Distribution System Plan

Part 2

AUGUST 15, 2022

Contents

Tables

Figures

Acronyms

AAC	All Aluminum Conductor
ACS	US Census American Community Survey
ACSR	Aluminum Conductor Steel-reinforced
ACT	Advanced Clean Trucks
ADMS	Advanced Distribution Management System
AdopDER	Distributed Energy Resources Forecasting Tool
ADPS	Advanced Distribution Planning System
AMI	Automated Metering Infrastructure
AMP	Asset Management Planning
ANSI	American National Standards Institute
API	Application Program Interface
ASTM	American Society for Testing and Materials
AVERT	Avoided Emissions and Generation Tool
AWG	American Wire Gauge
AWOs	Accounting Work Orders
AWRR	Advanced Wildfire Risk Reduction
B/C	Benefit-Cost Analysis
BC	Business Continuity
BCA	Benefit-Cost Analysis
BCEM	Business Continuity and Emergency Management
BES	Bulk Electric System
BESS	Battery Energy Supply System
BOD	Board of Directors
BSG	Business Sponsor Group
BTM	Behind the Meter
C&I	Commercial and Industrial
CBIAG	Community Benefit and Impact Advisory Group
CBO	Community-Based Organization
CE	Cost-effectiveness
CELID	Customer Experiencing Long Interruption Durations
CEMI	Customers Experiencing Multiple Interruptions
CEP	Clean Energy Plan
CI	Customer Interrupted
CIMT	Corporate Incident Management Team
CMI	Customer Minutes Interrupted
CPS	Capital Project Sponsor
CRG	Capital Review Group
CRIP	Customer Reliability Improvement Program
CVR	Conservation Voltage Reduction
CYME	Power Flow Modeling Software
DA	Distribution Automation
DEI	Diversity, Equity, and Inclusion
DEQ	Department of Environmental Quality
DER	Distributed Energy Resource
DERMS	Distributed Energy Resource Management System
DG	Distributed Generation
DHP	Ductless Heat Pump
DNP 3.0	Distributed Network Protocol 3.0
DOE	Department of Energy
DPSST	Department of Public Safety Standards and Training
DR	Demand Response
DRMS	Demand Response Management System
DSG	Dispatchable Standby Generation
DSMS	Demand Side Management System
DSP	Distribution System Plan
DSPx	Next Generation Distribution System Platform
EAHUrisk	Expected Annual Relative Housing Unit Risk
EE	Energy Efficiency
EJ	Environmental Justice
EMS	Energy Management System
EO	Executive Order
EPA	Environmental Protection Agency
EPRI	Electric Power Resource Institute
ESG	Environmental, Social and Governance
ETO	Energy Trust of Oregon
EV	Electric Vehicle
EVSE	Electric Vehicle Supply Equipment

Acronyms (continued)

FAN	Field Area Network
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Map
FLISR	Fault Location, Isolation, and Service Restoration
FP	Funding Project
FPL	Federal Poverty Line
FTM	Front-of-the-meter
GARE	Government Alliance on Race and Equity
GEB	Grid-Interactive Efficient Building
GEM	Greenlink Equity Map
GHG	Greenhouse Gas
GIS	Geographic Information System
GMS	Grid Management Systems
G-T&D PMO	Generation, Transmission & Distribution Project Management Office
GTB	Grow the Business
HB	House Bill
HCA	Hosting Capacity Analysis
HEMS	Home Energy Management System
HRFZs	High-Rise Fire Zones
HVAC	Heating, Ventilation, and Air Conditioning
ICEA	Insulated Cable Engineers Association
IDP	Integrated Distribution Planning
IEC	International Electrotechnical Commission
IEEE	Institute of Electrical and Electronics Engineers
IMT	Incident Management Team
IOC	Integrated Operations Center
IOUs	Investor-Owned Utilities
IPT	Integrated Planning Tool
IREC	Interstate Renewable Energy Council
IRP	Integrated Resource Plan
ISO	Independent System Operators
IT	Information Technology
IVR	Interactive Voice Response
kW	Kilowatt
L2	Level 2 EV Charging
LBNL	Lawrence Berkeley National Laboratory
LBNR	Loading Beyond Nameplate Ratings
LCOO	Lifecycle Cost of Ownership
LDV	Light-duty Vehicle
LEAD	Low-Income Energy Affordability Data
LTC	Load Tap Charging
MDHDV	Medium- and Heavy-duty Vehicles
MDM	Meter Data Management
MFH	Multifamily Housing
MLA	Minimum Load Agreement
MV90	Meter Interval Data Acquisition System
MVA	Mega-Volt Amp
MVAR	Mega Volt-Amp Reactive
MW	Megawatt
MWh	Megawatt-hour
MYP	Multi-Year Plan
NAICS	North America Industrial Classification System
NAN	Neighborhood Area Network
NEBs	Non-Energy Benefits
NERC	North American Electric Reliability Corporation
NFHL	National Flood Hazard Layer
NPV	Net Present Value
NREL	National Renewable Energy Lab
NT	Near-Term
NTR	Near-Term Asset Risk
NWA	Non-Wire Alternatives
NWS	Non-Wire Solutions
O&M	Operation and Maintenance
ODEQ	Oregon Department of Environmental Quality
OMS	Outage Management System
Ops	Operations
OPUC	Oregon Public Utilities Commission

