Chapter 2.

Distribution system vision

Chapter 2. Distribution system vision

"The only way forward, if we are going to improve the quality of the environment, is to get everybody involved."

— **Richard Rogers**, architect and author, A Place for All People: Life, Architecture and the Fair Society

2.1 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.[38] 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 PGE's vision to transform the distribution system of today to a 21st century community centered distribution system. We share our goals and our strategic initiatives to realize this vision: empowered communities, modernized grid, resilience, plug and play, and evolved regulatory framework. **Table 12** illustrates how PGE has met the Public Utility Commission of Oregon's (Commission or OPUC) DSP guidelines under Docket UM 2005, Order 20-485.[39]

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**.

Table 12. Distribution system vision: Guideline mapping

DSP guidelines	Chapter section
4.4.a	Section 2.3, 2.4, 2.5
4.4.b.iv	Section 2.3.2, 2.4
4.4.b.iv	Section 2.5
4.4.f	Section 2.5
4.4.g	Section 2.6

WHAT WE WILL COVER IN THIS CHAPTER

PGE's vision for a 21st century community-centered distribution system

How the distribution system can advance societal and environmental justice

How the distribution system can accelerate DER adoption

How the distribution system can maximize customer value

PGE's five strategic initiatives for the distribution system

How policy and planning will intersect to enable a transformed distribution system

How PGE's vision will be monitored and adapted over time

38. PGE uses the definition of environmental justice communities under Oregon House Bill 2021, available at: oregonlegislature.gov
39. OPUC UM 2005, Order 20-485 was issued on December 23, 2020, available at: apps.puc.state.or.us

2.2 Introduction

Through Order 20-485, the OPUC required investor-owned utilities (IOUs) to provide a clear long-term vision for their distribution system that advances policy goals and customer values.[40] This order also requires IOUs to share the goals of their vision and associated strategies — which impact safety, reliability, resilience, security, affordability and decarbonization — through direct investments in technologies and by accelerating the adoption and integration of DERs.

In 1995, a piece in the literary journal "Massachusetts Review" ascribed a saying to Arthur C. Clarke, in which he noted that society tends to overestimate what it can do in the near future and grossly underestimate what can be done in the distant future. This is because the human imagination extrapolates in a straight line, while real world events develop exponentially — like compound interest.

We envision a 21st century community centered distribution system that accelerates decarbonization through DER programs, non-wires solutions (NWS), virtual power plants and other mechanisms to strategically provide community benefits — especially to EJ communities — while improving metrics around safety, reliability, resiliency and security.

Our vision for the distribution system aims to steadily build on traditional utility values of reliability, safety and affordability by including new considerations such as decarbonization, community impact and cybersecurity. The sections below highlight the goals of this vision and the strategic initiatives that will enable us to realize this vision.

Our vision informs our long-term plan for the DSP and represents our initial steps toward evolving the distribution system. This initial DSP affords us the opportunity to explain how we plan to evolve the grid in a more inclusive way. We recognize that distribution system planning is an ongoing and iterative process. We look forward to gaining insights and feedback from partners and the Commission that will inform our next DSP submission.

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** Enabling equitable participation in the clean energy transition through human-centered planning and community engagement	**Modernized grid** Optimizing a grid platform that is safe, secure and reliable through current and future grid capabilities	**Resilience** Strengthening the grid's ability to anticipate, adapt to, withstand and quickly recover from disruptive events	**Plug and play** Improving access to DER investments needed to accelerate customers' clean energy transitions through such activities as hosting capacity analysis	**Evolved regulatory framework** Evolving the regulatory framework needed to support utility investment in customer- and community-centered solutions

40. OPUC Docket UM 2005 and Order 20-485, available at: apps.puc.state.or.us

2.3 Goals for the DSP

This section of our DSP consists of our long-term distribution system vision that is informed by broader goals related to maximizing reliability, customer benefits and efficient operation of the distribution system.

2.3.1 ADVANCE ENVIRONMENTAL JUSTICE

PGE envisions the distribution system advancing EJ through strategic deployment and use of grid assets (customer or utility owned) and tariffs to yield more equitable outcomes, especially for those who are most vulnerable.

Definitions of EJ have evolved over time, expanding from a narrower focus on distributive equity to include procedural and restorative practices. Historical inequities have led to frontline and EJ communities experiencing larger impacts. With this context, we acknowledge the need for an exploration of these multiple layers of burden faced by frontline and EJ communities and we are committed to alleviating and reducing the trauma experienced from policies and procedures that do not fight against inequities.[41]

In advancing EJ, it is important to lead with racial equity. There are many underserved populations in our service territory. Leading with race is not to ignore those factors. When all else is equal, race is the factor that points to inequities across all indicators of success. When we address these deep and pervasive inequities, we will also help to address other areas of marginalization in our EJ communities. Engaging with these communities will "bring the genius of a much broader group of constituencies to the task of developing…roadmaps and policies [and] the active support of those broader constituencies can help secure new policies and resources necessary to implement the strategies identified in roadmaps."[42]

The cost-of-service model, under which PGE is regulated, has assumed fairness for decades. However, recent legislation dictates that our collective understanding of rate design and cost-of-service principles demands reconsideration. Many communities are at risk of being left behind in the clean energy revolution if the company and regulations do not evolve.

