Appendix E. NWS details

This appendix provides more detail regarding the NWS process we applied while formulating the two pilot concept proposals. Much of the discussion is about overarching considerations and important factors that we have considered throughout the process. We expect that these considerations will lead to more discussion in the evolution of the DSP guidelines and do not represent an end state.

E.1 NWS process overview

Figure 61. Distribution planning process — augmented with consideration of NWS

E.2 NWS screening

This section describes the criteria PGE uses to identify if a NWS can solve the identified grid needs. Following Step 3a: Current state analysis, projects will be screened to determine if a NWS is applicable to the grid need, focusing on:

1. Type of grid need
2. Forecast certainty
3. Lead time
4. Minimum project cost

E.2.1 TYPE OF GRID NEED

To meet this criterion, a grid need must align with **Table 58**, which lists the type of grid needs that are applicable for NWS along with examples of wired and non-wired solutions that could potentially resolve the problem.

Table 58. Types of projects that are suitable for non-wired solutions

Type of grid need	Example of traditional solution	Example NWS product and/or service
Thermal capacity upgrade projects or (N-0) capacity projects usually driven by growth in load on existing infrastructure	Substation transformer capacity upgrade Reconductoring of circuit (larger wire size) Build new feeder	DERs that can reliably shape or be dispatched to alleviate existing or forecasted peak load on the distribution circuit or substation transformer.
Reliability solutions driven by N-1 contingency requirements	Substation transformer capacity upgrades Reconductoring of circuit Build new feeders Distribution automation	DERs that can be reliably dispatched to provide contingency relief at a requested time, duration and/or frequency.
Hosting capacity and volt-var improvements	Capacitor banks Change load tap changer settings Line voltage regulators Protection Upgrades (Hot Line Blocking, 3V0 Protection)	Smart inverters and batteries could be used to provide volt-var and Conservation Voltage Reduction (CVR) services. This would include supporting voltage quality, reducing losses, and net energy consumption on the feeder.
Resiliency upgrades: new supply paths for increased resiliency	New substation or feeders New switching points or tie lines Reconductors Substation upgrades Distribution automation	Microgrids for partial/full back-up power during grid and/or wildfire related emergencies.
Customer Experience	Case by case	Case by case
Policy-mandated NWS	Case by case	Case by case

E.2.2 FORECAST CERTAINTY

Modeling NWS, especially customer-sited solutions, is complex given the many different technologies and their interactive effects with each other and the grid under different weather scenarios, customer behavior, and device settings or preferences. The addition of forecast uncertainty exponentially increases the complexity and time required to analyze the different NWS options. To make prudent use of planning resources, the forecast variation within a study area must be reasonably certain for the project to be considered for a NWS. Presently, this is determined by the distribution planning engineer based on the available data and confidence. PGE expects learnings from the implementation of pilot projects will help establish a metric and threshold to determine forecast certainty and when (or if) a given level of uncertainty should prevent projects from proceeding through the screening process.

E.2.3 LEAD TIME

Timeline suitability is recommended to make sure there is sufficient time to develop a NWS, engage with the community, and implement the chosen solution in time to address the identified grid need. Aligning with national best practices[82], PGE will adopt a typical minimum lead time required for NWS of 30 months, though we will not exclude shorter lead time projects if there is compelling reason to do so. We also expect this requirement to change as we learn more from the pilot projects. This lead time requirement can be attributed to the following processes:

- NWS Development Process. The iterative nature of developing a NWS and additional regulatory approvals increase overall lead times for NWS. This process may take between 6 to 12 months.
- Implementation Process. The implementation time for the chosen solution is also a function of the scale and complexity of the project. The time for NWS implementation is typically 20 to 40 months, which contributes to the "minimum of 30-month" requirement above.