Acronyms (continued)

PF	Power Factor
PI Data Historian	Software for tracking SCADA measurements
PMO	Project Management Organization
PPE	Personal Protective Equipment
PSPS	Public Safety Power Shutoff
PUC	Public Utilities Commission
PUMS	Public-Use Microdata Sample
PV	Photovoltaic
R&D	Research and Development
RBA	Results Based Accountability
RD Meter	Remote Disconnect Meter
RFP	Request for Proposal
RUCA	Rural-Urban Commuting Area
SAIDI	System Average Interruption Duration Index
SAIFI	System Average Interruption Frequency Index
SAM	Strategic Asset management
SB	Senate Bill
SCADA	Supervisory Control and Data Acquisition
sFCI	smart Faulted Circuit Indicator
SGIP	Self-Generation Incentive Program
SGTB	Smart Grid Test Bed
SME	Subject Matter Expert
SSPC	Salem Smart Power Center
STB	Sustain the Business
T&D	Transmission & Distribution
TE	Transportation Electrification
TEINA	Transportation Electrification Infrastructure Needs Assessment
TEP	Transportation Electrification Plan
TRC	Total Resource Cost Test
TSO	Transmission System Operator
TWG	Technical Working Group
UST	Underground Storage Tanks
V	Volts
V2G	Vehicle-to-Grid
VOS	Value of Service
VPP	Virtual Power Plant
VVO	Volt/VAR Optimization
WCCTC	West Coast Clean Transit Corridor
WTC	World Trade Center
WVRP	Willamette Valley Resiliency Project
ZEV	Zero-Emission Vehicle

Executive summary

We applaud the leadership of the Public Utility Commission of Oregon (Commission or OPUC) in creating expectations for a human-centered planning approach to distribution system planning (DSP). Through Order 20-485, the DSP guidelines intend to "foster a developing process that supports a human-centered approach to DSP."

Our Empowered Communities strategic initiative promotes equitable participation in the clean energy transition. It is foundational to our new, human-centered approach and reflects the ideas and opinions of those who have participated in our community-based workshops and technical partnership workshops. During a DSP community engagement effort, we learned as new interested parties enter the energy space, expectations of us are changing. This means we need to evolve our practices and skills so that we show up in a way that aligns with our values and desired outcomes – to engage and serve all of our customers and communities.

This requires a learning mindset, which means we are curious and willing to listen and see things in different ways. It is not enough to simply gather the information; we must integrate new voices into our decision-making processes. This builds trust and enables meaningful collaboration. Engaging with our customers and communities in this way will help us move closer to our goal of an equitable energy future for all.

The OPUC's Order 20-245 required utilities to develop and file their initial DSP in two parts. On August 15, 2021, Portland General Electric Company (PGE) submitted our inaugural Distribution System Plan (DSP) Part 1 to the Public Utility Commission of Oregon (OPUC).

This submittal serves as PGE's second submittal (or DSP Part 2) and meets Staff's proposed, and Commission adopted DSP guidelines (found in Attachment 1 of Order No. 20-485).

We held 10 public workshops, including two community-led workshops led by three community-based organizations (CBOs) in the development of our DSP Part 1 and held an additional nine public workshops and four community-focused workshops facilitated by a CBO for DSP Part 2. In total, we conducted 23 total workshops between DSP Part 1 and Part 2.

Our Modernized Grid strategic initiative is critical to our vision of a 21st century community-centered distribution system and enables an optimized grid platform for a safe, secure, reliable system through current and future grid capabilities. It is a key element of the transformation and enablement of large-scale DER integration. Specifically, modernization will enable solar photovoltaic (PV) systems, storage capabilities and electric vehicles (EVs) to be integrated through DER programs. Modernizing the grid works to improve grid flexibility and asset utilization as well as reduces the need for long-term supply-side resources.

However, grid modernization is a complex undertaking requiring large investments focused on augmenting and improving the electrical grid. PGE is wary of the impact of these investments on customer prices. We will continue to take a pragmatic approach, balancing differing objectives. In this way, PGE can focus on investments that provide customer value once in service.

Our Resilience strategic initiative is an acknowledgement that climate change and a movement toward electrification, highlight the importance of a resilient energy ecosystem, especially regarding investments closer to the customer. We are leveraging emerging technology and building new relationships with customers and municipalities. These investments not only enable a stronger, more resilient infrastructure, but also enable an accelerated, robust response to the challenges that we and our customers face.

