1 Executive Summary

The IRP is best understood as a thorough analysis of a range of potential future resource portfolios, considering customer energy needs, policies, resource costs, economic conditions and the physical energy system. From this comprehensive view of many different futures, PSE identifies the actions which best balance cost and risk, while meeting both policies and customers' energy needs. Forecasts and plans will change as the future unfolds and conditions change, which is part of PSE's commitment to ensure ongoing reliable, safe, affordable and equitable energy for its customers.

1 Executive Summary

Contents

1. OVERVIEW

PSE is excited to share the first draft resource plan that meets the Clean Energy Transformation Standards and supports all PSE customers in benefitting from a transition to clean energy at the lowest reasonable cost. The draft electric plan:

a. Eliminates all coal-fired resources from meeting PSE customers' electricity needs by the end of 2025.
b. Provides greenhouse gas neutral electricity starting in 2030 through the end of 2044 through the addition of renewable resources.
c. Maximizes cost-effective, reliable conservation and prioritizes distributed energy resources and demand response.

In meeting the Clean Energy Transformation Standards and the requirements of the Clean Energy Transformation Act (CETA), the electric resource plan prioritizes cost-effective, reliable conservation and demand response, distributed and centralized renewable and non-emitting resources, at the lowest reasonable cost to our customers. Through this portfolio, the draft electric resource plan achieves significant carbon reductions, reducing carbon from PSE's electric supply by over 70 percent in direct emissions by 2029, and achieving carbon neutrality by 2030 through energy transformation projects. While implementing this highly decarbonized portfolio, the plan maintains safety, reliability and resource adequacy.

The natural gas resource plan calls for increased and continued conservation investment, which will eliminate the need to lock our natural gas customers into lengthy contracts to expand regional pipeline infrastructure. PSE is exploring the most cost-effective approaches to reduce the overall greenhouse gas emissions from the natural gas system. Further analysis is required to understand reductions in greenhouse gas emissions that may be achieved from cost-effective electrification opportunities and low-carbon gaseous fuels, which have not yet been evaluated in this draft IRP. Further analysis of cost-effective electrification opportunities will be evaluated and included in the final IRP.

The draft electric and natural gas plans were developed with stakeholder input over the last eight months. PSE believes that stakeholder input has improved the 2021 IRP. Public and stakeholder engagement is an essential part of developing an IRP and the engagement generated valuable constructive feedback and suggestions from organizations and individuals that helped inform the IRP analysis. The 2021 IRP had significantly enhanced public participation compared to IRPs, and PSE will continue to learn from this experience and enhance public participation in future IRPs.

1 Executive Summary

Between the last stakeholder meeting hosted on December 15, 2020 and the publication of this draft IRP on January 4, 2021, PSE has continued with the portfolio analysis and has been able to make significant progress, which is reflected in the draft preferred resource plan. The portfolio results and materials included in this draft have not all been shared with stakeholders prior to filing due to the timeline; however, PSE looks forward to stakeholder feedback on the new portfolio results and the draft resource plan presented here in meetings scheduled for early 2021. The IRP analysis is continuing, and areas where additional work is planned between now and the final IRP are summarized below in the “Next Steps” section of the Executive Summary.

The draft IRP is an important step in the public process. PSE will obtain public comments in writing from the Washington Utilities and Transportation Commission (WUTC) and at an upcoming open meeting hosted by the WUTC, and this feedback will be considered in drafting the final IRP, due in April 2021. The draft 2021 IRP is a work in progress. PSE is committed to continuing to improve planning and implementation through this 2021 process and in the years ahead.

The Resource Planning Process

The IRP/Clean Energy Action Plan (CEAP) process evaluates a range of potential futures and identifies the preferred portfolio as the lowest reasonable cost combination of energy conservation, distributed resources and utility-scale supply resources to meet the future needs of our customers. Specific energy efficiency, supply-side resource, distributed resource decisions and implementation of customer programs are not made in the context of the IRP.

The portfolio analysis presented in the IRP is best understood as a forecast of resource additions that appear to be cost effective given what we know today about the future. Advancement in technologies, increased renewable fuel supply options, lower resource costs, new policies, wholesale market evolution and other elements will change these forecasts.

