

Appendix

Appendix A. 2019 IRP Action Plan in review

Portland General Electric Company's (PGE) 2019 Integrated Resource Plan (IRP) was developed in consultation with the Oregon Public Utility Commission (OPUC or the Commission), and public stakeholders. Through the March 16, 2020, Commission decision and subsequent order issued May 6, 2020, the Commission acknowledged, with conditions and additional directives, the 2019 IRP. The 2019 IRP focused on three categories of actions: customer resource actions, renewable actions, and capacity actions. This appendix reviews the 2019 IRP with a focus on those three categories.

A.1 Customer resource actions

Action 1A: Seek to acquire all cost-effective energy efficiency, which is currently forecasted by the Energy Trust of Oregon (ETO) to be 157 MWa on a cumulative basis by 2025.³⁷⁶

Action 1B: Seek to acquire all cost-effective and reasonable distributed flexibility

The Commission acknowledged these actions with additional conditions and directives:³⁷⁷

Before the next IRP, PGE will work with Energy Trust and stakeholders to explore the potential for PGE's portfolio modeling to select incremental energy efficiency that is least cost, least risk, beyond Energy Trust's baseline forecast.

Before the next IRP, PGE will work with Energy Trust to develop high and low energy efficiency forecasts that have internally consistent assumptions with the load scenarios.

Before the next IRP, PGE and Energy Trust will conduct a workshop regarding data center load and energy efficiency measures and consider the adoption of the Northwest Power and Conservation Council energy efficiency capacity value modifiers. Staff may request a study if needed.

In the next IRP, PGE is to report on trends of sales by customer class and DER installments for 2015 through 2019.

³⁷⁶ This forecast was current at the time of the 2019 IRP filing, July 19, 2019.

³⁷⁷ In the matter of Portland General Electric Company, 2019 Integrated resource plan, Docket No. LC 73, Order No. 20-152, pg. 22, available at: <https://apps.puc.state.or.us/orders/2020ords/20-152.pdf>

PGE has acquired 27.4 MWa in 2020 and 24.1 MWa in 2021 of cost-effective energy efficiency. These acquisitions compose 33 percent of the targeted 5-year goal of 157 MWa by 2025 as discussed during the 2019 IRP.

PGE has acquired distributed flexibility of 231.31 MW.

- 92.7 MW DR Summer / 62.8 MW DR Winter (Customer Programs)
- 8.5 MW Battery (Nameplate MW) (Grid-Edge)
- 130.1 MW DSG (Grid-Edge)

We have incorporated and discuss how PGE has worked with ETO in accordance with the Commission conditions regarding our work with ETO within this IRP, including their process for forecasting Energy Efficiency (EE) for PGE's IRP based on the analytical model, results from the recent IRP forecast for data center EE potential, examples of EE savings from past data center projects, technologies employed, costs, incentives, kWh and kW demand savings, and lessons learned from the evaluations (see **Chapter 6, Resource needs**). PGE and ETO held a technical discussion with Staff and public stakeholders on data center load and energy efficiency measures on March 8, 2023. Staff did not request a study related to energy efficiency capacity value modifiers for inclusion in the 2023 IRP.

PGE reports on trends in sales by customer class in **Section 6.1, Load forecast**. PGE has reported on trends of sales by customer class and Distributed Energy Resources (DER) installments for 2015 through 2019 in the DSP part 1, Section 1.5 of Chapter 1.³⁷⁸

A.2 Renewable actions

Action 2: As modified in PGE's final comments,³⁷⁹ PGE conducted an RFP seeking up to approximately 150 MWa of new, renewable resources that contribute to meeting PGE's capacity needs by the end of 2024.