The past few years have brought profound changes to our daily lives, our society and our world. In Oregon we experienced historic heat and wildfires, ice and snowstorms, and increasing devastation from extreme weather. Changes to our climate are already resulting in widespread, rapid and intensifying observable impacts. Recent extreme weather events driven by changes to global systems affecting rainfall patterns and seasonal snow cover in the region have impacted our customers significantly, and the frequency and severity of these events is increasing. Throughout all this, customers deserve the peace of mind to know we are doing all we can to help keep the power on, especially during the hottest summer days and coldest winter nights.

Our Plug and Play strategic initiative is a key component of our connected electric system that gives customers a choice and a voice in the transformation of the grid. This interactive customer experience encompasses different aspects of the energy ecosystem – generation sources, electrical infrastructure, and customers – and connects them to each other through clean energy resources, technology, communications, data, services and products.

We are building a distribution system that provides more information to help manage energy bills and empowers everyone to make energy choices to support decarbonization. This includes providing seamless, equitable and affordable opportunities for rooftop solar, electric vehicle charging, home batteries, and home smart devices, along with building the people, process, and technology capabilities to meet growing demands, all while adapting to new challenges created by climate change. All of this is in service of creating a safer, more secure, reliable, resilient system and working environment.

WILLAMETTE VALLEY RESILIENCY PROJECT

PGE's sub-transmission (57 kV) and distribution system in the Willamette Valley is aging. Some of its unique equipment and assets have become non-standard or are nearing end-of-life; they weren't designed to withstand the ice storm of 2021. While PGE continues to maintain these assets to ensure reliability of the system, the increased demand from new load growth to severe weather events, has jeopardized an already fragile system. With these system improvements, we are supporting at least 50 MW of load growth for economic development in the valley, setting the foundation for adapting to future electrification of the I-5 corridor, reducing the impact of disruptive events, and providing for operational flexibility and compliance. The upgrades also will provide the infrastructure to bring more renewable generation resources onto the system, when needed.

Our Evolved Regulatory Framework strategic initiative aims to partner with the Commission and stakeholders to align our DSP with the current policy landscape and identify any downstream policy implications. The evolution of the DSP may require new rules and regulations to support its success. This evolution of rules and regulation is a key component to enable the goals of the DSP.

We are transforming the way we do business to support new policies, regulation, and community and customer demands. Our Evolved Regulatory Framework strategic initiative highlights the changes need to support investment in customer- and community- centered solutions. It seeks to identify and advance reforms to rules, regulations, and the regulated utility business model that streamline and enable the changes to distribution planning processes, investments and operations envisioned by the entire DSP effort.

PGE's strategy and vision

Our company's overall strategy to decarbonize, electrify, and perform supports our DSP's vision of a 21st century community-centered distribution system. Our DSP begins our journey of human-centered planning that advances environmental justice, promotes distribution energy resource (DER) adoption, maximizes grid benefits, and furthers decarbonization through DER programs, non-wires solutions (NWS), virtual power plants (VPP), resiliency, and other mechanisms to strategically provide community benefits — for all customers, especially environmental justice communities — while improving metrics around safety, reliability, resiliency, and security. **Figure 1** highlights the goals of this vision and the strategic initiatives that will help realize this vision.

Figure 1. PGE's corporate strategy, and vision, goals and strategic initiatives for the DSP

Corporate strategy	Decarbonize		Electrify	Perform	
DSP vision	21st century community-centered distribution system				
DSP goals	Advance environmental justice goals		Accelerate DER adoption	Maximize grid benefits	
DSP strategic initiatives	Empowered communities	Modernized grid	Resilience	Plug and play	Evolved regulatory framework

PGE's future holistic planning vision

While most agree that the energy transformation underway should address the threats of climate change, its alignment with social and environmental justice goals is still in its infancy. Oregon has been at the forefront of working to address historical wrongs and breaking down existing systems that discriminate or exacerbate inequities in society. In recent years, several policies have paved the way to support the move forward on our vision for a clean energy future such as UM 2005.[1] New emerging policy and regulation, such as Oregon's House Bill 2021 and Oregon Department of Environmental Quality's Climate Protection Program, address decarbonization of the electric sector and have also begun to investigate how energy policy can address equity. Throughout the UM 2005 proceeding, we noted intersections between the goals of the DSP and current policies, rules, standards and other regulations.[2] These policies provide a view of the regulatory drivers for change. In our DSP, we identify downstream regulation that can align with these policies to enable the vision of the DSP.