E.2.4 MINIMUM PROJECT COST

Smaller projects are often addressed by wired solutions that are relatively inexpensive and quick. Plus, the locational value of the avoided or deferred wired solution must be large enough to make a meaningful difference to DER adoption through different program mechanisms, such as marketing or incentives. For these reasons, and in alignment with national best practices, PGE maintains a minimum project cost threshold for NWS. This will allow us to focus on utility projects of sufficient scale that are more likely to be good candidates for NWS.

Following feedback from stakeholders and learnings from early efforts to develop the pilot concepts, PGE recommends $500,000 as a threshold for smaller grid needs (under 2 MW) and longer deferral periods (5 years or more). This is based on the expected impact to the benefit stack where an ideal/perfect resource could improve its benefits by approximately 20%. For all other projects a nominal figure of $1 million will be used to assess NWS suitability, but we will also consider the size of the project when determining suitability.

- Multi-Feeder/Substation. Typical lead time of more than two years to design and construct. Cost of project is typically higher (>$1 million). Geographic footprint is likely to cover a larger area, more customers, and thus, an increased opportunity for customer-sited DER solutions.
- Feeder/Circuit-specific. Typical lead time nine months to two years to design and construct. Cost of project is typically lower (<$1 million). Geographic footprint is also likely to cover a smaller area and present fewer load relief opportunities.

82. Screening of Non-Wires Alternatives in Distribution Planning: Guidance, Criteria, and Current Practices. EPRI, Palo Alto, CA: 2020. 3002018820.

E.3 NWS development process

If a NWS is deemed suitable to address a specific grid need, PGE will conduct the following steps to develop the NWS concept proposal:

- Conduct community needs assessment
- Determine resource potential and applicability to grid need criteria
- Assess DER costs and benefits
- Compile NWS portfolio and evaluate performance risks
- Document implementation considerations and engagement roadmap

We first provide a detailed overview of each of these key steps, and results of this process for our two concept proposals presented in **Section 6.4**.

E.3.1 CONDUCT COMMUNITY NEEDS ASSESSMENT

Following our best practices identified in **Section 2.2**, we aim to communicate early and often with our communities and break down technical barriers to robust participation in solution development. Therefore, our first step to developing a NWS project will be to conduct a community needs assessment. The precise scope and format of this needs assessment will evolve based on feedback received from participants. However, we expect this needs assessment to include a minimum of the following elements:

- **Community outreach and engagement findings:** Building off the series of Community Workshops we held to inform these initial concept proposals, we will continue to refine the presentation materials in ways that are meaningful to our community partners, as well as seek additional ways to connect and solicit meaningful participation and feedback.
- For instance, we will schedule and plan these engagement efforts with an increased emphasis on identifying CBO partners serving the affected areas where a NWS is being proposed, and providing opportunities for community leaders to be appropriately compensated for providing their localized expertise and knowledge of the communities they serve. This is a critical aspect to the work because many of our CBO partners are primarily engaged in delivering programs that are critical to the health and well-being of the community, but may lie outside of the traditional utility or energy services industry landscape and areas of expertise. Therefore, we need to pay for the type of services and know-how just like we do for other consulting engagements in the more technical realms of DER planning and implementation.
- All methods, outreach, and recommendations employed in a targeted NWS community engagement exercise will be compiled for later use in the decision-making and implementation phases of the process.
- **Localized survey of the building stock and customer base:** In order to make good on our promise of implementing human-centered planning, we will contract with local community partners and other technical service providers to develop detailed assessments of the local building stock in the NWS area. Doing so will ground the development of the NWS within the values of the community and identify DER solutions that will be both realistic and achievable.
- There is a large push to increase the capacity of CBOs to engage in the energy transition. For example, the Portland Clean Energy Fund recently awarded over $100M to fund 65 different projects in their second round of awards.[83] While this particular funding opportunity is unique to Portland, we see elements of this transition reflected in HB2021 and expect this dynamic of broadening participation in the energy system to continue growing across the state. We aim to continue developing the capacity of our CBO partners to enable them to directly benefit by procuring implementation and delivery contracts for initiatives like NWS projects. This is doubly important because not only can our community partners gain valuable experience scoping and delivering clean energy projects by participating in this manner, but they also maintain networks of trust with some of our most vulnerable customers, and therefore can greatly aid in the efficient delivery of these customer-sited solutions to the end users.