The significant overlap between grid transformation and social transformation focuses our attention on the following goals in the transition to the 21st century community-centered distribution system:

- **Assist EJ communities:** As defined in HB 2021, EJ communities include communities of color, communities experiencing lower incomes, tribal communities, rural communities, coastal communities, communities with limited infrastructure and other communities that have been traditionally underrepresented in public processes and adversely harmed by environmental and health hazards. These include seniors, youth and people with disabilities. PGE has begun the process to better understand the concerns and needs of EJ communities through engagement as outlined in **Section 3.4.** As the DSP evolves, we will continue to learn from these experiences and seek more ways to address specific concerns through outreach, planning and investments.
- **Provide direct benefits to communities:** Historically, loads were seen as homogenous, and utilities had little need to understand individual customer behavior. As distribution infrastructure and data resolution improve and DER penetration increases, PGE envisions new opportunities to provide customer and community value through new products and services. These include community microgrids, NWS and continued flexible load development. These new investments are a key feature of the 21st century community-centered distribution system and can be strategically used to reduce energy burden and create significant local economic impacts through workforce development. PGE will continue to work with participants to understand knowledge gaps in accurately identifying and valuing community benefits stemming from distribution-related investments. In Part 2 of the DSP, PGE will propose NWS projects focusing on community benefits as defined by our engagement with the local community (in accordance with our Community Engagement Plan outlined in **Chapter 3**).

41. Energy Justice Workbook, developed by Initiative for Energy Justice, available at: iejusa.org
42. Zero Cities Project, Equity Assessment Tool, Urban Sustainability Directors Network (USDN), 2019, pg. 5, available at www.usdn.org

2.3.2 ACCELERATING DER ADOPTION

Customer needs are evolving, especially as they relate to preferences for DERs driven by cost decreases, lifestyle factors and other considerations. PGE has noted this in the 2019 Integrated Resource Plan (IRP), and we continue to see an increasing importance placed by customers on power reliability and enabling a smart grid to further climate change abatement.[43] Additionally, the studies demonstrate the continued importance of a clean energy future, generating electricity from clean sources and keeping prices affordable.

DERs, however, introduce new challenges for traditional utility planning and operations because of their versatile operational capabilities and how they change customers' interaction with the grid. Without proper visibility into the impacts DERs will have in terms of changes to net load shapes and voltage profiles, as well as having adequate system protection devices in place, growth will be challenged by higher costs and greater uncertainty. However, if harnessed appropriately, these DERs can become assets for society by helping to enable decarbonization, system cost reduction and customer bill reduction. PGE has taken several steps to improve DER integration, but we are still learning and developing its capabilities. PGE envisions that the 21st century community-centered distribution system will accelerate DER adoption and leverage those DERs to deliver additional value to customers. In the following section, we talk about the strategic initiatives, each with one or more activities focused on the goal of accelerating DER adoption.

At a system level, PGE plans for DER impacts to the grid within the IRP, ensuring we have adequate resources to meet the energy and capacity needs of these emerging technologies. However, the locational nature of DER adoption has potential cost implications that must be explored through the DSP. The interplay of these analytical exercises between the DSP and IRP is a topic we explore further in **Section 2.5** on policy and planning intersections.

The rate of DER adoption directly impacts PGE's needs to invest in DER-ready infrastructure, such as EV charging infrastructure and substation protection devices for increased photovoltaic (PV) adoption. DER adoption may be driven by larger market forces (as in the case of solar PV and EVs) or more programmatic in nature (such as flexible loads). PGE is actively monitoring market trends for DERs as well as exploring opportunities to increase the adoption of flexible loads to balance the impacts of new loads through continued product and program development. **Figures 11a-d** show PGE's latest forecast of DER adoption through 2030. **Appendix G** provides detail of PGE's AdopDER model underlying these estimates. The figures below represent current forecasts, which were developed as part of our DSP. During the development of the DSP, Oregon has passed key legislative policies needed to help decarbonize the state's electricity supply, such as House Bill 2021. PGE will update the DER forecast for future DSP filings in order to account for policy evolution, new market trends, customer approaches, and emerging technology identified through PGE's Product Development initiatives and Smart Grid Testbeds. In support of Oregon's commitments to decarbonization and electrification, we have aspirational goals to aggressively grow our flexible load portfolio to upwards of 250 to 500 MW, the equivalent of serving more than 200,000 households. Additionally, we have aspirational goals to accelerate the state's Senate Bill 1044's goal of 25% of all registered vehicles and 50% of new vehicle sales across the state, growing Oregon's total number of electric vehicles on the road to over a million by 2030.[44]

Achieving these aspirational goals will require all of us to participate in this transition in new innovative ways, create new customer approaches, and new tools for engagement that assist in first cost hurdles and peace of mind. Through our future DSPs we will help pave the way for this transition. For example, we continue to evolve our AdopDER model, which will allow us to perform more iterative DER cost-effectiveness and locational adoption scenario analysis. This model will help us understand adoption patterns based on feeder-level customer demographics, new policies or intervention strategies. Developing new benefit accounting methods (e.g., locational net benefits analysis) will help quicken DER adoption. In addition, a more established mechanism to scale non-wires solutions wherein community benefits can be fully accounted for will help to promote DER adoption in the market.