On August 7, 2022, the US Senate passed the Inflation Reduction Act.[3] The bill is focused on addressing climate change through federal funding and by extending and expanding clean energy tax incentives (such as wind, solar and storage), as well as incentives for energy efficiency and transportation electrification. The bill contains credits for EV charging infrastructure, for

1. OPUC UM 2005, Order 20-485 was issued on December 23, 2020, available at: https://apps.puc.state.or.us/orders/2020ords/20-485.pdf
2. Oregon's 2021 HB 2021, available at: https://olis.oregonlegislature.gov/liz/2021R1/Measures/Overview/HB2021 and Oregon's Climate Protection Program can be found at: https://www.oregon.gov/deq/ghgp/cpp/Pages/default.aspx
3. Inflation Reduction Act one-page summary, available at: https://www.democrats.senate.gov/imo/media/doc/inflation_reduction_act_one_page_summary.pdf

purchasing new and used EVs, and energy efficiency investments for both residential and commercial buildings.

We embrace the challenge of leveraging the clean energy transformation to address environmental justice. We anticipate that the creation, filing, and acceptance of our initial plans will educate all parties and identify areas for continuing improvement for the DSP process. We expect the evolution of the DSP guidelines, alongside new policy, regulation, and federal funding, will advance distribution system planning and define how future investments are made and investment costs are recovered.

COORDINATION OF DSP BETWEEN IRP AND CEP

The introduction of the Clean Energy Plan (CEP) has forced a near-term conversation about where DSP should fit into the broader planning framework. What was previously a question of how the Integrated Resource Plan (IRP) and the DSP would successfully align inputs, outputs, and high-level assumptions, is now a conversation about how the DSP and IRP will feed into the CEP to convey a utility's overall decarbonization strategy. That strategy will need to address the following:

- Balance supply side and demand side investments to achieve decarbonization,
- Enable adoption of DERs such as solar, storage, EVs,
- Continue to support robust economic development in PGE's service territory, and
- Address aging infrastructure in the downtown core and older parts of the system.

All while maintaining reliability at fair and reasonable costs.

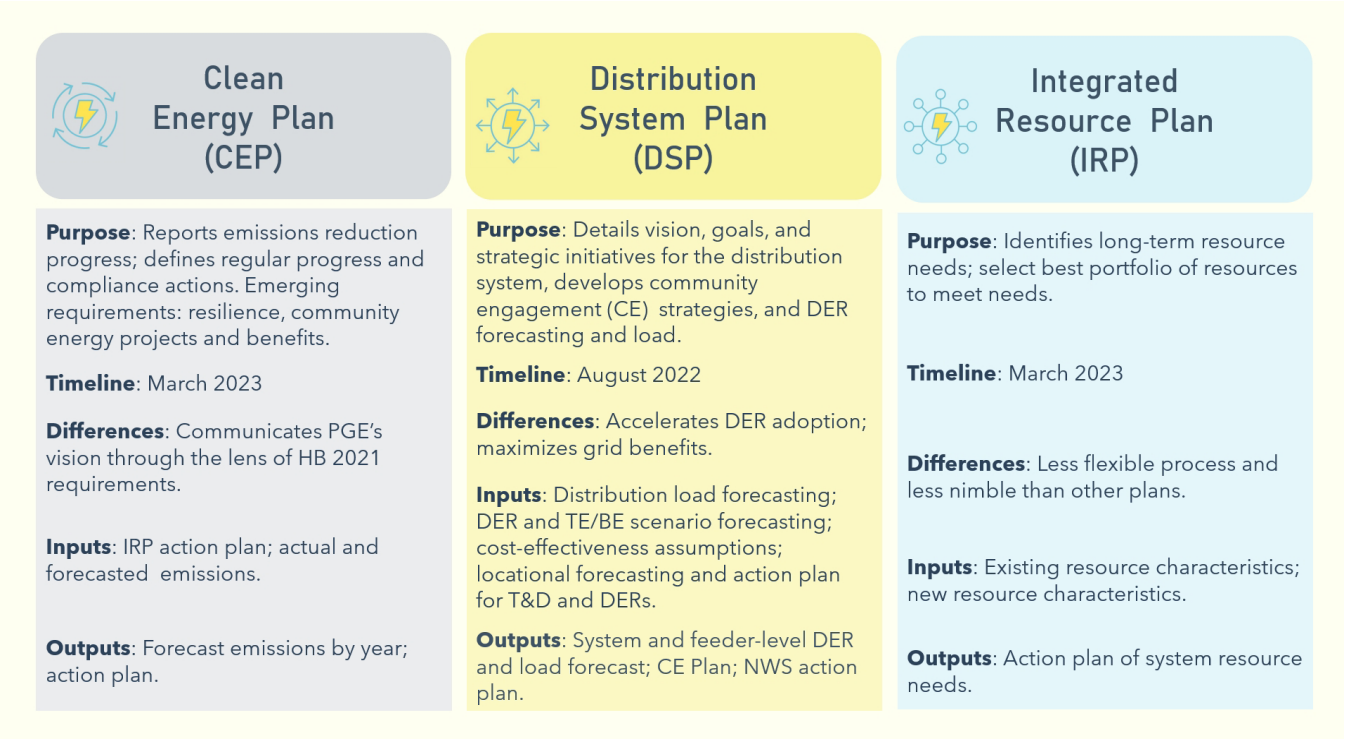
In DSP Part 2, we begin to advance our vision for the DSP to create a holistic, comprehensive, collaborative, and streamlined planning process that reports our decarbonization plans across the DSP, IRP, and CEP. This planning process shares our journey toward decarbonization in a clear and concise way and connects the dots for our regulators, policymakers, stakeholders, partners, and communities. While our vision of a holistic planning process aims to integrate workstreams alongside our corporate strategy to decarbonize, electrify, and perform, there is still much more work to be done.

