



Portland General Electric Company
121 SW Salmon Street • 1WTC0306 • Portland, OR 97204
portlandgeneral.com

September 2, 2021

Public Utility Commission of Oregon
Attn: Filing Center
201 High Street, S.E.
P.O. Box 1088
Salem, OR 97308-1088

**RE: PGE UM 1856 PGE Draft Storage Potential Evaluation
2021 Annual Energy Storage Update**

Pursuant to Public Utility Commission of Oregon (OPUC or Commission) Order No. 18-290, Portland General Electric Company (PGE) submits its third annual report on the progress of its energy storage proposal which includes: Baldock, Coffee Creek, Microgrid pilot, Port Westward 2 (PW2), Residential Storage pilot (called the “Smart Battery Pilot”), and the controls for the energy storage systems. During operation of the projects, PGE will submit comprehensive evaluations in the third, sixth, and tenth operating year, along with annual progress updates. The following report details each project and includes progress, challenges, and preliminary learnings, as available. As discussed further in this update, with the exception of the microgrid and Smart Battery pilots, several projects are delayed due to the COVID 19 pandemic and its business and social distancing consequences.

History of Energy Storage Docket

The Commission opened Docket No. UM 1751 in September 2015 to implement House Bill 2193, which requires Oregon electric companies (PGE and PacifiCorp) to submit proposals by January 1, 2018, to procure qualifying energy storage systems with capacity to store at least five megawatt hours of energy. PGE met this requirement and has procured 11 MWh of energy storage (Port Westward 2 and a Microgrid site Beaverton Public Safety Center) as of December 31, 2019.

PGE filed its energy storage proposal and final Energy Storage Potential Evaluation on November 1, 2017, which were reviewed in this docket. Order 18-290 partially approved and modified the stipulation and provided conditional approval on the following projects:

- **Energy Storage Potential Evaluation** – Prior to moving forward with any of the projects, PGE will submit a detailed written explanation of a plan to improve its energy storage modeling capability to estimate all energy storage benefits as directed in Order Nos. 17-118 and 17-375. This will be submitted to OPUC Staff (Staff) where they will evaluate and determine approval to allow PGE to move forward with all projects.
- **Baldock Mid-Feeder Project** – Submit a site analysis to Staff where they will evaluate and determine whether adequate evidence has been provided to allow PGE to move forward with the project.

- **Coffee Creek Substation Project** – Similar to Baldock, submit a site analysis for evaluation by Staff. In addition, PGE is to submit a justification for utility ownership.
- **Residential Storage Pilot** – Submit an addendum that details how PGE will optimize learnings and mitigate risks to Staff where they will evaluate and determine whether adequate evidence has been provided to allow PGE to move forward with the pilot.

2021 Annual Energy Storage Update

Baldock Mid-Feeder Energy Storage System

This project will develop and build a 2 MW, two-hour energy storage system adjacent to PGE's Baldock Solar facility and will be interconnected to the Canby-Butteville feeder. The final project energy rating (MWh) will be determined based on the proposal pricing received and space availability.

PGE has prepared the Request for Proposal (RFP) for this project, but due to economic conditions stemming from the COVID-19 pandemic, this project has been delayed to 2022. PGE still plans to issue the RFP in late 2021 for evaluation.

Coffee Creek Substation Energy Storage System

This project will develop and build a 17-20 MW, four-hour energy storage system sited and interconnected at PGE's Coffee Creek Substation. The final project rated capacity will be determined based on the proposal pricing received.

Due to economic conditions stemming from the COVID-19 pandemic, this project has been delayed to 2022. PGE still plans to reissue the RFP in late 2021 for revised pricing and re-evaluation.

Microgrid Pilot

This project will develop and build two microgrids and will serve either single customers or a subset of customers.

PGE and the City of Beaverton signed an agreement to deploy the first energy storage microgrid at the Beaverton Public Safety Center in 2019 under this pilot. The project consists of a 250 kW, four-hour battery owned and operated by PGE. The battery is paired with a 300 kW PV solar array owned by the customer, and a backup diesel generator also owned by the customer. Since being energized in September 2020, the distribution system serving the Beaverton Public Safety Center has experienced two outages: September 7, 2020 and October 5, 2020. On both occasions, the microgrid system provided emergency power to the site. However, the system performance was not as rapid as was desired. The problems were related to firmware within the battery system inverters. New firmware has been created by the manufacturer and is being installed on September 13, 2021. At that time, the system will be re-commissioned.