PGE received regulatory approval to issue the 2021 All-Source RFP³⁸⁰ in December 2021, with the RFP structure reflecting the intent of the 2019 IRP Action Plan and the significant resource need to be driven by the passage of House Bill 2021 after the acknowledgment of the 2019 IRP. PGE's 2021 RFP saw robust participation, with 110 bid options received,

³⁷⁸ Distribution System Planning Part 1 available at:

https://assets.ctfassets.net/416ywc1laqmd/ELNdf17zyQvQiU9k71pIX/683cd2f7b3098517068c4594100a1025/DSP_2021_Report_Chapter1.pdf

³⁷⁹ PGE's Response to Staff Report at 4.

³⁸⁰ In the matter of Portland General Electric Company, Request for Proposal and Independent Evaluator, Docket UM 2166, Order No. 21-460

representing over 11,500 MW of potential resources. PGE's final shortlist proposed for Commission acknowledgment included 13 unique projects representing 599 MWa of energy and 497 MW of capacity contribution (ELCC - effective load carrying capacity).³⁸¹

The OPUC acknowledged PGE's final shortlist with conditions on July 15, 2022 (later memorialized in Order No. 22-315). In the Order, the Commission encouraged the Company to consider procuring approximately 250 MWa of renewable resources should procurement conditions warrant.³⁸² On October 25, 2022, PGE announced the procurement of the Clearwater Energy Center, a 311 MW portion of a wind facility located in Eastern Montana that will be constructed and operated by NextEra Energy Resources LLC. PGE continues negotiations with final shortlist bidders and will announce further actions upon execution of agreements.

PGE entered into three long-term solar contracts to support PGE's Green Future Impact (GFI) program. The 162 MW Pachwaywit Fields (also known as Montague Solar Facility) was announced in February 2020 and is expected to reach commercial operations by Fall of 2023 to support the GFI PGE supplied option phase I. Long-term agreements were also executed for the Bakeoven Solar Project and the Daybreak Solar Project to support GFI Customer supplied option for both phase I and phase II. The Daybreak and Bakeoven Solar Projects are expected to reach commercial operations by 2024.

A.3 Capacity actions³⁸³

Action 3A: Pursue cost-competitive agreements for existing capacity in the region.

Action 3B: Update the Commission and stakeholders on the status of PGE's bilateral negotiations and any resulting impacts on capacity needs.

PGE and Douglas County Public Utility District No.1 signed a five-year power purchase agreement to supply PGE customers with up to 160 MW of additional capacity from the Wells Hydroelectric Project on the Columbia River north of Wenatchee, Washington. The five-year agreement began in January 2021. PGE successfully executed a long-term contract for the

³⁸¹ PGE's final shortlist request for acknowledgment, filed May 5, 2022, available here:

<https://edocs.puc.state.or.us/efdocs/HAH/um2166hah151340.pdf>

³⁸² Order No 22-315 at Page 5

³⁸³ In the final comments, PGE proposes size limits that would apply across all procured resources. For capacity, PGE proposes not to exceed PGE's identified 2025 Reference Case capacity need of 697 MW for the combined capacity contribution of all procured resources; PGE will refine that maximum following an updated needs assessment prior to any RFP. For energy, PGE proposes to constrain energy additions across the capacity action and the renewable action to approximately 150 MWa to align with the 250 MWa portfolio screen and the expectation that bilateral procurement will result in some energy additions. The Commission acknowledged these actions with the additional condition that PGE must optimize its procurement approach.

output of Pelton Round Butte Project share owned by the Confederated Tribes of Warm Springs (CTWS). The fifteen-year agreement begins in 2025 and secures long-term off-take for 249 MW

As discussed in the OPUC Special Public Meeting on April 20, 2021, PGE procured both capacity and energy through a single all-source RFP. The final shortlist, acknowledged with conditions on July 14, 2022, and memorialized in Order No. 22-315, included 497 MW capacity contribution (ELCC) through five projects.

Our 2021 IRP Update,³⁸⁴ filed January 29, 2021, updated the Commission on our use of bilateral negotiations to procure needed capacity. Pursuant to Order No. 21-129, we kept the Commission and Staff informed on negotiations and ultimately executed contracts totaling 234 MW of nameplate capacity using the bilateral procurement process.