We are working with the OPUC, partners, and interested parties to identify synergies between the three plans. As a starting point, we have incorporated the outputs from the DSP into the IRP, which will drive the creation and selection of future planning portfolios for DERs and electrification. Our IRP will incorporate available DER forecasts needed to assess system needs and solutions. These inputs will inform the IRP's selection of capacity expansion need, and ultimately will drive the creation of a preferred resource strategy and an action plan.

> House Bill 2021, creates an ambitious clean energy framework that requires us to decarbonize our retail electricity sales by 2040 in a manner that provides direct benefits to local communities, maintains a focus on reliable service, and a commitment to affordability and equitable outcomes. HB 2021 sets forth a robust set of requirements including annual goals/actions that demonstrate progress towards the clean energy targets.

The CEP may present the new findings from analytical planning processes through the lens of Oregon's rapidly changing and decarbonized energy future, with a focus on reliable, affordable, and equitable outcomes. Through the CEP, we are working to further clarify the timing and intersections between the DSP, IRP and CEP. A key focus will continue to be the improvement of opportunities for community engagement and accessibility, including coordination across dockets to reduce workload wherever possible. The result of these proceedings must meaningfully reflect stakeholder and community input. **Figure 2** illustrates the initial relationship we see between these planning processes. This relationship will evolve over time with the finalization of DSP and CEP guidelines from the OPUC, which we anticipate will happen in 2023.

Figure 2. Current relationship between planning documents



This new landscape requires thoughtful and ongoing discussion. At the time of this DSP filing, there are still many outstanding questions on how CEP requirements will impact existing DSP guidelines and which types of proactive investments should be made to the distribution system to accelerate the equitable implementation of a decarbonization future envisioned in HB 2021. The CEP will identify actions and investments not envisioned in our DSP or the OPUC's DSP initial guidelines. We look forward to working with the OPUC and partners to further develop and refine the DSP guidelines. Our intent is to present our DSP Part 2 at an OPUC Public Meeting between three to five months following this filing, and after a period of stakeholder feedback and OPUC staff review.

PGE's Distribution System Plan (DSP) summary and highlights

PGE is proud to submit Part 2 of our inaugural DSP for consideration by our customers, partners and the Commission. This DSP reinforces our ongoing commitment to the clean energy future and takes the steps to integrate environmental justice goals. We detail, in this plan, our actions for the distribution system and the role of the DSP in achieving it. We are committed to transitioning to a human-centered planning approach and believe the engagement process that contributed so heavily to this submission is evidence of that commitment.

Our customers are at the center of everything we do. In addition to addressing the OPUC's UM 2005 requirements, the 23 workshops we conducted created a community of DSP partners, committed to building a better understanding of both our work and our partners' needs and expectations. Our goal for the workshops was to start conversations that contributed to our DSP while also creating a platform for collaboration. **We thank the participants for continuing with us on this journey and are grateful for their partnership and insights.**

As OPUC Staff pointed out in the acceptance of our DSP Part 1, we "expect a great amount of learning will result from the Part 2 filings," including the following high-level lessons:

- How and where utilities are forecasting load growth, DER and EV adoption.
- How and where utilities identify areas of the distribution system which need investment.
- How utilities consider and evaluate various investments to address grid needs.
- How utilities have evaluated non-wires solutions pilot concept proposals.
- How utilities' community engagement plans were implemented.
- And finally, what investments utilities are planning in the next several years.

We are eager to continue working with our DSP partners and learn together as we take on the challenges presented by a 21st century energy ecosystem.

This report provides substantial transparency into our company and distribution system planning functions. To highlight some of the key aspects of our plan, we summarize below the main points in each chapter.

CHAPTER 1
DISTRIBUTION SYSTEM PLANNING OVERVIEW

The Distribution system planning overview chapter represents PGE's process to determine the distribution grid's ability to serve existing and future power demand. Our process includes meeting customer needs, enhancing safety, increasing reliability and resiliency, meeting new standards and requirements, reducing risk, and optimizing the configuration of the distribution system. We analyze the grid under both normal operating conditions and abnormal conditions that could arise during situations such as equipment failure. Our distribution planning is a cyclical process that includes DER/TE load forecasting and adoption, grid needs analysis and solution identification steps.