The battery has been dispatched to deliver bulk energy services, including portfolio resource optimization (demand response) and frequency response. The system had issues with availability that have largely been resolved and now provides frequency response reliably and demand response when requested.

PGE and the Oregon Military Department have signed an agreement to deploy the second energy storage microgrid at the Anderson Readiness Center under this pilot. This project consists of a 500 kW, two-hour battery owned & operated by PGE. PGE issued the RFP in February 2021. In June 2021 PGE awarded the contract and design and equipment procurement is currently underway. It is expected that this project will be energized in Q2 2022.

Both microgrid sites are designed to support community resiliency.

Port Westward 2 (Generation Kickstart) Energy Storage System

This project will develop and build a 5 MW, two-hour energy storage system at PGE's Port Westward 2 Generating Station (PW2). This energy storage system will be coupled with one of PW2's reciprocating engines. The project will enable the combined resource (i.e. the energy storage system and a PW2 reciprocating engine) to qualify as spinning reserve, even when the engine is not running.

The project design work was completed in November 2020 and the BESS equipment was delivered to site in December 2020. Construction and controls integration work has continued through August of 2021. Backfeed power will be available to the BESS in September 2021 to start the testing and commissioning process. The project is currently scheduled to be in service in October 2021.

Residential Storage Pilot

PGE's Smart Battery Pilot seeks to integrate up to 525 customer-owned residential storage units as a dispatchable resource providing grid services. During grid outages, the energy storage system provides back-up power to participating residences. In exchange for allowing PGE to operate the battery for grid services, a customer receives \$20 or \$40 per month. Customers within the Smart Grid Testbed are also eligible for an up-front rebate to encourage the density that will be needed to test locational benefits, and income qualified customers participating in the Energy Trust of Oregon's (ETO) Solar Within Reach program are also eligible for an up-front rebate so that PGE may better understand the needs of a diverse set of customers.

This was the first full year of the residential pilot since the Schedule 14 tariff became effective in August 2020. There are presently 50 customers enrolled in the pilot as of August 2021 with a total capacity of around 400 kW or 1MWh.

Operational Readiness

The previous update was filed a few weeks after the tariff approval of this project. Since the last filing PGE has achieved many tasks to be able to recruit, enroll, and dispatch customer owned batteries. A non-exhaustive list includes finalizing PGE's collaboration with the ETO as an implementation partner responsible for trade ally management and rebate payments; the ability

for PGE to provide customer on-bill credits, integration of this Pilot with the existing interconnection processes and software, marketing materials and customer-facing website, and the IT integration and customization of the Virtual Peaker software to be able to enroll customers and dispatch batteries. Additionally, staff procedures and training were needed as the Company interacts with customers and distributed energy storage in new ways.

Customer Recruitment and Outreach

PGE has conducted multiple outreach events to educate and invite customers to learn about the pilot, the benefits of energy storage systems and the rebates available to customers. In April 2021, PGE sent targeted marketing materials via email or post card to Smart Grid Test Bed customers who currently have solar or have been identified as being interested in a solar + battery solution. PGE also sent the same marketing materials to current solar customers and customers identified as being interested in a solar plus battery solution in PGE's service area. The attached documents are the marketing materials sent to customers.

PGE was initially meeting its recruitment goals primarily through the enrollment of customers with existing qualified devices, though uptake has slowed as PGE has captured most of these customers. While the Company continues to work on new ways to communicate with customers and has been in close partnership with our partners at the ETO on recruitment activities, the Covid pandemic, nationwide shortage of energy storage devices, and supply chain issues mean that new installations are slower than expected. PGE is optimistic that the extension of the state rebate (\$2,500 from ODOE), a potential ITC refresh (30% Federal tax credit), and ETO's planned Solarize campaigns within the Hillsboro and Milwaukie Test Beds can provide a boost to energy storage adoption and enrollment.

PGE also has information about the program on its website at portlandgeneral.com/smartbattery. The website provides details about the Smart Grid Test Bed incentives and the on-bill rewards available to all customers. Finally, the website provides a link to the ETO's website for customers interested in buying a storage system. Customers can submit a request to receive a bid from any of the trade allies working with ETO.