The IRP determines the supply-side capacity, renewable energy and energy need which set the supply-side targets for future detailed planning in the Clean Energy Implementation Plan (CEIP) and the resource acquisition process. Informed by the IRP/CEAP, the CEIP will prescribe four-year targets for resources, programs, and enabling systems by incorporating more accurate costs and feasibility for programs and projects, as well as the equitable distribution of benefits to customers.

Next Steps

This draft IRP is published three months before the final IRP. The final proposed IRP and CEIP rules were adopted on December 28, 2020, just days before this filing is due. There are several important components of the analysis that are not yet complete; these are summarized below. Both the analysis and the public participation process continue into early 2021. PSE plans to complete the remaining analysis and solicit stakeholder input in two upcoming public meetings, in addition to obtaining feedback from the WUTC's recessed open meeting and written comment period. Once all of the analysis is completed, the Preferred Portfolio, CEAP and Action Plans will be updated and finalized. The WUTC reviews and acknowledges the final IRP after it is filed. The analysis, assessments and evaluation still to be completed for the final IRP are as follows.

- **SCENARIOS AND SENSITIVITIES**. The IRP uses scenarios and sensitivities to evaluate a range of possible future conditions. Stakeholders played an important role in developing the sensitivities in this IRP, as documented in Appendix A. Portfolio results are available for many scenarios and sensitivities in Chapter 8. However, some important sensitivities are yet to be completed, including a gas-to-electric fuel conversion sensitivity and a temperature sensitivity designed to capture climate change impacts on demand. As these results are analyzed, PSE may evaluate additional portfolio sensitivities.
- **MARKET RELIANCE ANALYSIS**. An analysis of short-term and long-term market purchases to meet long-term peak planning will be available in the final IRP. This analysis will inform the degree to which PSE should rely on market purchases for peak capacity planning.
- **ECONOMIC, HEALTH AND ENVIRONMENTAL ASSESSMENT OF CURRENT CONDITIONS.** The methodology and approach for this assessment is described in Appendix K, which builds on the Department of Health's Washington Tracking Network. The assessment is informed by discussions of the Department of Health's draft Cumulative Impact Analysis (the final Cumulative Impact Analysis is not yet available). This adds new elements to consider in determining the lowest reasonable cost analysis, as required by CETA.
- **STOCHASTIC ANALYSIS**. To assess the risk of changes in hydro or wind conditions, electric and natural gas prices, load forecasts and plant-forced outages, and to observe how costs change across portfolios, PSE will complete the stochastic analysis for the final IRP.
- **FLEXIBILITY ANALYSIS**. The flexibility analysis explores the sub-hourly flexibility needs of the portfolio and determines how new and existing resources contribute to meeting those needs. PSE presented the draft flexibility analysis modeling approach and results to stakeholders on December 15, 2020 and solicited stakeholder feedback. PSE has met with stakeholders regarding the analysis and is still in the process of incorporating that

feedback. The final flexibility results will be included in the updated portfolio analysis for the final IRP.

- **MAXIMUM CUSTOMER BENEFIT SCENARIO**. This is a new scenario and PSE is working with the WUTC to understand the expectations and realistic options for completing this scenario in the 2021 IRP. Further guidance is required from the WUTC to understand the details of the scenario.
- **ENERGY ASSISTANCE ASSESSMENT.** By July 31, 2021, PSE will provide an assessment to the Department of Commerce of mechanisms pertaining to energy assistance, as well as progress toward meeting customer energy assistance need. Existing PSE programs include bill assistance and weatherization services. Currently, PSE does not have any distributed energy resource (DER) programs as part of its energy assistance strategy. However, in future years, there may be programs and mechanisms that could be used to meet customer energy assistance need, and those programs will be considered and incorporated into the IRP as indicated in draft WAC 480-100-610(3). In examining energy assistance need, PSE will continue review of its recently completed Low-income Needs Assessment. In addition, PSE will conduct further qualitative research and analysis to better understand the barriers to serving low-income customers in order to encourage further participation of income-eligible households in the weatherization and bill assistance programs.
- **AVOIDED COST ANALYSIS.** An analysis of the avoided cost estimate for energy, capacity, transmission, distribution and greenhouse gas emissions will be included in the final IRP.