We review the current state of our system and evaluate near- and long-term projections for system loading conditions based on established guidelines. Our current guidelines are centered on project priority, long-term system adequacy, operational flexibility and ability to serve customers during weather extremes.

MAIN POINTS

- Discusses our existing and future distribution system adequacy analysis.
- Highlights our distribution grid analyzes during normal and abnormal conditions.
- Distribution system conditions in near- and long-term are evaluated based on established guidelines.

New technologies, including advanced system monitoring and control and lower-cost DERs, have allowed us to better understand what's happening inside the distribution system and has changed our approach to planning and operating the distribution grid. Our distribution system planning has historically been focused on the analysis of one-way power flow during current and future peak loading conditions. But with the rise in DERs, more complex and detailed power flow analysis will become increasingly necessary.

CHAPTER 2
EMPOWERED COMMUNITIES

The Empowered communities chapter represents PGE's efforts as an essential service provider to engage and understand where our customers live, work, learn, play as well as co-develop solutions that provide direct clean energy community benefits. To begin to understand all our customers and communities, we must leverage the work started in DSP Part 1 and integrate best practices into community outreach and engagement efforts across our organization. Doing so enables all of our teams to have a more complete understanding of our customers' and communities' needs; the community has a better understanding of our business; and we are all ready to develop solutions together.

The DSP has provided a platform for us to expand our community engagement efforts. Since its inception, there is increasing need for community outreach and engagement across our workstreams. Traditionally, We have conducted customer outreach, but legislation and regulation is calling for two-way communication and interaction. Community engagement requires the application of an equity lens and a commitment to iteration to so that we can be flexible and responsive to new learnings. We are in a continuous pattern of learning, iterating and engaging, while simultaneously working to operationalize equitable community engagement practices and strategies across our company. As we work to evolve our competency and capacity for this new work, we acknowledge that we need to learn and intend to be open and transparent in our engagement with community partners and other interested parties.

MAIN POINTS

- In response to our evolving needs around community engagement, PGE is developing a portfolio-based program approach to how we conduct community outreach and community engagement across our organization.
- Community engagement requires a commitment to an iterative approach in how it is conducted and competency in who conducts it.
- We continue to learn from community partners on how to best show up for and engage EJ communities and those that serve and advocate for them.

For DSP Part 2, we honored our three focus areas from Part 1's Community Engagement Plan. These focus areas include competency in community engagement practices and operationalizing equity, activation of CBOs and making better use of demographic data. In each of these focus areas, we reflect on our goals and objectives previously identified and outline the actions that PGE has taken since DSP Part 1.

CHAPTER 3
LOAD AND DER FORECASTING

The Load and DER forecasting chapter represents PGE's current state of our distribution system needs assessments, which are informed by three key input streams: the corporate load forecast, bottom-up load additions and historic seasonal peak load trends at the locational level.

We forecast a significant increase in electrification from transportation and buildings, and with it, opportunities to offset localized capacity constraints with a growing mix of flexible loads and distributed renewable energy technologies like solar and battery storage. This load and the subsequent adoption will grow significantly beyond 2030 and areas of the grid will likely see significant growth even sooner. Because of this, we are evolving our tools and processes around bottom-up load and DER forecasting which can provide useful information to planning and system operations so we can prepare our grid for these new loads come.

For the first time in 2022, we completed a granular, feeder-level forecast for DER adoption through 2050. Our DER and transportation electrification (TE) forecasting and adoption model, AdopDER, is a new planning tool that combines detailed accounting of our customer base, technology performance features and costs, and public policy drivers in order to forecast DER and TE load and adoption at the customer site-level. By combining top-down and bottom-up forecasting methods, we can better understand the potential impacts to our distribution system from a growing adoption of clean energy resources.

While we are improving our distribution system forecasting capabilities, we are also incorporating equity metrics and data to inform program planning and grid investments. We've integrated demographic, environmental justice and resiliency data into our AdopDER model to assess whether current programs and offerings lead to equitable outcomes, and where we can make improvements to better serve our communities.

MAIN POINTS

- Corporate load forecasting process and drivers
- Current bottom-up load forecasting methods
- DER forecasting methods
- DER forecasting results at the granular substation level

Increased adoption of DERs will, at some point, affect our system; we know we need to plan for these new loads and resources in order to be responsive to new customer requests, especially if they require significant system upgrades to accommodate our customers' climate and decarbonization goals such as fleet electrification. Our planning teams are now working with our TE team to provide greater insight into customer plans to electrify medium- and heavy-duty vehicles. We incorporated these insights into our workflow and have mapped likely hotspots of fleet electrification. We look forward to working with our partners as the regulatory framework continues to evolve to enable investments in the distribution grid to accelerate transportation electrification.