43. 2021 Q2 PGE Escalant Residential Tracking study, available upon request.
44. Based on the Oregon Department of Transportation's (ODOT's) Transportation Electrification Infrastructure Needs Analysis (TEINA) report available at www.oregon.gov

Figure 11.a. PGE's transportation electrification load forecast, reference case

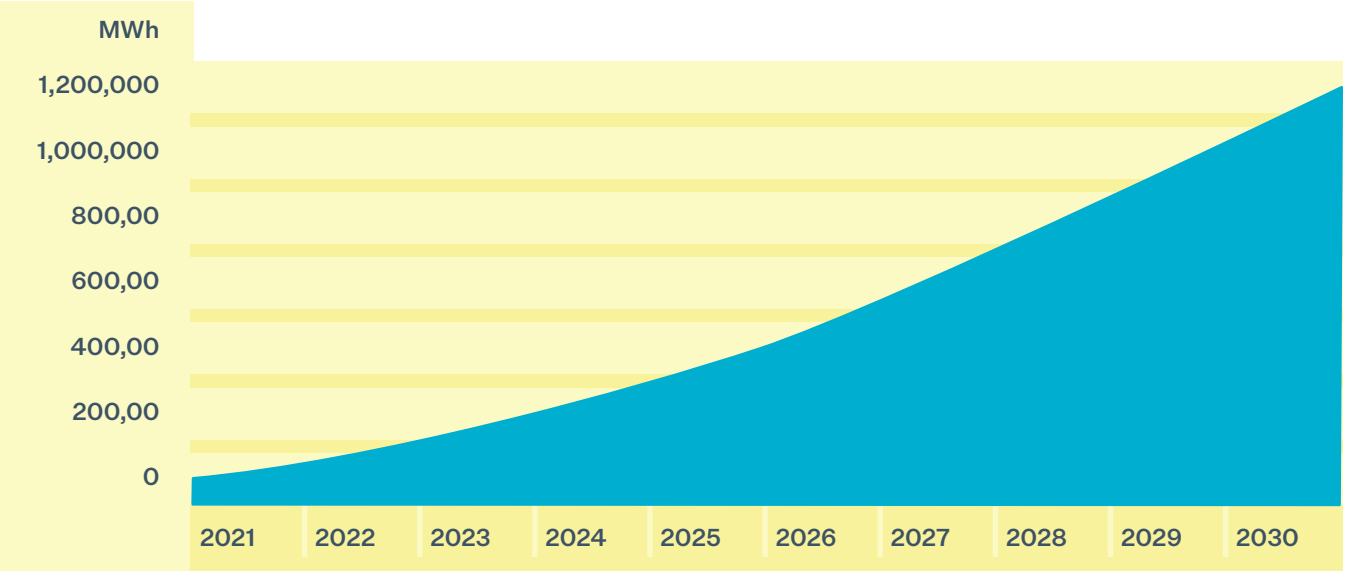


Figure 11.b. PGE's DR/flex load forecast, reference case

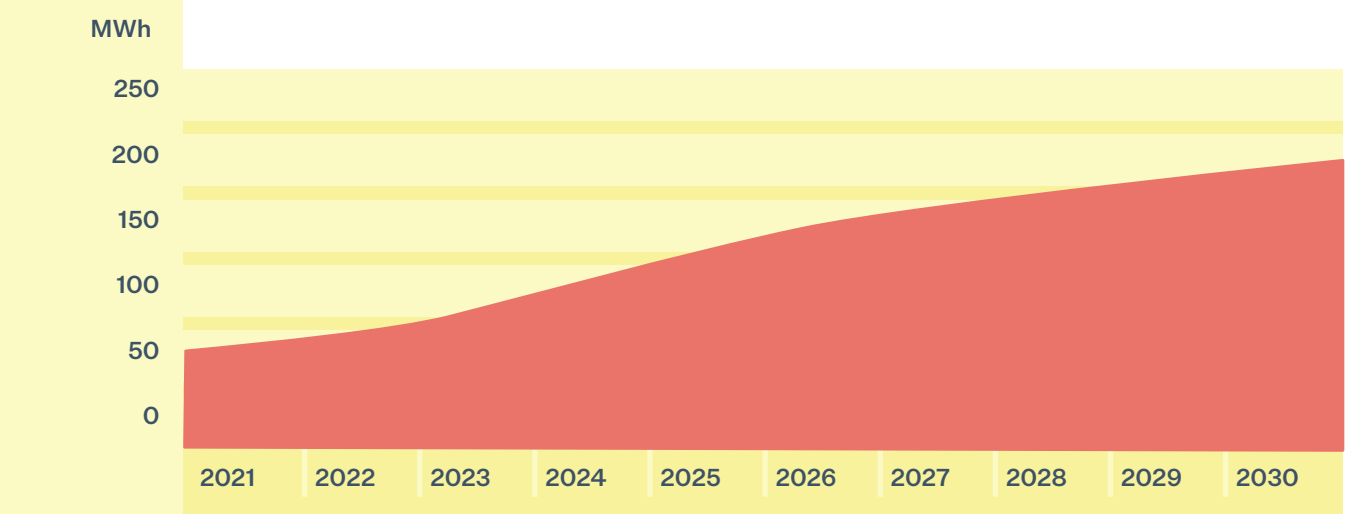


Figure 11.c. PGE's solar PV forecast, reference case

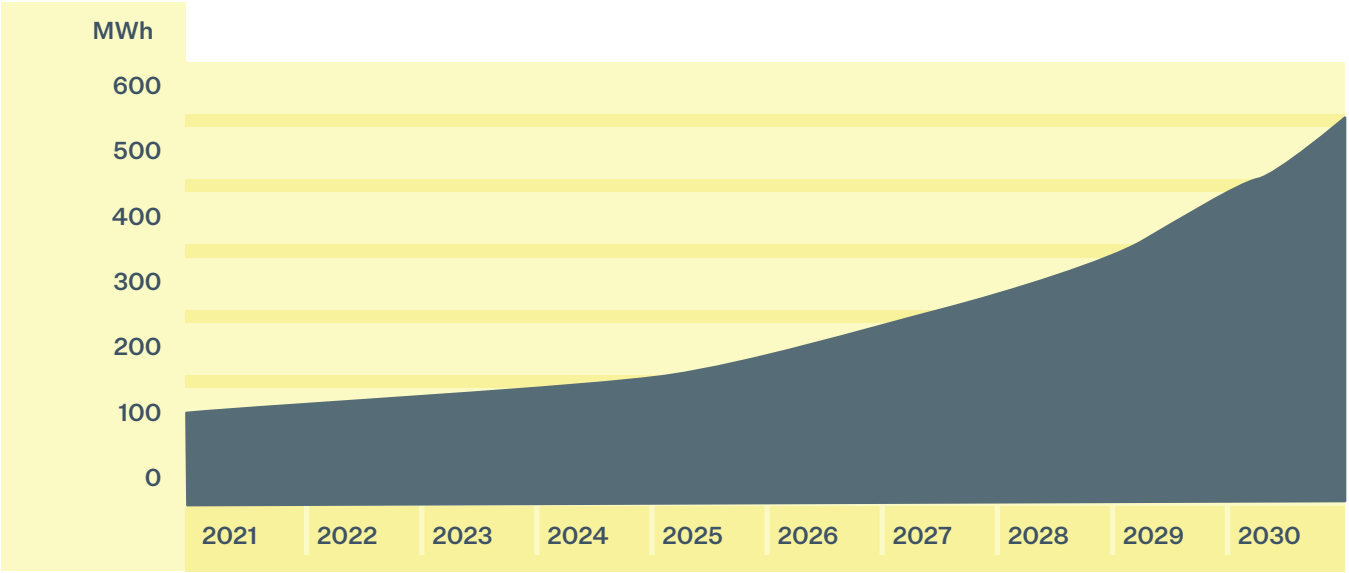
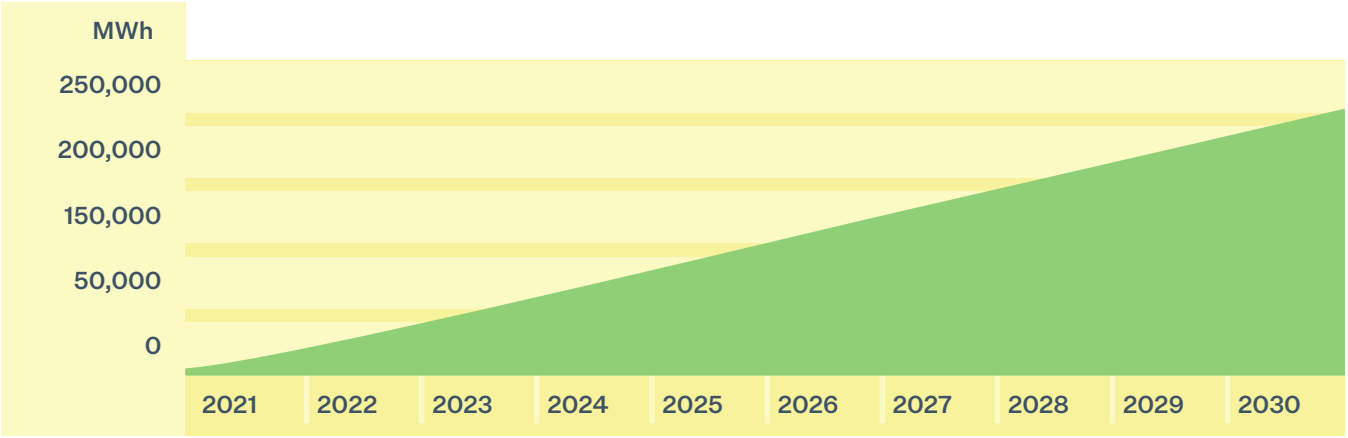