83. Portland Clean Energy Fund grant recipients, available at: https://www.portland.gov/bps/cleanenergy/2022-pcef-rfp-2-grant-recipients

While we are separately detailing these aspects of the Community Needs Assessment, they are in fact interdependent. At the outset, we will share existing information and datasets with our community partners (such as the results of our Equity Index scores for the targeted areas) in order to engage in discussions about what additional datasets our CBO partners may have regarding their community. For instance, the sheer scope and availability of Census data is helpful for conducting analyses across many geographic areas and scales of granularity, but there are serious limitations to relying solely on this data source for developing culturally responsive program interventions.[84]

We will attempt to augment our existing DEI data with localized knowledge to the extent possible for each targeted NWS project development. We expect feedback and insights gathered during the community outreach and engagement step to directly influence the nature and scope of localized survey activities we outlined. For example, by conducting initial community outreach, we might identify which CBOs have the relevant expertise and interest in bidding on a competitive grant or contract opportunity (likely through competitive RFP). The vehicle of these contract opportunities would then provide opportunity for direct economic development in the community, while generating actionable findings such as:

- Detailed energy needs of the community
- Identification of any additional datasets about local demographics and trends
- Insights regarding technical potential for DER solutions given the local building stock
- Recommendations regarding effective delivery channels to promote equitable distribution of DER solutions.

This is a high-level proposal of what we interpret as valuable aspects of a community needs assessment. However, we recognize that we are not the experts in this area and we welcome feedback on this proposed approach to help us realize the vision of empowered communities.

E.3.2 DETERMINE RESOURCE POTENTIAL AND APPLICABILITY TO GRID NEED CRITERIA

As discussed in **Section 3.5**, PGE uses the AdopDER model to forecast DER growth, including distributed solar and storage, EVs, and demand response / flexible loads.

However, this forecast simply applies different disaggregation rules to our system-wide DER forecast to assess locational adoption under business-as-usual programmatic and market effects. To assess the potential of DERs to contribute to a NWS, we need to further define and prioritize DER potential based on the particular characteristics of each area. The main areas we will discuss in our evaluation of the pilot concepts are:

- **Shape of contribution:** Assess the contribution of each DER type toward reducing locational system needs
- **Availability of resource:** Determine the realistic amounts of DERs that can be installed on a timeline that will alleviate grid constraints commensurate with the deferred traditional solution, given existing and potential new programs and partnerships and the potential influence of higher avoided costs on making existing offerings more economically attractive to customers
- **Reliability:** Develop understanding of how the DERs can be expected to contribute to system relief during expected worst-case scenarios, including during N-1 contingency events and extreme weather conditions.

Taken together, these factors will improve our ability to weigh the benefits and costs against existing and established practices of evaluating distribution system improvements.

In this filing, we developed a representative mix of DER technologies that could comprise a NWS portfolio of adequate size to meet the identified grid needs. We did this in order to evaluate the relevant costs and benefits of each option compared to the traditional (wired) solution to meet the grid need, and to solicit dialogue about the various considerations of each approach within the context of existing rules and practices.[85]

84. This dynamic has been raised by DEI practitioners and community advocates for some time, and we accept their critique as valid in and of its own account. However, to see an overview of this issue from a national media source as it pertains to the 2020 Census undercount, see for example this NPR article, available at: https://www.npr.org/2022/03/10/1083732104/2020-census-accuracy-undercount-overcount-data-quality
85. We have done our best to ensure the DER portfolio developed, as well as associated costs and benefits, represent what would likely get installed under a future NWS pilot. We emphasize that due to timing constraints and the uncertainty associated with eventual Commission guidance on the relative merits of these proposals, what we present here and in **Section 6.4** are representative portfolios only and may not reflect actual mix of technologies (and therefore overall costs and benefits) that would get deployed if the NWS pilot concept is approved.