CHAPTER 4
GRID NEEDS ANALYSIS

The Grid needs analysis chapter represents PGE's analytical framework to plan and identify grid needs at the distribution system. This planning process is informed by key drivers such as load growth forecasts, economic development, new large single loads, grid modernization, regulatory requirements, safety, reliability performance of the system, urban growth boundary expansion, and zoning changes.

The DSP is tasked with identifying grid needs and prioritizing those grid needs for solution development. There are several metrics used to consider what these grid needs are and how to prioritize them.

We plan the distribution system to prevent equipment overloads when it is in normal configuration, as well as configurations during outage scenarios. During outage scenarios, we restore power using switching devices that move customer load to adjacent distribution equipment. We analyze equipment that is overloaded or is approaching overload levels in both a normal or an outage configuration.

Our forecasts for general load growth and new forecasts for DER adoption are two inputs we use to anticipate future load growth. In addition to forecasts, we analyze known large load additions coming from new or existing customers, which can also dictate the anticipated load growth on the distribution grid. These large load additions can come from our internal teams as well as external resources.

MAIN POINTS

- Showcases the analytical framework for identification of Grid Needs.
- How we assess risk within the distribution system.
- How grid needs are ranked and prioritized according to the Distribution Planning Ranking Matrix.
- Identifies 12 prioritized grid needs.

We utilize existing loading conditions, anticipated load growth, and risk and reliability assessments, which all feed into a scoring matrix called the Distribution Planning Ranking Matrix. In addition to these three main categories, we assign points to each grid need for addressing safety concerns, adhering to transmission system compliance issues, meeting customer commitments, and being a precursor to other grid needs projects. Our Distribution Planning Ranking Matrix prioritizes the distribution grid needs that will be the focus of solution development.

CHAPTER 5
SOLUTION IDENTIFICATION

The Solution identification chapter presents PGE's process to identify potential solutions that address system deficiencies. Our solution identification process is directly fed from the output of the grid needs analysis process. In the solution development process, we perform a system study that supports identification of potential project options.

Our study includes a problem statement, study methodology, analysis, project benefits, cost estimates and a recommended option. We utilize distribution load flow software to analyze distribution system options by modeling scenarios and running load flow simulations, which assist in determining a preferred option for a project.

Once options are identified, we conduct a benefit-cost analysis (BCA) that will produce a range of outputs used to analyze risk and economic costs associated with specific assets that are included in the solution. We then include the risks and economic costs associated with each asset in the scope of a project, which are aggregated to provide a project level assessment of risk, benefits, and cost.

MAIN POINTS

- System studies are performed to further understand and characterize the prioritized grid needs.
- A benefit-cost analysis is performed to evaluate proposed solutions.
- Recommended solutions are scored and ranked using the ranking matrix discussed in the grid needs analysis.
- Provides recommended solutions for the 12 grid needs identified in Grid needs analysis.

The distribution planning projects we develop in the Solution Identification process are prioritized using our Distribution Planning Ranking Matrix and inform our portfolio planning process. Our Generation, Transmission, & Distribution Portfolio is split along two axes: Sustain the Business (STB) and Grow the Business (GTB). STB focuses on projects that replace our existing assets for the purposes of operational improvement and risk reduction. GTB focuses on projects that increase grid capacity and/or flexibility needed to address load growth or increased demand, which may include a commitment to a customer, internal partner, municipality, or co-owner.

CHAPTER 6
NON-WIRES SOLUTIONS

The Non-wires solutions chapter represents PGE's commitment to empower our communities to engage in the clean energy transition by supporting efforts like NWS. Oregon is leading by engaging in complex and difficult concepts that push the envelope of traditional utility business practices, all while conducting extensive technical and community engagement with our partners. We are co-developing solutions that meet the needs of the communities we serve and help evolve the overall conversation of distribution system planning.

To assess non-wires solutions, we developed a process flow that lays out the framework to evaluate these new technologies against traditional distribution investments. We've considered several factors, including screening criteria, community engagement, technical performance characteristics, and reliability improvements. Following our process, we identified five candidates that passed our initial screening, of which two were selected as pilot projects for this DSP. Both pilot projects feature a range of DER-based solutions.

As a part of our NWS process, we created a policy and procedures document (**Appendix E**) that was shared with partners through our DSP Partner Workshops. We also shared NWS analysis with various stakeholders, partners and community-based organizations through our DSP Partnership Workshops and Community Workshops. The participants of these workshops assisted us in identifying strengths and weaknesses, as well as opportunities within our NWS approach and plan.