Figure 11.d. PGE's building electrification load forecast, reference case



The graphs in **Figure 11** are described below by DER:

- The transportation electrification and building electrification graphs represent the total energy impacts of these DERs.
- The solar PV graph represents the estimated nameplate capacity (in MW-dc) of rooftop solar that will be added to the system.
- DR/flex loads represent the expected MW contribution of PGE's flex load portfolio to summer peak.

2.3.3 MAXIMIZE GRID BENEFITS

Grid benefits, in this context, refer to customer value that results from the planning and optimal operation of the system. Their impact can be measured through quantitative metrics that are established either nationally or at the state level. These metrics represent elements of both traditional planning and relatively newer initiatives such as decarbonization, cybersecurity and resilience. PGE identifies the following as primary grid benefits addressed by the transition to the 21st century community-centered distribution system.

- **Decarbonization:** In line with HB 2021, PGE is committed to reducing greenhouse gas (GHG) emissions from the power served to customers by at least 80% by 2030 and 100% by 2040. Measured in metric tons of carbon dioxide equivalent, we will address this goal primarily through the IRP process. However, through improved management of DERs, we expect the distribution system to have an increasing role in reaching these reduction targets. Part 2 of the DSP will include an analysis of how DERs can factor into solution identification for identified grid constraints.

- **Safety:** Safety has, for more than 130 years, been a central focus for PGE. PGE is committed to the safety of communities and employees and will ensure safety improvement is a key consideration as PGE transitions to the 21st century community-centered distribution system.

- **Reliability:** PGE continues to improve reliability through the integration of technology, better planning practices and improved operator control. We use industry-standard reliability metrics, such as System Average Interruption Duration Index (SAIDI) and System Average Interruption Frequency Index (SAIFI), which are detailed further in **Appendix B**. As PGE transitions to the 21st century community-centered distribution system, the need for reliability is further emphasized as more and more end uses come to rely on electricity as their primary energy source. For example, a customer adopting EVs should not experience an overall reduction in reliability compared with a gasoline vehicle.

- **Resilience:** The frequency and intensity of disasters such as wildfires, storms, heatwaves and droughts have been increasing. This has propelled the conversation around resilience to the very top of PGE and society's focus. Resilience is defined as the robustness and recovery characteristics of utility infrastructure and operations, which avoid or minimize interruptions of service during an extraordinary and hazardous event.[45] Through this transition, PGE will focus on resilience by incorporating new strategies and analytical techniques that improve decision-making across the company. For example, strategies may include leveraging locational benefits to promote resilience-based DERs such as microgrids and risk-based assessment of pole materials.

- **Security:** The protection of the cyber-physical grid has received increased attention from the discussions driven by UM 2005. In March 2021, the U.S. Government Accountability Office (GAO) reported on cybersecurity vulnerabilities, especially on the distribution grid and need for immediate action.[46] Information technology (IT) and operational technology (OT) play a key role in enabling the 21st century community-centered distribution system. However, IT/OT also increase the number of access points for cybersecurity attacks and require an integrated and proactive approach to security development. PGE has taken several steps to improve physical and cybersecurity as outlined in PGE's 2021 General Rate Revision Request.[47]

- **Fair and reasonable costs:** The transition to a clean energy future will require additional investment in the grid. Historically, PGE has ensured the affordability of the distribution system through a combination of lowest-cost and -risk investments that provide safe, reliable power for customers. We believe the regulatory paradigm must evolve to capture the intent of policy direction (HB 2021), which requires the elimination of GHG emissions in a manner that provides direct benefits to communities. This shift requires all parties to rethink the evolution of fair and reasonable costs to include an equity-lens.

Equitable implementation of our future DSP Action Plan is a critical next step and will serve to support and complement the empowered communities pillar, as well as other pillars. Notably, equitable implementation will improve community resilience and assist in evolving the utility regulatory framework, which is needed to provide flexibility in co-developed solutions that meet identified community needs.