In July 2021 PGE launched the PGE Smart Battery Community in an effort to better engage current participants of the PGE Smart Battery Pilot. Also known as *Customer Conversations*, this platform is a market research online community (MROC) intended to help PGE better serve its customers by giving them a chance to talk to one of PGE's market researchers and pilot team through a series of discussions and activities. Community participants can interact with each other as well. This community is invitation-only and is monitored by a PGE market researcher. As of August 11, 2021, this community is comprised of 14 participants who have visited the community an average of three times, with the most frequent users interacting with the community 10 times since launching.

This platform is valuable because it allows the Storage & Resiliency Team to

- Better understand the desires, tensions, and motivations of the Pilot Participants
- Connect Pilot Participants to one another in an organic, engaging way
- More effectively evaluate real-time impacts of the Pilot

Dispatches and Technical Discovery

After surveying the residential battery landscape in 2019, PGE issued an RFI to residential battery manufacturers and of the respondents PGE qualified the following five Original Equipment Manufacturers (OEMs) for participation in the residential pilot: Tesla, Solar Edge, Generac, Sunverge, and Sonnen. These five OEMs were selected based on their products' market readiness, customer experience, technical capabilities, products' ease of installation and configuration, warranty, supply chain, product availability in the region, and ability to integrate their batteries into PGE's grid for PGE's control and operation.

In the summer of 2020, PGE procured and installed five batteries (one from each selected OEM) for testing, measurement, and experimental purposes. Concurrently, PGE began recruiting participants into the pilot. To connect the residential batteries to PGE's distribution systems, PGE selected two aggregation platforms for evaluation: Virtual Peaker and Kitu Systems. Virtual Peaker provides communication and controls for the residential batteries using custom proprietary APIs while Kitu systems uses standard IEEE DER communications protocol. PGE is interested in testing which of these two aggregation platforms presents a better opportunity for integration into PGE's operations.

Phase 1 of the Grid Edge testing was performed on PGE-owned batteries, located at PGE facilities. Prior to dispatching customer devices PGE tested all use cases and integration capabilities on the five test batteries, one for each of the represented brands on the qualified products list. This research was valuable to yield information about the use cases that the manufacturers would enable each device to perform and uncover any limitations to the grid services enabled to be dispatched by each manufacturer. The Phase 1 work also involved integrating PGE's DRMS software Virtual Peaker with PGE's local DERMS, to allow batteries to be dispatched automatically according to grid needs, rather than manually through the dispatch software.

Another Phase 1 activity was testing the accuracy of the inverter metrology output as compared to PGE's utility grade metering. PGE concluded that there is no significant difference between the data from the OEM inverter data and PGE's meter data. This information is an important finding for future development efforts, should PGE wish to implement a pay-for-performance model or make billing adjustments based on battery activity for any future iterations of the program.

Currently, all five battery OEMs prefer to communicate using custom APIs, while only two of the five OEMs, were able to support IEEE DER communication to PGE. As a result, all current and prospective participants of the pilot are being set up on the Virtual Peaker aggregation platform. As the IEEE DER communication standards continues to gain widespread adoption, PGE anticipates that the other battery OEMs will present opportunity to be integrated into Kitu Systems' aggregation platform.

On January 26, 2021 PGE conducted its first customer owned residential battery dispatch by requesting 50kW from enrolled customer batteries, thus kicking off Phase 2 of the dispatch of

customer devices. The call was scheduled from 7 to 9 AM. At the time the program had 18 participating customers who collectively contributed 56.3kW to PGE's grid. As seen in Figure 1, the participating devices responded to PGE's dispatch signal, but the resultant power curve was jagged, versus the desired flat output of power.