A.4 2019 Action Plan checklist order no. 20-152

Table 77. Requirements and compliance from Order 20-152

Requirement	PGE compliance
<p>Order 20-152 at 2 We ask PGE to continue working to build a common understanding of its modeling terms and processes.</p>	<p>PGE communicates IRP analysis through a series of public meetings and informal communication. The process is open to the public and building understanding with participants is a key objective of these meetings. See Appendix C, 2023 IRP public meeting agendas.</p>
<p>At 7</p>	<p>PGE complies with this requirement as part of IRP analysis and development. GFI resources are included in 2023 IRP modeling. See Chapter 6, Resource needs.</p>

³⁸⁴ In the matter of Portland General Electric Company, Integrated Resource Planning, Docket No. LC 73, Order No. 21-129 <https://apps.puc.state.or.us/orders/2021ords/21-129.pdf>

Requirement	PGE compliance
<p>PGE does not exclude load associated with its voluntary green energy programs. PGE states that, because these programs have not yet started or are relatively new, the 2019 IRP considers potential customer participation in these programs in sensitivities. PGE states the sensitivities have little impact on PGE's needs. PGE states it will monitor participation in future IRPs and IRP Updates.</p>	
<p>At 8 We also direct PGE to incorporate examination of customer program growth assumptions, including utility-offered programs and direct access, in its next IRP.</p>	<p>PGE included the most up to date forecasts of customer programs, including both utility-offered programs and direct access; See Section 3.1.7, Regulatory policy: Direct access of Chapter 3, Planning environment.</p>
<p>At 8 PGE stated it would continue to examine options related to Colstrip units 3 and 4 as additional information becomes available and will continue to prioritize cost impacts and risks to customers, reliability, and GHG emissions implications.</p>	<p>PGE continues to perform this work as part of IRP analysis and development. See Section 6.10, Need sensitivities of Chapter 6, Resource needs.</p>
<p>At 9 PGE communicated a sense of urgency to complete a Colstrip study and committed to complete the analysis by July 31, 2020. We consider this time frame reasonable, and because we expect that discussion of PGE's study will provide a framework for next steps, we do not establish a required schedule for updates at this time.</p>	<p>Complete Colstrip enabling study.³⁸⁵</p>

³⁸⁵ The Colstrip enabling study is available at: <https://assets.ctfassets.net/416ywc1laqmd/2AK9jf4GCmd1tyaLA8EODE/fb40144334f40fab7cc2e001676f1977/2020-colstrip-enabling-study.pdf>

Requirement	PGE compliance
<p>At 15 We recognize Staff and stakeholders' growing frustration with PGE' s insistence on physical compliance modeling, and consider it important for PGE to proactively, consistently, and clearly show how portfolio results would change if PGE used an RPS compliance assumption that more closely matches its actual compliance strategy. This would involve maximizing use of unbundled RECs, which PGE has consistently done for RPS compliance, and should also involve using portfolio optimization tools to inform the least cost, least risk RPS compliance strategy.</p>	<p>PGE discusses RPS requirements and our expectations of future REC generation in Section 6.7, RPS need, Section 11.4.6, Targeted policy portfolios, and Section 11.5.2, Resulting RPS position.</p>
<p>At 16 We appreciate that PGE agreed to provide a climate adaptation strategy as an enabling analysis for the next IRP. This will be a helpful document to orient discussions around low water conditions, new flow patterns, and higher temperatures resulting from climate change.</p>	<p>PGE worked with an external consultant to evaluate how climate adaptation should be incorporated into long-term utility modeling; see Ext. Study-III, Climate adaptation. PGE then took recommendations from this work and evaluated three climate adaption sensitivities; see Section 6.9, Climate adaptation.</p>