45. Definition of resilience per the National Association of Regulatory Utility Commissioners (NARUC), available at: pubs.naruc.org
46. Government Office of Accountability Report: GAO-21-8, available at: gao.gov
47. PGE's UE 394 filing on July 9th, 2021, available at: edocs.puc.state.or.us

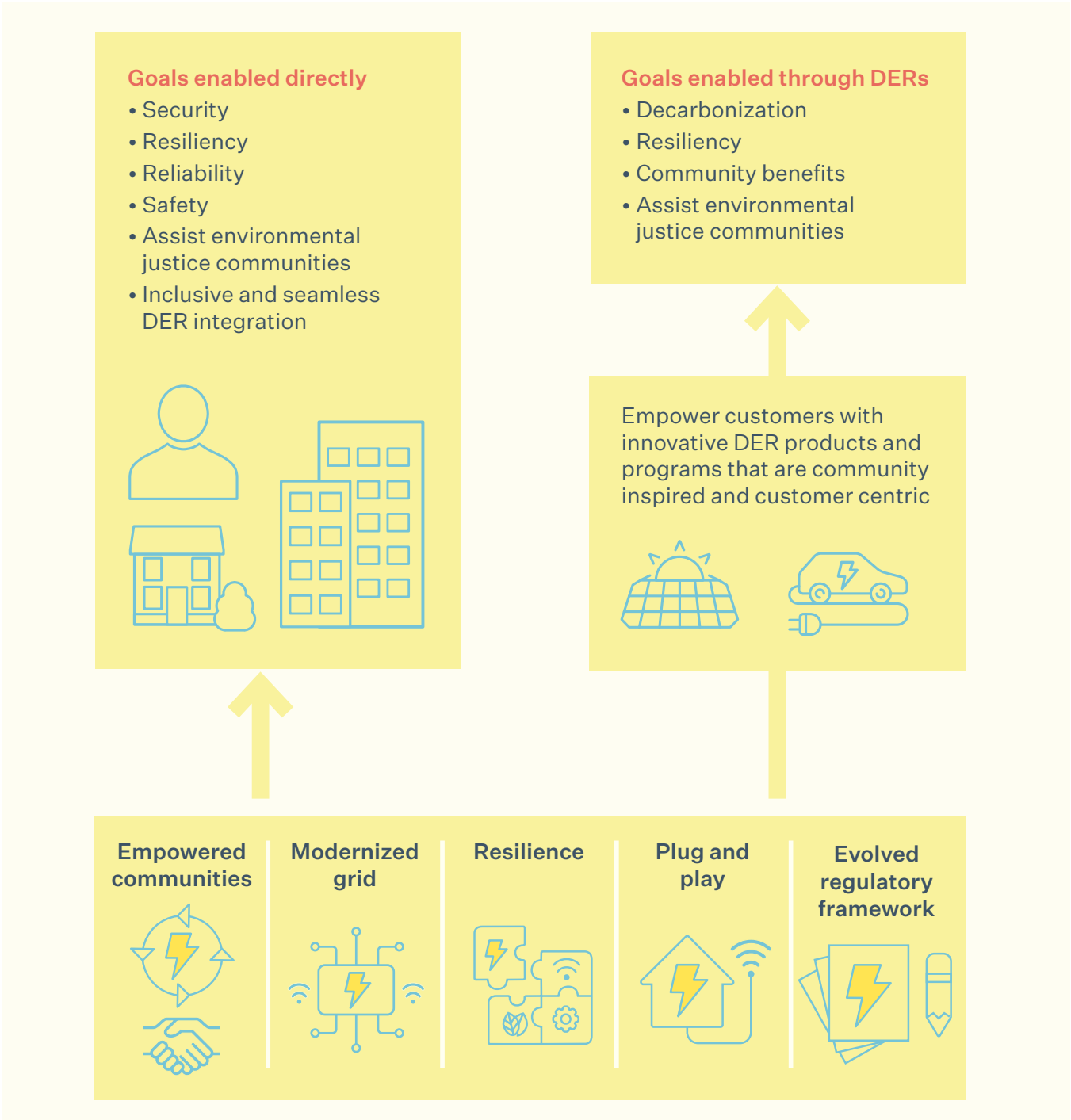
2.4 Strategic initiatives for the DSP

To execute on our vision and goals for the distribution system, PGE has developed and is working on five strategic initiatives:

- Empowered communities
- Modernized grid
- Resilience
- Plug and play
- Evolved regulatory framework

Figure 12 illustrates how these strategic execution initiatives enable DERs and help achieve the goals of a 21st century community-centered distribution system.

Figure 12. PGE's initiatives address the goals of the 21st century community-centered distribution system



The strategic initiatives are briefly described here, with more details in subsequent chapters.

2.4.1 EMPOWERED COMMUNITIES

The empowered communities initiative focuses on evolving PGE's culture to better integrate EJ goals as outlined in **Section 2.3.1** in the distribution system. Activities under this initiative will be the primary way to create the right space and relationships needed to foster equitable participation in the clean energy transition. In the action plan in Part 2 of this DSP, PGE will outline the company's tactical approach. With this, we take the first step in creating a more integrated and community-centered distribution system planning approach. PGE expects this initiative to help the company develop new DER products and programs that meet the precise needs of PGE customers, especially EJ communities, while improving their participation to enable these DERs to scale and provide broader societal benefits. **Chapter 3** provides the current activities PGE is undertaking within this initiative as related to the DSP.