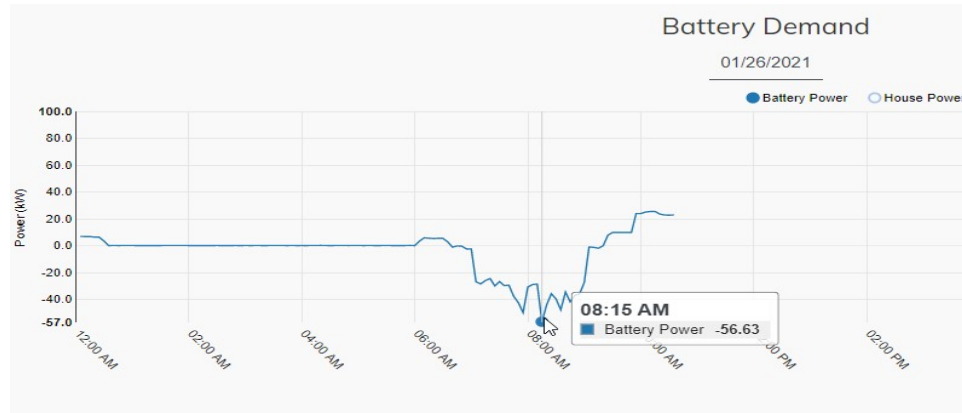


Figure 1

PGE has continued to dispatch the battery fleet alongside PGE's other demand response resources for weather related grid needs, including the unprecedented heat dome that occurred in June of 2021. The dispatch signal was revised and refined to be able to generate a smooth energy curve and provide a better customer experience. The total contribution of the battery fleet to PGE's grid since inception of the project is about 1 MW.

In addition to performing traditional demand response for generation capacity purposes, the PGE team has been methodically working through the other grid services outlined in the UM 1856 filing. Notably, PGE successfully demonstrated that residential customer batteries can perform fast frequency response, which the project team had not thought possible during development of the pilot. While thus far only tested with one PGE-owned test battery, the capability is a promising new value stream. Since fast frequency response is dispatched in response to a major grid disruption that cannot easily be tested PGE has reached out to Portland State University's power lab to coordinate for access to a grid simulator to perform further testing.

Looking into 2022 and beyond, the Grid Edge team will continue to work with PGE's software vendor Virtual Peaker on integration upgrades that will enable additional grid services like Volt/VAR and autonomous frequency response. Other software enhancements PGE would like to pursue include relative dispatch of the devices (currently PGE can only dispatch in absolute terms- for example, the desire would be able to ask for 50% of the available capacity, versus currently we could only ask for 2.5 kW from each customer); and updating the software to enable the batteries to continue to charge from solar power while on Standby mode.

PGE has also contracted with a third-party vendor to complete a data collection and performance analysis plan, and PGE looks forward to implementing this dispatch plan to ensure that relevant data and information is generated to be evaluated upon conclusion of the Pilot. Further work will also be done to standardize the onboarding process of new customers and the exercises that each

new customer will go through to ensure customers are receiving the correct monthly incentive and the functionality of their device.

Energy Storage Modeling Capability

On January 1, 2021, the Electric Power Research Institute (EPRI) completed its valuations of our 3 PGE-sided BESS projects (Baldock Mid-Feeder Project, Coffee Creek Substation Project, and Port Westward 2 Project) under UM 1856, with reports in the form of PowerPoint presentations. These valuations took into account locational operating restrictions or use cases and ran an evaluation of the stacked benefits of energy storage under those conditions using their StorageVET software. Through this process, it became clear that BESS projects have the highest value as generation capacity resources. There is also potential value in providing frequency regulation and Energy Imbalance Market (EIM) participation. Further, as expected, prioritizing locational use cases or restrictions has an impact on the overall quantifiable benefits of the system but may confer other benefits which are harder to quantify in dollar value, such as incremental decarbonization.

Please direct any questions regarding this filing to Chris Pleasant at (503) 464-2555. Please direct all formal correspondence and requests to the following email address pge.opuc.filings@pgn.com

