

Chapter 5.

Resilience: managing disruptive events



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“If we can come up with innovations and train young people to take on new jobs, and if we can switch to clean energy, I think we have the capacity to build this world not dependent on fossil fuel. I think it will happen, and it won’t destroy the economy.”

— Kofi Annan, former Secretary-General of the United Nations

5.1 Reader’s guide

PGE’s Distribution System Plan (DSP) takes the first step toward outlining and developing a 21st century community-centered distribution system. This system primarily uses distributed energy resources (DERs) to accelerate decarbonization and electrification and provide direct benefits to communities, especially environmental justice (EJ) communities.⁹¹ It’s designed to improve safety and reliability, ensure resilience and security and apply an equity lens when considering fair and reasonable costs.

This chapter describes the activities, planned or in-flight, and how PGE’s human-centered vision of the distribution system can provide safe, secure, reliable and resilient power, at fair and reasonable costs. It also describes PGE’s resilience efforts and the investments needed to anticipate, adapt to, withstand and quickly recover from disruptive events. Shifts in the climate, as well as a shift toward electrification, put a spotlight on the importance of resilience, especially measures that are closer to the customer. PGE is leveraging new technology and building new relationships with customers and municipalities. These investments not only enable a stronger, more resilient infrastructure, but ties to communities also enable an accelerated, robust response to the challenges PGE and customers face together. **Table 25** illustrates

how PGE has met the Public Utility Commission of Oregon’s (Commission or OPUC) DSP guidelines under Docket UM 2005, Order 20-485.⁹²

WHAT WE WILL COVER IN THIS CHAPTER

Why it’s important to maintain a resilient grid and the current challenges in doing so

New approaches to building resilience, both on the customer side and the utility side

How PGE is strengthening resilience throughout the distribution system

For more details on how PGE has complied with the requirements under UM 2005, Order 20-485, see **Appendix A. DSP plan guidelines compliance checklist.**

91. PGE uses the definition of environmental justice communities under Oregon House Bill 2021, available at oregonlegislature.gov

92. OPUC UM 2005, Order 20-485 was issued on December 23, 2020, available at apps.puc.state.or.us

Table 25. Resilience: guideline mapping

DSP guidelines	Chapter section
4.4.b.i	Section 5.3, 5.4, 5.5
4.4.b.ii	Section 5.3, 5.4, 5.5
4.4.b.vi	Sections 5.3, 5.4, 5.5
4.4.d	Sections 5.3, 5.4, 5.5
5.2	Sections 5.3, 5.4, 5.5
5.3	Sections 5.3, 5.4, 5.5

5.2 Introduction

Through Order 20-485, the OPUC required investor-owned utilities (IOUs) to provide a list of planned investments that advance the vision of the company. PGE is also required to identify key opportunities for distribution system investments that provide benefits to customers.

Resilience is top of mind for PGE as climate change and extreme weather present new challenges. The largest ice storm in 40 years caused unprecedented power outages just in the past year, and the Bootleg wildfire partially severed Oregon’s transmission of power to and from California.

If Oregon is going to achieve its decarbonization and vehicle electrification goals, Oregonians must be able to depend on the electrical infrastructure when it is most needed. Because of this, PGE has established the Resilience Accelerated Response Coordination (Resilience ARC) initiative, which brings together leaders and teams from across the company to improve PGE’s ability to meet customer and community expectations for resilient power delivery. This initiative has three areas of focus:

- **Customer infrastructure resilience:** investigation into customer-sited solutions, such as microgrids, batteries and other DERs, that enable customers to mitigate the effects of outage events and, during normal conditions, provide services to the grid
- **PGE infrastructure resilience:** investment in infrastructure, such as grid hardening, integrated grid technologies and energy supply hardening, that mitigate the occurrence of outages during disruptive events such as wildfires and wind or ice storms
- **Operational resilience:** improvements in PGE’s ability to meet customers’ needs during disruptive events and accelerate the restoration of service through emergency preparedness, outage response and customer support

5.3 Customer infrastructure resilience

PGE has several planned and active initiatives that serve to create or enable more resilient customer infrastructure. The following descriptions provide examples of the activities PGE is planning or undertaking to enable customers to mitigate the effects of disruptive events and get access to the services they need.