MAIN POINTS

- Demonstrates our commitment to supporting our communities through innovative offerings like non-wires solutions and finding ways to maximize community benefits.
- We developed a process flow for our two pilot concepts that can act as a blueprint for future NWS engagements.
- We identified over 5 million annual kWh of energy efficiency, over 4 MW of distributed solar, and over 2 MW of flex load potential for an Southeast Portland community.

In this initial approach to develop a minimum of two NWS pilot concepts, we applied our process to the grid needs identified through the heavily loaded equipment report accounting for overlap with historically disenfranchised communities, current staffing availability, DSP time constraints, and size of the grid need, where possible. From this short list, we then engaged in an initial review of the customer demographics of each location. Based on this exercise, we saw two potential candidates rise to the top as preferable sites to develop the full NWS concept proposal (i.e., Eastport and Dayton).

CHAPTER 7
NEAR-TERM ACTION PLAN

The Near-term action plan chapter represents PGE's two- to four-year action plan, which focuses on maintaining grid performance and further enhancing capabilities that support Oregon's policy goals. Among these are maintaining adequate, reliable, and affordable electric service; integrating DERs and TE; supporting beneficial electrification; and augmenting resilience to mitigate the severe weather effects of climate change, as well as emerging cyber and physical threats.

The investments described here are based on an assessment of key grid and customer needs, new technology developments, and best practices. Much of the current distribution system was designed and deployed decades before the wide-scale adoption of DERs, the rise in transportation electrification, evolving customer expectations for digital interactions and emerging challenges caused by climate change and cyber threats. Operational challenges introduced by these new technologies and customer demands require process refinements to plan, engineer, and design the grid's capabilities in advance of its changing uses.

In creating our vision of a 21st century community-centered distribution system, we developed goals that not only focus on maintaining a safe and reliable grid, but also advance environmental justice, accelerate DER adoption, and maximize grid benefits. We utilized these goals alongside our five strategic initiatives to create an action plan that meets the DSP guidelines, aligns to our vision for the DSP, and represents our plans for modernizing the distribution system. These goals are focused on:

- **Empowered communities** — Enabling the equitable participation in the clean energy transition through human-centered planning, outreach and community engagement.
- **Modernized grid** — Optimizing a grid platform that is safe, secure and reliable though current and future grid capabilities.

MAIN POINTS

- Specific investments in the distribution system that address the grid needs discussed in earlier sections.
- Investments in the distribution system that are being made to address other drivers.
- Investments and proposed investments to advance the 21st century distribution system.

- **Resilience** — Strengthening the grid's ability to anticipate, adapt to, withstand and quickly recover from disruptive events.
- **Plug and play** — Enabling DER adoption by improving access to grid edge investments that accelerate customers' clean energy transitions through activities such as hosting capacity analysis.
- **Evolved regulatory framework** — Establishing the regulatory framework needed to support utility investment in customer and community centered solutions.

The actions outlined in our plan are summarized in **Table 1**.

Table 1. Near-term action plan summary

Action plan investments
276 capital investment projects through 2026 needed to address reliability, resiliency, safety, compliance, and customer loads
12 prioritized grid needs investments in 2023
DER Opportunities by 2026
Investments into customer DER portal needed to develop a device management, enhance customer billing and settlements, streamline interconnections and customer communications
Design of a VPP with expansion capabilities needed to meet HB 2021
Investments for planning and engineering capabilities needed to enhance PGE's AdopDER model, development of a Next Generation Planning Tool, DER data management systems, and updates to cost-benefit model and tools for NWS
Investments into grid management systems for ADMS for critical infrastructure and DA
Investments into sensing, measurement, and automation, telecommunication and cybersecurity

Table 2 shows the estimated costs for proposed investments, solutions, and actions within our DSP, which reflect our commitments to our DSP goals and vision. At the time of this DSP filing, there are still many outstanding questions on how CEP requirements will impact existing DSP guidelines and which types of investments should be made to the distribution system to accelerate the equitable implementation of a decarbonized future. These investments in our distribution system do not include investments, solutions, and/or actions related to our Clean Energy Plan (CEP).

Table 2. Near-term action plan estimated investment summary

Investment Summary (estimated $M, incurred)	2023	2024	2025	2026	Total
Traditional T&D Investments for Customers, Reliability, Safety and Compliance	$285.0	$285.0	$285.0	$285.0	$1,140.0
Prioritized Grid Needs (included in Traditional T&D Investments)	$55.3	$56.3	$87.1	$28.7	$227.4
Grid Modernization Investments	$40.0	$40.0	$40.0	$40.0	$160.0
Total T&D and Grid Mod Investment	$325.0	$325.0	$325.0	$325.0	$1,300.0

PGE's budgets are fixed each year and many factors could cause a reprioritization of the work that is identified in the plan, often on a year-to-year basis. The projects and investments represent the body of work that PGE has identified for the coming years. Changes in our local environment will dictate the timing and duration over which that work is completed and whether or not the identified projects are displaced by other projects of higher priority.