid. The participating customer vehicles will only dispatch during the designated time and only up until the customer's vehicle battery reaches the designated minimum state of charge. Customers will be compensated per kWh dispatched from the vehicle during the event period at the rate described in Table 1. Ford will track total kWh dispatched from participant vehicles and will report to PGE monthly. At any point a customer can opt out of an event and can adjust their preferred minimum state of charge.

To accomplish the Pre-Charge Response to PGE Alert Use Case, PGE will relay an alert to Ford whenever there is an increased likelihood the customer will need to leverage their vehicle for resilience (e.g., a severe weather warning or Public Safety Power Shutoff event). Once this signal is received, Ford will temporarily disable the charge management strategies stated above and will send notification to the customer encouraging them to charge their vehicle to maximum state of charge during off-peak pricing. PGE customers intend to utilize their Ford F-150 Lightning vehicles as a resilience resource, so this use case is to ensure that PGE is not using the customer battery as a utility resource during events where there's an increased chance of outage. If an outage occurs, the customer's vehicle will automatically backup the home via the Intelligent Backup Power Mode. Once the event is concluded, PGE will notify Ford who will re-set the customers to the pre-event setpoints.

I.4 Participation and Type of Participant Targeted (Provide reasoning for the number)

Customer Marketing & Recruitment Strategy

PGE will employ two distinct marketing pathways to recruit customers to participate in the V2X Demonstration: a direct marketing approach for existing Ford F-150 Lightning owners in PSPS zones and a tiered marketing approach for standard PGE customer participants. PGE will target the recruitment of a maximum of 20 participants, reserving a minimum of 5 spaces for PSPS customers.

For customers residing in Public Safety Power Shutoff zones, PGE will employ a direct email outreach strategy to offer the larger \$5,000 equipment installation incentive. This pathway will specifically target existing Ford F-150 Lightning owners through direct communication channels to encourage them to install the required bidirectional charging equipment and will market the benefit of utilizing their vehicles as a home backup resources during outages.

For the standard PGE customer, PGE will conduct outreach via three strategies: Internal PGE marketing to employees, friends, and families; direct email outreach to customers who either own an F-150 Lightning or are on the waitlist to receive one; and via in-app notifications within

the FordPass App for existing Ford vehicle owners. Since Ford is offering incentives limited to customers who have yet to purchase their F-150 Lightning, priority will be placed on recruiting customers currently on the waitlist or those who intend to purchase their vehicles during the Customer Recruitment & Enrollment phase of the demonstration. The V2X demonstration is not geographically constrained so any PGE customer intending to purchase a Ford F-150 Lightning and install the required bi-directional charging equipment is eligible to participate.

Prior to the launch of the marketing phase, the project team will create a V2X Demonstration webpage that outlines the offering, incentive amounts, and participation expectations and will include a link to the enrollment form. Since the demonstration marketing will be conducted via direct outreach, this webpage will be publicly available but will only be accessible through the shared link (i.e., public webpage but hidden). Customer inquiries will be directed to the Smart Grid Test Bed inbox at smartgridtestbed@pgn.com.

I.5 Optional Activities or Alternatives Considered

Within this demonstration, the telematics-based bi-directional charge management will be handled by Ford through their native platform. In future programs or demonstrations, this communication could be facilitated directly by PGE via integration with Ford's platform or via third-party aggregator (e.g., OVGIP, Virtual Peaker, WeaveGrid, etc.). The testbed V2X demonstration will be leveraging Ford and their bi-directional charge management platform as a streamlined pathway to derive the demonstration learnings but PGE does not intend for this configuration to be used for future iterations at scale. PGE will consider leveraging a comprehensive vehicle communications platform to facilitate charge management for multiple OEM types.

I.6 How this Demonstration Project Fulfills Testbed Proposal Work

The goal of this demonstration is to align PGE's managed charging strategy with the newly developed bi-directional charging technologies being released into production by electric vehicle manufacturers, whereby PGE can attain increased control over the newly introduced flexible loads incurred by customer electric vehicle adoption. Presently, PGE uses managed charging to reduce electric vehicle charging during on-peak times or to shift charging to utility optimized times; this demonstration goes further to explore what additional value may be available through bi-directional charging in reducing site-based consumption during on-peak times and of leveraging these electric vehicles as a grid asset to export during times of distribution system stress. Additionally, PGE customers are increasingly aware of the ability of electric vehicles to dispatch power to their home and to the electric grid. This demonstration lays the foundation for PGE to develop a pilot or program that meets customers' expectations for leveraging this functionality.