5.3.1 COMMUNITY RESOURCE CENTERS

As Oregon grapples with wildfires, extreme and erratic weather and the potential of a large-scale earthquake, communities and municipalities must ensure that clean water is available, emergency services are able to function and citizens have a safe place to cool off or warm up, reach loved ones and power critical equipment. PGE will investigate the best way to partner with municipalities on resilience solutions for critical infrastructure, as well as the optimal solution for public community resilience centers. These centers could be used for PGE's areas at risk of a Public Safety Power Shutoff (PSPS) or, in the case of seismically sound structures, could act as a gathering site in the event of a large-scale earthquake.

5.3.2 BATTERY ENERGY STORAGE

Battery energy storage plays an important role in PGE's clean energy future, as well as in helping customers meet their resilience goals.⁹³ Because of this intersection in use cases, a Resilience and Energy Storage Products team was created in early 2021 to consolidate work being done across the company on customer solutions.

PGE's residential storage pilot — the PGE Smart Battery Pilot — helps customers afford whole-home back-up power through on-bill rewards and includes upfront incentives for select customers. In turn, PGE may dispatch the batteries for grid services. This not only increases the resilience of our customers, but also lays the groundwork for expanding our energy storage capabilities across the service territory.

We will continue to watch the evolution of energy storage technology and continue to innovate and partner with customers to meet their resilience and clean energy goals. This might mean developing innovative ways to help customers afford home energy storage, such as financing options for interconnected devices, or enhanced resilience options on the distribution side that can pair energy storage as a grid resource, such as a neighborhood-level microgrid.

5.3.3 MICROGRIDS

Power outages from the recent ice storm hit PGE's non-residential customers hard during an already challenging economic climate. Commercial and industrial customers are asking how PGE can provide them with solutions to prevent the loss of inventory, keep patients safe and allow them to remain open when their customers may most need them — during a power outage.

Some solutions we are exploring include siting custom-engineered microgrids at customer locations that can provide resilience to the customer and flexible load to the utility.⁹⁴ In this concept, PGE and the customer would share the costs and benefits, with PGE paying for the cost-effective portion of the resource and the customer paying for their share over time.

93. For more information about PGE's work with batteries, docket UM1856, available at apps.puc.state.or.us

94. Learn more about PGE's work with Beaverton to establish the Beaverton Public Safety Center, available at microgridknowledge.com

5.3.4 ENERGY PARTNER PILOT

The Energy Partner Pilot is investigating revisions to allow commercial and industrial customers to be appropriately compensated for integrating their energy storage resources with PGE.⁹⁵ With the advent of advanced energy technologies, customer-owned equipment can now provide a variety of grid services, such as contingency reserve, frequency response and renewable power integration, all of which contribute to a more resilient grid while addressing customer needs.

5.3.5 TRANSPORTATION ELECTRIFICATION

PGE has been watching the emerging market of electric vehicles that have the capability to provide backup power to a home or facility in the event of an outage. Transformational solutions like grid-connected heavy-duty fleet charging (which pairs energy storage with vehicle charging) are able to provide back-up power to facilities. We are investigating the ability for fleet vehicle owners to be credited for energy put back onto the grid when they do not qualify for traditional net metering. School bus fleet operators in particular are hoping to find additional revenue streams to help pay for the more expensive electric busses through Time of Use bill management.

5.4 PGE infrastructure resilience

PGE has several planned and active initiatives to strengthen infrastructure by mitigating the occurrence of outages during disruptive events such as wildfires and wind or ice storms. The following descriptions provide examples of the activities PGE is planning or undertaking to harden the grid against outage events.