Requirement	PGE compliance
<p>At 16 To advance a common understanding of whole portfolio decarbonization, we plan to hold a Commission workshop during the 2021 IRP development process to assess PGE's progress in developing and representing in its IRP a holistic decarbonization strategy, in the context of how other GHG policy drivers have developed. It is important that PGE consider its entire portfolio-including existing resource dispatch and transitions, new resource additions, and customer and demand-side resources-to deliver a full picture of how a least-cost, least-risk portfolio may also meet customer, company, community, and state decarbonization goals.</p>	<p>Compliance with House Bill 2021 satisfies this request.</p>
<p>At 16-17 We encourage PGE to consider portfolios that achieve PGE's proportionate share of the greenhouse gas emission reductions in Executive Order No. 20-04, as well as developing least-cost, least-risk strategies for assisting communities in its service territory that seek deeper, faster reductions.</p>	<p>PGE included a robust discussion of the pace of decarbonization pathways going forward; See Chapter 5, GHG emissions forecasting and Section 11.4.1, Decarbonization glidepath portfolios.</p>
<p>At 17 PGE explained the difficulties with transmission modeling, as transmission availability is constantly changing, and upgrade costs are not known until a specific project is studied. Nonetheless, PGE agreed to investigate how it can incorporate transmission availability of sub-regions to inform resource choices.</p>	<p>PGE has incorporated transmission availability into portfolio modeling through data pulled from Bonneville Power Administration's (BPA) Transmission Study and Expansion Process (TSEP) and from an analysis of planned upgrades that may impact PGE's system. PGE describes transmission availability in Chapter 9, Transmission and its impact on portfolio selection in Chapter 11, Portfolio analysis.</p>

Requirement	PGE compliance
<p>At 19 PGE's nontraditional screens were valuable here as a way to focus on key portfolio attributes, but in the future PGE should work closely with stakeholders to gain broad understanding of significant non-traditional screens before PGE uses a specific criterion as a constraint in modeling or as a screen in scoring.</p>	<p>PGE complies with this requirement in Chapter 11, Portfolio analysis, and through discussion about scoring metrics and portfolio analysis assumptions at several IRP Roundtable meetings</p>
<p>At 19 PGE should continue to work with Staff and stakeholders to explore how to model the cost and risk tradeoffs of energy additions in this environment.</p>	<p>PGE complies with this requirement in Chapter 11, Portfolio analysis and through discussion about scoring metrics and portfolio analysis assumptions and results at several IRP Roundtable meetings</p>
<p>At 19 ...PGE also will need to consider future changes in energy markets, such as the potential transition to security-constrained, economic dispatch day-ahead markets, and how its resources will perform against market-wide clearing prices.</p>	<p>PGE evaluates its resource portfolio against Western Power prices that are simulated in Aurora. This simulation approximates a Western economically dispatched day-ahead market. See Appendix H, 2023 IRP modeling details for more information on the Aurora model.</p>
<p>At 19 ...PGE will need to continue to evaluate and balance the tradeoffs between more certain near-term rate impacts and less certain long-term projected cost savings.</p>	<p>Chapter 11, Portfolio analysis includes a substantial discussion about the trade-offs associated in resource planning between near- and -term costs.</p>
<p>At 19-20 ...PGE will also need to continue to support its proposal as it moves forward in changed circumstances, assessing whether the impacts of the COVID-19 pandemic are a material change to forecasts, needs, and its customers' tolerance for near-term rate pressure.</p>	<p>PGE includes a substantial discussion of the effects of the pandemic as well as other developments in load forecasting in Section 6.1, Load forecast and Appendix D, Load forecast methodology.</p>