2. ELECTRIC PREFERRED PORTFOLIO

PSE's commitments to reducing greenhouse gas emissions and maintaining affordability and reliability for PSE customers are embodied in the draft preferred portfolio.

The IRP analyzes a range of potential future resource portfolios to identify the least cost, least risk portfolios that meet energy needs while ensuring reliability and incorporating policy requirements. The resource plan should be interpreted as a forecast of resource additions that look like they will be cost effective in the future, given what we know about resource and technology trends today.

This section describes the draft preferred portfolio and how it meets PSE's electricity needs. The draft preferred portfolio is one of a range of portfolios that PSE modeled for this IRP that meets the Clean Energy Transformation Standards. The inputs were developed through an evaluation of portfolio results from stakeholder-selected sensitivities and tested against the least cost portfolio selected by the deterministic portfolio analysis. Deterministic portfolio analysis assumes perfect foresight about the future, so to assess the risk of potential future changes in hydro or wind conditions, electric and natural gas prices, load forecasts and plant forced outages PSE also performs a stochastic portfolio analysis that will be completed for the final IRP. For a comparison of the resource additions, costs and emissions from the portfolios evaluated so far, see Chapters 3 and 8.

Electric Resource Need

PSE's energy supply portfolio must meet the electric needs of our customers reliably. For resource planning purposes, those physical needs are simplified and expressed in three measurements: (1) peak hour capacity for resource adequacy, i.e., does PSE have the amount of capacity available in each hour to meet customer's electricity needs; (2) hourly energy, i.e., does PSE have enough energy available in each hour to meet customer's electricity needs; and (3) renewable energy, i.e., does PSE have enough renewable and non-emitting resources to meet the annual delivered load.

To ensure that peak capacity needs are met, operating reserves provide additional, accessible electricity available fo unexpected conditions. These are required by contract with the Northwest Power Pool and by the North American Electric Reliability Corporation (NERC) to ensure total system reliability in case of unforeseen changes in generation or delivery availability.

As part of meeting energy needs, Washington State has two laws that require electricity to be supplied by renewable resources. The first is a renewable portfolio standard (RPS), enacted in 2006, which requires PSE to meet specific percentages of our load with renewable resources or renewable energy credits (RECs). Under the RPS, PSE must meet 15 percent of its energy needs with RPS-qualifying renewable energy. The second renewable energy requirement is Washington State's Clean Energy Transformation Act (CETA), enacted by the legislature in 2019 and still in rulemaking. CETA requires that the 2030 electric supply be carbon neutral, such that at least 80 percent of Washington state electric sales (delivered load) are met by non-emitting or renewable resources by 2030, and 100 percent of sales must be met with renewable or non-emitting electricity by 2045.

In addition to peak capacity, energy and renewable energy needs, PSE will evaluate sub-hourly flexibility in this IRP. The sub-hourly analytical framework developed for this IRP has been shared with stakeholders to solicit feedback and will be completed for the final IRP.