2.4.2 MODERNIZED GRID

PGE's vision of a grid expands on the integrated grid approach as reported in the company's 2019 Smart Grid Report.[48] The goal of a modernized grid is to ensure the system can meet evolving customer needs while realizing the full value of DERs. PGE has been proactively modernizing the grid, integrating technologies such as smart meters and an advanced distribution management system (ADMS) to reduce outage response times and billing costs, among other benefits. Moving forward, this initiative will help align critical activities to enable and scale DER programs while addressing capability gaps in the company, such as performing locational net benefits analysis and optimized DER dispatch. The capabilities that collectively form the modernized grid and current investments in those capabilities are expanded in **Chapter 4**.

2.4.3 RESILIENCE

Resilience is top of mind for PGE as climate change and extreme weather present new challenges. A 1-in-40 year ice storm caused unprecedented power outages just in the past year, and the largest wildfire in the nation at the time temporarily severed Oregon's transmission of power to California. Customers are feeling the urgency to take action to prepare for the unexpected, as does PGE. This initiative brings together leaders and teams from across the company to improve our ability to meet customer and community expectations for resilient power delivery through solutions both old and new, such as grid hardenings and resilience-focused DERs. Details on this initiative are provided in **Chapter 5**.

2.4.4 PLUG AND PLAY

With the ability to seamlessly interconnect a bi-directional flow, a modernized grid is a key enabler to improved access to DERs. Additionally, DERs have different effects on the grid under different conditions, including time, location, demand magnitude and system contingency. Today's grid is not designed to receive energy from customers at scale. Thus, some DERs today, specifically inverter-based systems and some types of EVs, such as mass transport electrification, may require complex studies. This increases lead times and impacts the customer experience. Furthermore, studies are difficult to scale with PGE's current capabilities. To improve access to DERs, we envision that information exchange of key studies, such as hosting capacity and locational net benefits, will allow us — and the market — to determine the best DER locations to maximize customer and societal benefits. As the company progresses, these studies will become standard processes that can be regularly updated with new data. By modernizing the company's planning capabilities, we strive to create a seamless, scalable interconnection process that addresses barriers to DER adoption. This DSP notes investments in planning tools, detailed in **Section 4.7.3**, to improve interconnection capabilities. Hosting capacity analysis will be a focus of plug and play in **Chapter 6**.

48. PGE's 2019 Smart Grid Report, available at: apps.puc.state.or.us

2.4.5 EVOLVED REGULATORY FRAMEWORK

Working with communities, partners, OPUC Staff and other utilities, PGE plans to identify regulatory and rulemaking opportunities for equitable, resilient energy delivery that keeps pace with the clean energy transition. We will work toward the sustained success of this transition while minimizing the impact to those who are most marginalized. PGE expects that as DER proliferation increases, more regulatory alignment and evolution is needed. The rate of this evolution must be correlated with the expected adoption of DERs, thus helping the company through clear regulation. PGE identifies an initial set of regulatory elements that can accelerate PGE's vision in **Chapter 7**.

2.5 Policy and planning intersections

Our vision for the distribution system over the next 5 to 10 years includes our DSP strategic initiatives and goals, and their alignment with state law and OPUC policies. These goals, as stated in the DSP requirements, include increased reliability, effective integration of DERs and broader GHG emissions reduction. There are many aspects of the DSP that intersect with other key policies and regulatory requirements, as well as utility planning and investments. Below, we discuss the interactions of the DSP with other planning activities, investments and tools that will advance the DSP vision.

2.5.1 PLANNING INTERSECTION

The impact of DERs will have an increasing influence on both IRP and transmission and distribution (T&D) planning. This influence can vary depending on how specific DERs are used for different needs, such as distribution relief, system level capacity contribution or other ancillary grid needs.

Moving forward, PGE will continue to build on and integrate the tools to further improve and align IRP and DSP methodologies around resource contribution of DERs.

2.5.1.1 DSP interactions with IRP

PGE has developed the in-house capability to produce DER forecasts in a transparent, consistent and repeatable manner based on a site-level adoption model. This marks the first step in integrating DSP and IRP tools to provide holistic system needs and impacts of DERs. By coupling the bottom-up and top-down approaches to DER forecasting in a single tool, PGE will be able to evaluate future scenarios of DER adoption with a consistent set of inputs and outputs, ensuring greater alignment of decision making.

At the time of this DSP filing, the IRP receives the following inputs related to DERs:

- Market adoption of DERs such as EVs and solar PV: This is the expected adoption of DERs free of programmatic influence on the market.
- Economic potential of current and expected future DER products and programs: This refers to the expected programmatic adoption of cost-effective DERs given their grid and societal impacts.
- Integration of non-cost-effective DER supply curves: The IRP will receive estimated supply curves of non-cost-effective DERs that will be introduced with other supply-side resources to better understand the portfolio dynamics of integrating DERs.

Currently, the peak MW contributions of DERs in PGE's DER forecast are determined based on an assumed dispatch taken from the IRP's loss of load probability (LOLP) heat map. In future evolutions, PGE plans to include more refined dispatch and control assumptions capturing a wider array of potential grid services of DERs and any commensurate change in value streams that impact cost effectiveness.

Appendix G provides additional detail of PGE's AdopDER model and includes responses to key stakeholder questions as they pertain to the interaction between the IRP and the DSP.