5.4.1 WILDFIRE RISK ASSESSMENT AND MODELING

PGE has developed a model based on its asset management methodology to assess wildfire risk due to PGE equipment and proximity to vegetation. Additional improvements in 2021 will allow us to assess risk closer to real-time with current meteorological conditions to assist in making PSPS decisions.

5.4.2 SITUATIONAL AWARENESS

There are multiple projects underway to enhance situational awareness on the transmission and distribution grid and in PGE's service territory.

- Permanent weather stations: Construction of an additional 23 weather stations, in addition to the two active stations on Mt. Hood, is commencing in 2021. These stations will enhance PGE's awareness of weather conditions during extreme weather events in high-risk wildfire areas.
- Early fault detection system (EFD): An EFD system will be constructed and deployed on all feeders in the Mt. Hood PSPS area in 2021. This system will monitor distribution lines and alert PGE of possible failure modes, which then can be addressed before a fault event occurs. The system will be in the pilot stage in 2021.
- Smart faulted circuit indicators (sFCIs): Deployment of sFCIs on feeders in high-risk wildfire areas will enhance PGE's ability to quickly locate a failure on the distribution system to isolate and restore customers' power faster. This is especially important in high-risk wildfire areas during the wildfire season.

95. For more information on PGE's Energy Partner activities, docket UM1514, available at apps.puc.state.or.us

- Intelligent reclosers: Additional smart reclosers will be deployed in the high-risk wildfire areas and on other feeders in the service territory. These reclosers provide for automatic switching schemes to quickly segment and restore power. In addition, they will improve our ability to deploy better system protection routines and feed system status to distribution system operations teams through supervisory control and data acquisition (SCADA) connections.

5.4.3 DESIGN AND CONSTRUCTION STANDARDS

Robust design and construction standards are an essential part of ensuring the resilient operations of the electric grid now and into the future. Given recent extreme events, several efforts are underway to provide the confirmation and confidence that the standards PGE has today will position the company to meet its long-term goals. Specifically, design criteria are being reviewed to ensure the weather events we design for today align with forward-looking climate models. That effort will drive a review and future updates to construction standards, ensuring that the construction materials specified meet performance criteria. By ensuring PGE understands the changing weather patterns, we can ensure that facilities are built to withstand future disruptive events.

5.4.4 INSPECTION AND MAINTENANCE PLANS

PGE maintains a Facilities Inspection and Treatment to the National Electrical Safety Code (FITNES) program that is designed to satisfy Oregon’s Chapter 860, Division 024 Safety Standards. The program involves a detailed inspection of approximately 10% of PGE’s overhead facilities per year, with an overall objective of inspecting 100% of the facilities every 10 years. The program includes a detailed visual inspection of structure and support systems (e.g., poles, crossarms, insulators, guys and anchors), grounding and conductor clearances. The detailed inspection also includes testing to assess the condition of wood poles and the application of wood preservatives. Poles that are found to have inadequate height or remaining strength are replaced. The FITNES program operates year-round.

5.4.5 MT. HOOD IMPROVEMENTS

The goals of this project are to increase reliability and reduce outages for PGE customers in the Mt. Hood corridor to keep life-critical services available to the general population.

Mt. Hood is an area where PGE customers face many outages from storms, wildfires and PSPS. This project will work to move transmission and distribution lines from overhead to underground and increase redundancy in PGE’s system to prevent many of these outages. This project also will increase reliability in the distribution system for critical customers in the vicinity, such as medical centers, water treatment facilities, fire departments, ranger stations and grocery stores.

5.4.6 TELECOMM RISK AND SINGLE POINTS OF FAILURE

The goal of this effort is to develop a quantitative framework for capturing known vulnerabilities to the telecom transport network and using subject matter expertise to validate the risks and consequences. This information will be translated into business cases that support the articulation and prioritization of investments in PGE’s telecom network.