I.7 How the Demonstration Project informs Pilot and Program Development (Including potential scale)

This demonstration will expand PGE's ability to meet customer expectations for the use of their electric vehicles as a grid resource via bi-directional charging. Currently, PGE and the overarching utility industry has not developed a pathway of recognizing electric vehicles as a dispatchable grid resource, though through this demonstration, PGE will begin alignment of the required teams to identify, review, approve, and subsequently call upon electric vehicles

as energy storage devices that can both absorb and export power when optimal for the customer and for the distribution grid. This demonstration will drive expanded coordination between PGE’s grid products, interconnection team, operations teams, and account services, ensuring that this structure can be expanded for future iterations.

1.8 Funding Source and Total Costs (Including: O&M expenses and revenues, broken down by FERC account, capital costs, number of FTE employees, and number of contractors.)

PGE is seeking \$370,000 in SGTB Phase II funding to support this 1.5-year demonstration; the table below represents the details of this request.

Table 4: V2X Demonstration Budget Allocation

Budget Item	Amount	Notes
PGE Staffing	\$160,000	Project Coordinator and Analyst staff
Equipment Install Incentives	\$75,000	Equipment Installation Incentives
Customer Ongoing Incentives	\$35,000	Customer Participation Incentives
Recruitment & Outreach	\$25,000	Customer awareness and recruitment campaign
Equipment & Research	\$25,000	Metering needs and collaborative research opportunities
Evaluation	\$50,000	Third party evaluation contractor
<i>Total</i>	<i>\$370,000</i>	

1.9 Timeline of Activity (Including: Milestones and evaluation)

*Project Planning and Preparation (Q1-Q2)*⁷

The project team will collaborate with Ford and other industry stakeholders to vet proposed demonstration design, solidify the bi-directional charge management communication process, identify the data reporting sources and requirements, and to assess anticipated customer reception to participation requirements and incentive structure. The information gathered here will inform the Customer Marketing & Recruitment stage, clarifying the total potential customer base for recruitment and how the project team tiers the outreach strategy. During this stage, PGE’s Legal and Regulatory Affairs teams will be engaged to update Schedule 13. Once incentives are finalized, the V2X Demonstration webpage will be posted and the Customer Marketing & Recruitment stage can begin.

⁷ Quarters refer to the project implementation, which will begin following OPUC approval. Q1 of the V2X research is expected to correspond to Q2 2024.

Milestone: Complete stakeholder and customer market assessment of demonstration's incentive package structures and determine anticipated customer reception to demonstration offering.

Customer Marketing & Recruitment (Q2-Q5)

The project team will publish the V2X Demonstration webpage and will begin conducting customer outreach, beginning with direct outreach to existing F-150 Lightning owners in PSPS zones and with internal marketing to PGE employees and their friends and families. Shortly after, Ford will begin contacting PGE customers on their waitlist via direct email outreach. If the enrollment goals have yet to be met at this stage, PGE and Ford will contact existing Ford F-150 Lightning owners, beginning with customers already enrolled in PGE's Smart Charging Program. Upon confirmation that customers have received their F-150 Lightning and have completed the installation of the required bi-directional charging equipment, PGE will enroll customers in TOD pricing and will apply the monthly participation bill credit. Ford will subsequently be instructed to apply the Peak Time Avoidance charge structure to the participating vehicle.

Milestone: Successfully recruit a minimum of ten, or a maximum of twenty, customers to participate and begin managing participating customers vehicle charge.

Risk and Mitigation Strategy:

1. Customers do not participate in the demonstration.
 - a. Mitigation Strategy - Tier customer marketing and recruitment to prioritize optimal customers (purchasing an F-150 Lightning and intending to install required equipment), then continue to stage outreach to remaining potentially eligible customers (currently own an F-150 and are willing to install required equipment). Since only a select few installation contractors will be trained on installing the Ford Home Integration System, the project team will ensure that any system being installed outside of PGE's outreach gets contacted to assess ability to participate.

Customer Recruitment into DR Programs (Q3-Q8)

As participants receive their F-150 Lightnings and complete their required equipment installation, the PGE team will begin transitioning customers to the remaining Use Cases: Peak Load Demand Reduction, Peak-Time Event Grid Export, and Pre-Charge Response to PGE Alert. Following a PGE participation overview communication, Ford will set participant vehicles to provide power to their homes during on-peak times through the Intelligent Power Mode, and PGE will follow established process for communicating Peak-Time Event to Ford to notify customers of upcoming vehicle dispatch and export events. Ford will provide monthly vehicle charging reports to PGE, which will be used to provide monthly Peak Time Grid Export incentives on the associated months when events occur.

Milestone: Execute testing of all use cases and process associated incentives.

Risk and Mitigation Strategy:

1. Customers do not plug in their vehicles to dispatch power during peak times or participate in Peak Time Events.
 - a. Mitigation Strategy - Due to the size of the demonstration, the PGE project team can conduct direct outreach to participating customers to inquire about their specific vehicle charge setpoints and intentions for providing home backup and/or grid export during events. If customers demonstrate that they are reluctant to use their vehicle's battery to provide power to their homes or grid export, this will be a valuable learning from the demonstration as to customer expectations for utility-vehicle interaction.