For each grid need, we developed two NWS options to compare against the traditional wired solution:

- **Reliability focused:** These portfolios assumed relatively low DER penetration and a higher reliance on front-of-the-meter storage to address the identified grid need. These tend to be higher cost but also have elements of higher reliability given the known timelines and performance characteristics of these type of resources.
- **Customer resiliency focused:** These portfolios sought to maximize the amount of realistic achievable customer-sited DER adoption, including distributed solar and storage, demand response / flex loads, and energy efficiency. While the size of the need still likely requires some level of firm resource procurement (such as front-of-the-meter storage), the size of this need is greatly reduced by the increase in customer-sited DERs.

To develop the amount of DERs contributing to each portfolio, we first leveraged the feeder-level DER adoption results from AdopDER for solar PV, storage, and flex loads / demand response. In order to reflect the higher locational value and potential for increased targeted marketing and incentives, we quantified the achievable potential as the difference between the reference case adoption and 120% of the high adoption scenario.

For energy efficiency, we reviewed Energy Trust's typical project types over the last few years and evaluated these for their ability to contribute savings during the time period (generally summer, 12pm to 7pm) of the grid needs particular to each NWS area. We then used our judgment to apply these average project sizes to the specific types of customers we see on the NWS feeders. After developing this forecast, we confirmed with Energy Trust that these targets are reasonable given the potential for enhanced incentives and the lead times needed to bring these resources online.[86]

E.3.3 ASSESS DER COSTS AND BENEFITS

A benefit cost ratio is calculated based on the present value of the costs and benefits over the lifetime of the project. PGE has leveraged the National Standard Practice Manual, DOE's next generation of distribution planning, New York's BCA handbook, and California's DER ACC, which are vetted by experts across several jurisdictions and stakeholders to determine the range of costs and benefits applicable to NWS analysis. PGE screens each DER/program's benefit-cost ratio accounting for locational value, value stacking of bulk system benefits, and community values including reduction in energy burden, health and safety, and customer resilience, as applicable.

The resource economics may change based on available community partnership opportunities and various potential external funding arrangements. These will be reviewed on a case-by-case basis and may include efforts to pair NWS projects with local-, state-, or federal tax rebates or incentives, or any other means of supplemental funding that acts to reduce the total cost of delivering the NWS solution. In such cases, leveraging this cost share may tip the calculation in favor of projects that otherwise would not be cost-effective.

86. PGE appreciates the continued partnership from Energy Trust to identify additional ways to showcase the potential of energy efficiency investments to alleviate constraints on the distribution system and provide for additional GHG benefits to our communities. We believe that Energy Trust's experience with Targeted Load Management pilots for PacifiCorp and Northwest Natural will prove valuable if the pilot concepts are approved and move forward for further development. Due to staff and budget constraints for this filing expressed by Energy Trust, we opted to keep the energy efficiency potential assessment for the NWS at a high-level and therefore is subject to future refinements.

E.3.4 COMPILE NWS PORTFOLIO AND EVALUATE PERFORMANCE RISKS

PGE's preference is to leverage NWS to accelerate DER adoption and provide enhanced opportunities for customers to benefit directly from our distribution system investments, particularly EJ communities. Therefore, once the applicable resources and their respective characteristics are identified, the customer-sited DERs are assessed to determine if they can, in aggregate, meet the identified grid need for the required years. Based on the remaining need, the portfolio is either reduced or augmented (based on considerations of risk and cost, among others) with utility-scale solutions like front-of-the-meter storage.

When analyzing the performance of the portfolio, we will also consider the interactive effects of resources and any unintended consequences they may pose to the distribution system. PGE integrates the impact of a NWS within CYME through modified load profiles. The study area is simulated in CYME to determine if the NWS solution addresses all applicable thermal and voltage violations under both N-0 (normal) and N-1 (contingency) grid conditions. PGE will analyze peak and day-time minimum loading impacts, as applicable. If the NWS successfully addresses the applicable violations, the project is moved to the next step of decision making.