5.4.7 ADVANCED METERING INFRASTRUCTURE (AMI) RESILIENCE IMPROVEMENTS

Initially intended to support automated meter reading, AMI can now provide resilience for customers and communities as an additional, critical function. The improvements planned by this initiative will ensure the infrastructure supporting AMI data’s resilience is upgraded to mission-critical versus the current state.

5.5 Operational resilience

PGE has several planned and active initiatives to accelerate and improve the response to outages during disruptive events such as wildfires and wind or ice storms. The following descriptions provide examples of the activities we are planning or undertaking to enhance outage response.

5.5.1 END-TO-END ASSESSMENT PROCESS

This effort aims to ensure accurate descriptions of the extent of impacts from an incident early enough and consistently throughout an event to allow customers and communities to make key decisions.

Personnel will perform damage assessment activities and will merge assessment outputs into the overall outage response command, control and information systems of the incident management structure. This consolidated, holistic assessment allows us to better understand the material, personnel and equipment needed early in the storm, which in turn accelerates outage modeling and speeds up the development of estimated restoration times for customers.

5.5.2 OUTAGE MANAGEMENT PLANNING AND PREPARATION

Recent ice storm and wildfire events have required PGE to exercise its full complement of outage management and response capabilities. Lessons learned during these events have provided improvement opportunities. A few examples of include:

- Aligning outage management plans that are maintained within each organization
- Clarifying roles, responsibilities and terminology among those plans
- Ensuring that all PGE staff are familiar with these planning materials

This will promote collaborative planning and training and exercise participation within the operational levels of the organization.

5.5.3 STAGING SITE OPERATIONAL PLAN

The size and scope of these events exposed the challenges of not having a mobile command post and associated resilient communication capabilities in the field, as some locations were affected by communication outages. Based on review of the existing staging site operational plans, PGE is creating a prioritized list of enhancements that will increase logistical and operational support capabilities for wildfires, large storms and earthquakes. For example, company-owned sites such as the Rodeo Grounds will be improved to handle restoration activities of up to 100 mutual assistance crews.

5.5.4 COMMUNITY ENGAGEMENT AND PUBLIC INFORMATION TOOLS

This effort focuses on the development of a set of essential elements of information and intelligence products (such as dashboards and online maps) that meet customer needs for actionable information and ensure the corporate incident management team (CIMT) is aware of expectations. PGE is working with local governments and organizations to identify communication needs and develop a means to engage impacted customers directly. This includes direct notifications across multiple channels, including SMS, phone and email.

5.5.5 WIRE-DOWN, WIRE-WATCHER AND DAMAGE ASSESSMENT PROGRAM

The goal of this project is to enhance the wire-down/wire-watcher program in coordination with damage assessment program improvements, expanding capacity and capabilities and providing a broader group of PGE employees the ability to participate. This will ensure that the wire-down program relies on non-line department resources to staff the program, rather than resources that could otherwise perform assessment and restoration work.

5.5.6 PARTNERSHIPS

Significant outage events present the need to engage resources external to PGE, such as local governments and third-party restoration crews. This effort will promote collaborative planning and training and exercise participation within the operational levels of these disparate organizations. PGE will formalize agreements, establish interoperable information-sharing mechanisms among emergency management agencies, and establish public/private sector operating agreements. These agreements will define clear expectations between what PGE does and what the emergency management community does to inform customers and alleviate impacts during an outage.

5.5.7 CRITICAL MATERIALS AND SERVICE PROVIDER REQUIREMENTS

Large outage events often result in the rapid depletion of materials on hand. This effort focuses on ensuring PGE's materials and supply chain are equipped to handle a surge in demand. It includes activities such as defining storm response and business continuity requirements for all critical material and service contracts, documenting contingency tactics to set up service providers for extended or expanded services, and having vendors stock up facility supplies beyond normal levels ahead of a storm.