Sincerely,

\s\ Robert Macfarlane

Robert Macfarlane
Manager, Pricing & Tariffs

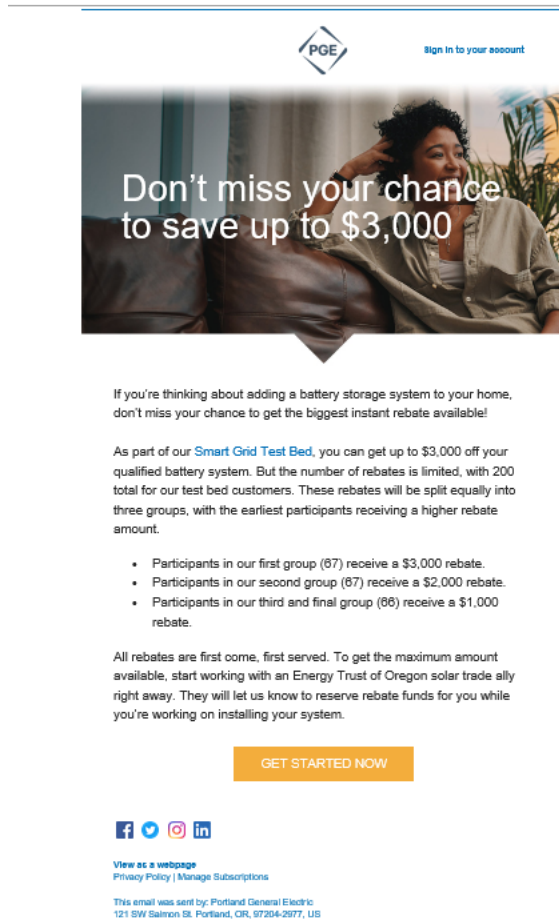
cc: UM 1856 Service List

Smart Battery Pilot-Marketing Materials


Image No. 1 Postcard sent to Solar/Battery targets

Image No. 2 Communication sent to Solar Customer.

Image No. 3 Communication sent via email to 40,310 residents in the Smart Grid Test Bed



The image shows an email layout for a PGE rebate offer. At the top left is the PGE logo, and to its right is a link to "Sign in to your account". Below this is a large image of a woman sitting on a couch, with the text "Don't miss your chance to save up to \$3,000" overlaid. To the right of the image is a large, faint letter "I". Below the image is a paragraph of introductory text, followed by a paragraph explaining the rebate details. This is followed by a bulleted list of rebate amounts for three groups. Below the list is another paragraph of text. At the bottom of the main content area is an orange button that says "GET STARTED NOW". Below the button are social media icons for Facebook, Twitter, Instagram, and LinkedIn. At the very bottom, there are links for "View as a webpage", "Privacy Policy", and "Manage Subscriptions", followed by a small footer address: "This email was sent by: Portland General Electric, 121 SW Salmon St. Portland, OR, 97204-2977, US".

 [Sign in to your account](#)

Don't miss your chance to save up to \$3,000





If you're thinking about adding a battery storage system to your home, don't miss your chance to get the biggest instant rebate available!

As part of our [Smart Grid Test Bed](#), you can get up to \$3,000 off your qualified battery system. But the number of rebates is limited, with 200 total for our test bed customers. These rebates will be split equally into three groups, with the earliest participants receiving a higher rebate amount.

- Participants in our first group (87) receive a \$3,000 rebate.
- Participants in our second group (87) receive a \$2,000 rebate.
- Participants in our third and final group (86) receive a \$1,000 rebate.

All rebates are first come, first served. To get the maximum amount available, start working with an Energy Trust of Oregon solar trade ally right away. They will let us know to reserve rebate funds for you while you're working on installing your system.

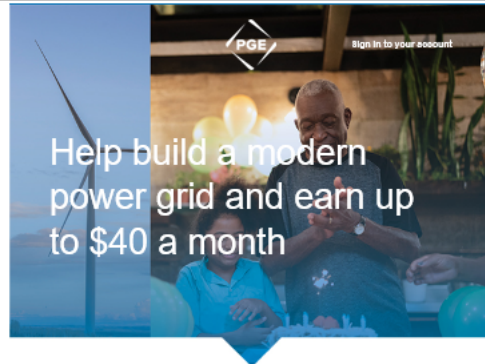
[GET STARTED NOW](#)

[View as a webpage](#)
[Privacy Policy](#) | [Manage Subscriptions](#)

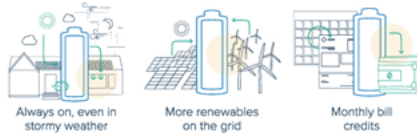
This email was sent by: Portland General Electric
121 SW Salmon St. Portland, OR, 97204-2977, US

Image No. 4 Communication sent via email to customers with batteries recently installed and expressed interest in the pilot.



As the owner of solar panels and a home battery storage system, you're already helping lead the way toward Oregon's clean energy future. Now you can get even more out of your system by joining the PGE Smart Battery Pilot.