Requirement	PGE compliance
<p>At 21 We agree that it is important to understand how PGE' s forecast would change with more aggressive energy efficiency measures, and also require PGE to explore the significant, cost-effective energy efficiency opportunities that may exist with data centers that are a significant component of industrial load growth.</p>	<p>PGE evaluated the cost and risk trade-offs associated with the addition of more EE adoption in portfolio analysis; see Section 8.2, Additional distributed energy resources and Chapter 11, Portfolio analysis for more detail.</p> <p>With the Energy Trust of Oregon PGE presented on the topic of EE opportunities at data centers at the March 8th, 2023 round table.</p>
<p>At 22 Before the next IRP, PGE will work with Energy Trust and stakeholders to explore the potential for PGE's portfolio modeling to select incremental energy efficiency that is least cost, least risk, beyond Energy Trust's baseline forecast.</p>	<p>PGE evaluated the cost and risk trade-offs associated with the addition of more EE adoption in portfolio analysis; see Section 8.2, Additional distributed energy resources and Chapter 11, Portfolio analysis for more detail.</p>
<p>At 22 Before the next IRP, PGE will work with Energy Trust to develop high and low energy efficiency forecasts that have internally consistent assumptions with the load scenarios.</p>	<p>PGE included high and low EE forecasts developed by the ETO; see Section 6.2, Distributed Energy Resource (DER) impact on load. PGE then incorporated those forecasts into its Need Futures, described in Section 6.6.1, Capacity under different Need Futures.</p>
<p>At 22 Before the next IRP, PGE and Energy Trust will conduct a workshop regarding data center load and energy efficiency measures and to consider adoption of the Northwest Power and Conservation Council energy efficiency capacity value modifiers. Staff may request a study if needed.</p>	<p>This workshop was held March 8, 2023.</p>

Requirement	PGE compliance
<p>At 22 In the next IRP, PGE is to report on trends of sales by customer class and DER installments for 2015 through 2019.</p>	<p>PGE provided these data in the 2019 IRP Update Appendix B and Appendix C.³⁸⁶</p>
<p>At 23 At the meeting, we also made special reference to the need for PGE to examine the implications of the COVID-19 public health crisis and corresponding economic disruption that were just emerging in Oregon as we made our acknowledgment decision in this case.</p>	<p>PGE discussed these topics in Chapter 6, Resource needs.</p>

³⁸⁶ See pages 60-61: <https://edocs.puc.state.or.us/efdocs/HAH/lc73hah13049.pdf>

A.5 2021 IRP update order no. 21-129³⁸⁷

Requirement	PGE compliance
<p>At 2 Our deliberations involved two categories of interrelated issues, ELCC methodology and PGE's assumptions for new baseline solar resources. For methodology, PGE uses a single year of 2025, and we adopt Staff's recommendation for PGE to compute ELCC values by year and present the findings with its next IRP.</p>	<p>We complied by estimating annual ELCCs by resource from the first main year of need through 2026, in line with the best practices provided by UM 2011. See Appendix K, Tuned system ELCCs.</p>
<p>At 4 We find it is reasonable for PGE to complete its supply side resource study that is currently underway and update costs and operating characteristics of generation resources in the next IRP.</p>	<p>PGE conducted its own evaluation of supply-side options; see Appendix M, Supply-side options.</p>
<p>At 1, 6 Staff requests that PGE compute effective load carrying capability (ELCC) values by year and present the findings with its next IRP. Staff and stakeholders can use the findings to determine whether the impact of resource retirements and additions, and other changes in the load and resource balance, significantly change the ELCC values.</p>	<p>Complete; see Appendix K, Tuned system ELCCs.</p>

³⁸⁷ In the matter of Portland General Electric Company, Integrated Resource Planning, Docket No. LC 73, Order No. 21-129, available at: <https://apps.puc.state.or.us/orders/2021ords/21-129.pdf>

Requirement	PGE compliance
<p>At 1, 6 Staff requests a workshop with PGE for the purpose of working with PGE before the 2021 IRP is filed to look at natural gas generation in the "high renewables buildout" price forecast and discuss whether gas resources would be likely to generate significantly less in that future, thus reducing market prices.</p>	<p>PGE is not using a high-renewable buildout in this IRP.</p>
<p>At 4 PGE should update its GEAR resources to include the recently approved customer-supplied option in Commission Order No. 21-053 in the base portfolio. The executed contract should not be treated as a sensitivity because it is now a reality.</p>	<p>All GFI resources are included in the IRP planning models.</p>