2.5.1.2 DSP interactions with T&D planning

DER adoption impacts T&D planning in the following ways:

- AdopDER's cost-effective DERs and locational adoption capabilities will help us understand adoption patterns based on feeder-level customer demographics. This feature will allow for additional modeling granularity by accessing gross and net load shapes for each feeder based on a range of plausible DER adoption scenarios. This will be a significant evolution compared to today's distribution load forecasting approach described in **Section 1.3.2**.
- PGE will plan for NWS by identifying grid locations with different maximum potential for DER adoption based on feasibility factors (e.g., building stock characteristics) as well as how changes in localized incentives might spur additional adoption. PGE is investing in evolving its capabilities to perform other NWS analyses ahead of the Part 2 DSP filing as noted in **Section 8.3.2**.
- PGE is exploring how DER behavior may affect T&D systems at higher levels of penetration. Because AdopDER explicitly models DER shapes (both passive and dispatchable) and aggregates up to feeder-level impacts on net system load, T&D planners can explore the impacts of different DERs, such as solar PV and EVs. In addition, AdopDER includes impacts of weather and solar resource availability, allowing system planners to understand expected DER behavior under extreme weather conditions.

Our near-term focus has been alignment between DER modeling and distribution planning functions. PGE is currently performing a gap analysis to determine if DERs require additional transmission planning capabilities as noted in **Section 4.7.3.2**.

2.5.2 IMPACTS ON T&D CONSTRUCTION BUDGET

The DSP has wide-ranging and significant effects on PGE's construction budget. The following are key investments driven by the DSP:

- **Grid modernization investments to advance PGE's vision:** PGE has developed a new capital allocation group called the Grid Modernization Business Service Group (Grid Mod. BSG) to help the company balance and prioritize grid modernization projects and ensure funding is allocated for projects based on appropriate justification. The Grid Mod. BSG also includes a significant IT overlay to ensure IT/OT and cybersecurity integration.
- **T&D investments driven by locational adoption of transportation and building electrification:** EV adoption, especially medium- and heavy-duty vehicles, is likely to have distribution system impacts in the long term. These impacts may be mitigated, but not necessarily eliminated, by DER programs such as managed charging. Through the DSP, the net impact and location of EVs will be supplied as inputs to the T&D planning process. This interaction between the planning teams will increase as building electrification ramps up, which will likely drive relatively more T&D projects than in the past. PGE will consider NWS for T&D projects that can be deferred or eliminated.
- **T&D investments, such as protection, driven by the impact of inverter-based systems' impact on hosting capacity:** High DER penetration may lead to excess generation, driving protection equipment needs that ensure safe and reliable operation under excess generation conditions. PGE has updated its engineering standards to ensure new substations have the necessary equipment to allow for generation backfeed. However, for existing substations, this problem may require a solution such as a battery and/or protection system upgrades. As DER programs and tariffed offerings improve, we will better optimize energy use across these different DERs, further minimizing the number of T&D investments relative to the increasing penetration of energy-generating DERs.

- **Investments in NWS and hybrid solutions (wired and non-wired) to replace some traditional T&D projects:** As PGE's planning capabilities mature, NWS will become a more prominent part of the solution mix for T&D projects. Traditional T&D solutions aim to address specific constraints with reliable solutions that have long asset lives. NWS are different in that they require more complex probabilistic planning models to ensure they address specific T&D constraints at the same reliability levels. Unlike traditional infrastructure investments, they can potentially satisfy local grid needs while also providing system-level benefits, such as resource adequacy, frequency response and optimized wholesale energy purchases. In addition, DERs may contribute societal and environmental benefits, such as decarbonization and resilience. For these reasons, NWS have a more complex relationship with planning and budgeting compared to traditional T&D projects.

2.6 Monitoring and adapting PGE's DSP vision

PGE's plan is to monitor progress using a combination of traditional and newer metrics. For metrics around reliability, resilience and outages, we measure the overall performance of the distribution system in three ways:

- System Average Interruption Duration Index (SAIDI)
- System Average Interruption Frequency Index (SAIFI)
- Momentary Average Interruption Event Frequency Index (MAIFe — calculations are limited to feeders with remote monitoring)

These are further detailed in **Appendix B. Baseline data and system assessment details**, along with PGE data over multiple years.

- For the metrics around decarbonization, community impact and EJ impact, PGE will draw from the metrics outlined in HB 2021, including the topics to be covered in the biennial report developed by the Community Benefits and Impact Advisory Group. These include:
  - Million metric tons of carbon dioxide equivalent (CO_2e) per year
  - Energy burden change
  - Disconnections within EJ communities

Through the development of Part 2 of the DSP, PGE will deliver locational forecasts that provide the analytics to calculate the change in these metrics resulting from DER investments. Additionally, PGE will work with partners and OPUC Staff to convene relevant advisory groups, such as the Community Benefits and Impact Advisory Group outlined in HB 2021, to set targets, track progress and adapt the DSP, IRP and Clean Energy Plan over time.