Connect your battery to PGE and help us store renewable power from the grid for when it's needed. You'll be part of a modern grid that's cleaner, cheaper and more responsive.



By letting us store and use energy in your battery, you'll be helping keep costs low for everyone. We'll make sure you always have backup power in the event of an emergency or outage, and you'll earn \$20 to \$40 a month as a credit on your bill.

Signing up is easy

Just click on the Enroll Now button below and give us a little information about your battery. After we receive your information, we'll contact you to schedule a quick safety verification. Once the battery has been verified, you'll begin receiving your bill credit each month.

Thank you for helping us shape Oregon's clean energy future — we need you!

ENROLL NOW

[Want to know more?](#)

Smart Battery Website.

All of the information about the program can be found on our website www.portlandgeneral.com/smartbattery. This website was designed to provide information about the benefits of owning a Storage System, whether it is paired with a solar system or not, details about the Smart Grid Test Bed incentives, and the on-bill rewards available in all PGE's territory. The site also has a link to direct customers to the Energy Trust of Oregon website for customers interested in buying a StorageSystem to submit a request to receive a bid from any of the trade allies working with Energy Trust of Oregon.

Image No 5 PGE Smart Battery Website.

portlandgeneral.com/about/who-we-are/innovative-energy/smart-battery-pilot

Apps | Scheduling | Tools | Learning | Reading list

Join the PGE Smart Battery Pilot

Help build Oregon's clean energy future and earn cash rewards

Home > About > ... > Smart Battery Pilot

What can a battery storage system do for you? You might be surprised.

- You can rely on back-up power if there's an outage.
- You can earn monthly credits as part of the PGE Smart Battery Pilot program.
- You'll get the most of your solar panels.
 - A battery lets you store the energy you generate during the day.
 - You can then use that renewable energy at night.

Right now, it's more affordable than ever to add a battery to your home. For a limited time, PGE is offering instant rebates of up to \$3,000 for customers in our Smart Grid Test Bed, or \$5,000 for customers participating in Solar Within Reach.

Interested? Start by asking for a quote from an [Energy Trust of Oregon solar trade ally](#). It takes just a few minutes.

[Request a quote](#)

Always on, even in stormy weather

More renewables on the grid

Monthly bill credits

Feedback

Image No. 6 Hyperlink to Energy Trust of Oregon.

How the pilot works

- If you already have a battery energy storage system
- If you don't have battery storage
- Qualifying battery storage systems

Get cash

You'll earn cash rewards for participating in the program:

- Earn \$20 a month if your battery can only charge from your solar system. Earn \$40 a month if your battery can charge from the PGE system and/or your solar.
- Up to 200 Smart Grid Test Bed customers will also receive an instant rebate of \$1,000 to \$3,000 toward the cost of installing a battery.* [Learn more.](#)
- Up to 25 income-qualified customers will receive a \$5,000 instant rebate toward the cost of installing a battery energy storage system when also participating in the Energy Trust's Solar Within Reach program.*

Have a battery? Email us

Need a battery? Get started!

[Hyperlink to Energy Trust of Oregon](#)

Feedback

Image No. 7 Energy Trust of Oregon form to request a purchase and installation bid of a Storage System



Battery Pilot

You are taking the first step to participating in the [Portland General Electric \(PGE\) Smart Battery Pilot](#)! Energy Trust is working with PGE to connect you with a network of licensed and insured solar trade ally contractors experienced with the design and installation of both solar and home battery systems. In order to participate in the Smart Battery Pilot you must work with an approved solar trade ally, however you are not required to install solar. The trade ally contractors can provide you a bid to install a solar plus home battery storage system, add a home battery to an existing solar installation or install a standalone home battery without solar. Once you complete and submit this form, Energy Trust will match you with qualified solar trade ally contractors in your area based on the information you provided for you to choose from. The trade allies will:

- Assess the potential of your rooftop or property for solar power, if you are interested in pursuing a [solar + home battery storage installation](#)
- Provide a customized bid with estimated incentives, tax credits, and utility cost savings so you can see the net costs for your system
- Answer any questions you have about incentives and tax credits, equipment and installation, operation and maintenance

Let's get started!

This proposal is for my *

Home