PGE is undertaking a multi-year effort to obtain the next generation of planning capabilities. Time-Series Power Flow is a key capability needed to study the impact over the course of a day, or potentially multiple days, that the NWS portfolio has on reducing thermal and voltage violations. This is a reflection of the fact that resources must be available at the right time of day, and potentially across multiple days and/or seasons (depending on the need being addressed). As part of the solution development, PGE will also consider eliminating NWS that may result in unsafe conditions and/or negatively impact equity, create equipment or human safety concerns, or other case-by-case considerations.

Given that there are significant unknowns about the reliability of DERs to provide locational grid services, PGE is adopting a phased approach to the implementation of customer programs where the range of potential demand reductions are large, meaning that either savings are unpredictable during peak conditions, or where savings can be significantly influenced by customer behavior, especially in smaller geographical footprints.

For instance, although certain programs (e.g., Peak Time Rebates or Time of Day pricing) offer potential for quick scaling and low cost of enrollment, they also are more variable in the shape of the savings provided and therefore increase uncertainty risks. Therefore, PGE will balance the amount of more reliable resources like battery storage and water heater DR programs, with more behavioral-based programs like these. In addition, key learnings of the pilot will be to further quantify and determine the operational characteristics of these resources when aggregated at smaller geographic scales. This type of information is important for system operators to develop the trust needed to call on these during contingency events.

E.4 Decision making

All wired and non-wired solutions are analyzed and compared via a comprehensive set of metrics and analysis. NWS can impact the following metrics:

- **Lifecycle cost of ownership.** Represents the delta between the current system and the proposed solution, where lifecycle cost of ownership is the cost to own and maintain asset(s) over time and is the NPV of cost stream, which includes maintenance, risk, and capital investment. Customer owned assets shift the cost to own and maintain asset(s) to the customers lowering the lifecycle cost of ownership and making the project more favorable.

- **Benefit cost (B/C) analysis.** For wired solutions, this metric compares the delta in lifecycle cost of ownership divided by capital investment required to determine whether risk and reliability benefits exceed investment. For NWS, it includes incremental costs and benefits that stem from the resource economics as detailed in the **NWS development process**. Thus, the benefit-cost analysis for NWS can include distribution system benefits such as the locational value, bulk system benefits such as capacity and energy, and applicable non-energy benefits, which can make it more favorable.

- **Near-term risk.** Annual probability of failure multiplied by consequence of failure. Consequence of failure is primarily focused on the customer's reliability experience, monetized by willingness-to-pay data. The analysis also includes, where applicable, calculated safety and environmental risks. The interaction of near-term risk with NWS portfolios is complex and may make the NWS more or less favorable for selection.

- **Equity metrics.** This is an emerging metric. NWS have the potential to positively impact equity metrics. We have outlined multiple pathways to develop an equity index in this report, including a comprehensive assessment of potential candidate variables across demographic, environmental, and resiliency categories, and will continue to work with DSP participants to appropriately integrate equity metrics into decision making for NWS projects.

- **Resilience metrics.** This is an emerging metric. Given the breadth of DER options evaluated, the impact on resiliency depends on both the definition given, and the operation of the DER type. Solar PV has the potential to provide backup generation during an outage if the inverter is set with appropriate settings. Similarly, battery storage can provide relief to the grid or can be reserved for providing maximum backup power to the customer in the event of an outage. Moreover, demand response and flexible loads provide value in an outage if they are configured as part of a microgrid, and therefore can help shed non-critical loads to maximize the availability of any on-site generation and storage. Given the inherent trade-offs concerning resilience impacts of NWS, further analysis is required to better understand these use cases.

Once each metric is calculated, PGE will leverage guidelines to score the different elements and determine the recommended solutions. Each metric has an associated weight that determines the effective impact of the metric to the final decision. These weights will be shared following the development of the equity metrics through the DSP public process.