I.10 Lessons to be learned (Learning Objectives)

The primary goal of this project is to operationalize customers' electric vehicle batteries as a grid resource that can shift and shave load, while also providing advanced grid services by providing grid export potential during event windows where the grid is stressed. Currently PGE only has the ability to shift electric vehicle load so this demonstration will set the framework for future pilots and programs where bi-directional electric vehicle charging can be leveraged.

In addition to the goals listed above, the demonstration will also provide insights into:

- o Customer appetite for leveraging their electric vehicles to reduce kWh consumption during peak times to impart on-bill savings,
- o The technical requirements of installing a bi-directional charger and how to review and approve their installation within PGE's interconnections team,
- o The data sharing requirements of an electric vehicle manufacturer to have visibility into participant vehicle discharge and the associated impact on the home/grid,
- o The requisite communications channels between PGE and the electric vehicle manufacturer, PGE and the participating customers, and the electric vehicle manufacturer and the participating customers,
- o What forms of incentives (up-front, ongoing, non-monetary, etc.) are most impactful to achieving participant enrollments.

I.11 Benefit to Customers and Ratepayers

The V2X Demonstration offers an array of benefits to ratepayers through the exploration of bi-directional charge functionality available in Ford's F-150 Lightning vehicles. Examples include:

- o **Enhanced Flexibility and Backup Power:** Participating F-150 Lightning owners, equipped with the requisite Ford Home Integration System (HIS) and Ford Charge Station Pro, will have more flexibility in managing their EV charging. In the future, learnings from this demonstration will benefit customers who have electric vehicles that have similar bi-directional charging functionality.
- o **Grid Optimization and Load Management:** Leveraging the bi-directional charging capabilities of EVs, PGE gains the ability to manage electric vehicle charging and discharge, reducing peak load demands during on-peak times. This contributes to optimizing grid operations and minimizing strain during high-demand periods, leading to an improved system for everyone.

- **Cost Savings and Incentives:** Customers enrolled in the Time of Day rate structure stand to gain financial benefits by optimizing vehicle charging during lower cost times and to reduce demand during on-peak times, leading to potential bill savings. Additionally, the offered incentives, including Equipment Purchase Incentive, Monthly Participation Incentive, and Peak-Time Event Participation Incentive, add value and reward to participants for their involvement.
- **Contribution to Grid Stability:** By participating in grid export during Peak-Time Events, customers not only reinforce their home's resiliency but also contribute to grid stability during times of peak demand, providing a valuable service to the community.
- **Resource Efficiency and Resilience:** The V2X demonstration introduces a new avenue for PGE to harness EV batteries as a potential energy storage resource, enabling more efficient use of available energy resources. This helps enhance grid resilience during critical moments, such as planned outages or severe weather warnings, ensuring a reliable power supply to customers.
- **Financial and Environmental Impact:** As the demonstration progresses, the collective effort to optimize charging times, reduce peak demands, and use EVs as grid assets is poised to yield cost savings and environmental benefits, ultimately influencing the management of utility costs and supporting sustainability goals. By leveraging electric vehicles to reduce customer demand during peak times, PGE will be better suited to meet our clean energy generation goals and the greenhouse gas (GHG) reduction goals set out in Executive Order 10-04 by exploring the development of an electric vehicle-based flexible load resource that can be leveraged to shed demand during peak load times, reducing PGE's reliance on traditional GHG intensive energy generation methods used to meet peak load.

I.12 Evaluation Strategy (Including a Final Report)

Following the completion of the demonstration, the SGTB team will present to the Commission an evaluation of project activities and results. These findings will include results related to:

- Receptiveness of F-150 Lightning owners to the demonstration goals, required equipment installation requirements, and recruitment strategies,
- Quantity of eligible battery capacity nominated to participate in daily dispatch events and for export during Peak-Time Events,
- Total energy generation avoided via customer vehicle providing home power with associated emission intensity values,
- The success of utilizing the native Ford-based charge control platform as compared to using a third-party aggregator platform,
- Projection of estimated total amount of controllable flexible load to be made available to PGE if this demonstration were to be scaled,
- Insight into if demonstration is feasible to scale to a product pilot.

The evaluation will also include feedback from customers on their experience with the project, including satisfaction with incentives, performance, and functionality of the vendor platform, and impact on vehicle use.

The SGTB team will issue an RFP for a third-party evaluator to conduct this work. PGE is requesting \$50,000 to conduct this evaluation, which will be completed within 3 months of project completion.

In addition to the formal evaluation, the project team will report to the DRRC and Commission at least quarterly on the status of the project, including any major accomplishments, barriers, and/or proposed changes to scope.