Electric Peak Hour Capacity Need

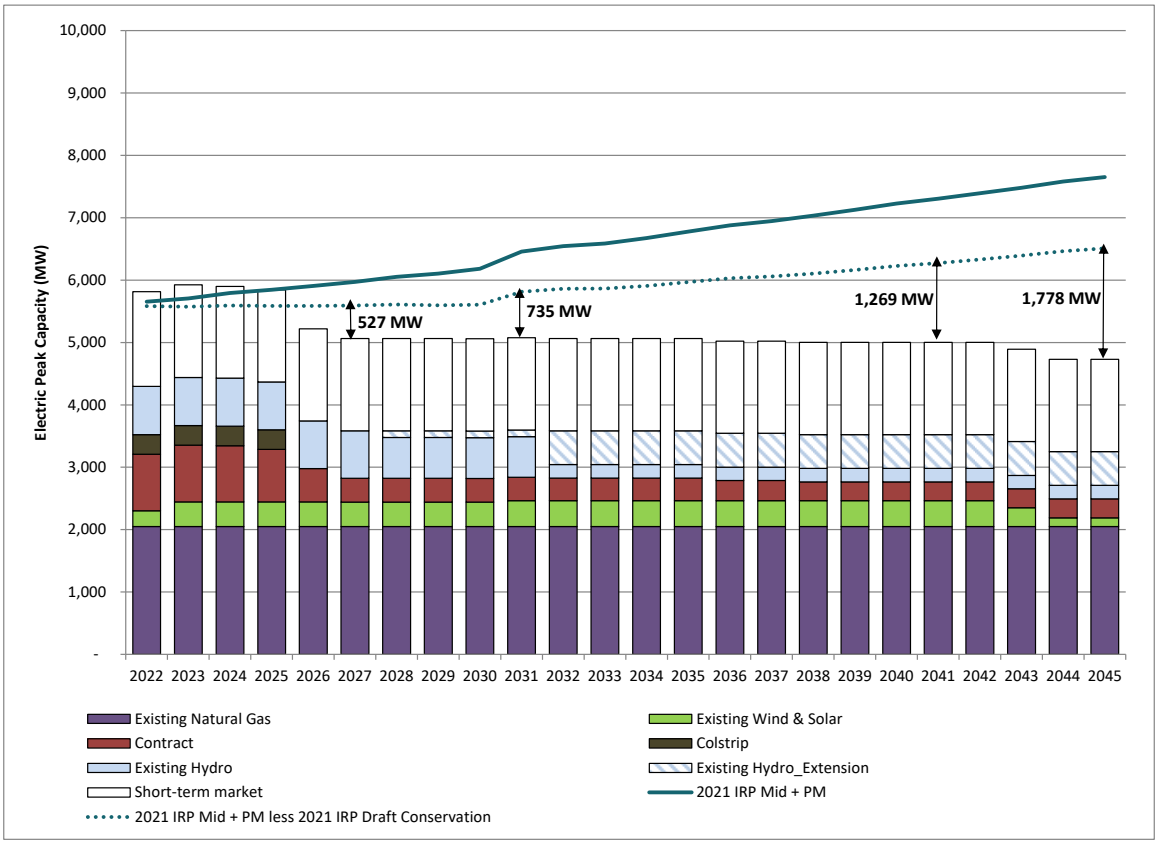
Figure 1-1 compares the existing resources available to meet peak hour capacity[1] with the projected need over the planning horizon. Before any additional demand-side resources, peak capacity need in the mid demand forecast plus planning margin is 907 MW by 2027 and 1,381 MW in 2031 (represented by the teal line). This includes a 20.7 percent planning margin (a buffer above a normal peak) to achieve and maintain PSE's 5 percent loss of load probability (LOLP) planning standard. Figure 1-1 shows a noticeable drop in PSE's resource stack at the end of 2025. The drop is caused by the elimination of Colstrip 3 & 4 from PSE's energy supply portfolio starting in 2026, which removes approximately 370 MW of capacity, and the expiration of PSE's 380 MW coal-transition contract with TransAlta when the Centralia coal plant is retired at the end of 2025.[2]

Cost-effective, reliable demand-side resources (DSR) play an important role in moderating the need to add supply-side resources in the future. This can be seen in the dashed teal demand line in Figure 1-1. The dashed line includes the benefit of DSR, which reduces peak need in 2027 from 907 MW to 527 MW.

The peak capacity deficit assumes that 1,500 MW of market purchases is available to meet peak capacity need. Further analysis of market availability is forthcoming in the final IRP and may change PSE's electric peak hour capacity need.

1 / Resource capacities illustrated here reflect the contribution to peak, not nameplate capacity. Refer to Chapter 7, Resource Adequacy Analysis, for how peak capacity contributions were assessed.
2 / PSE entered the coal transition contract with Transalta under RCW 80.80 to facilitate the retirement of the only major coal-burning power plant in Washington state.

Figure 1-1: Electric Peak Hour Capacity Resource Need after Cost-effective Demand-side Resources



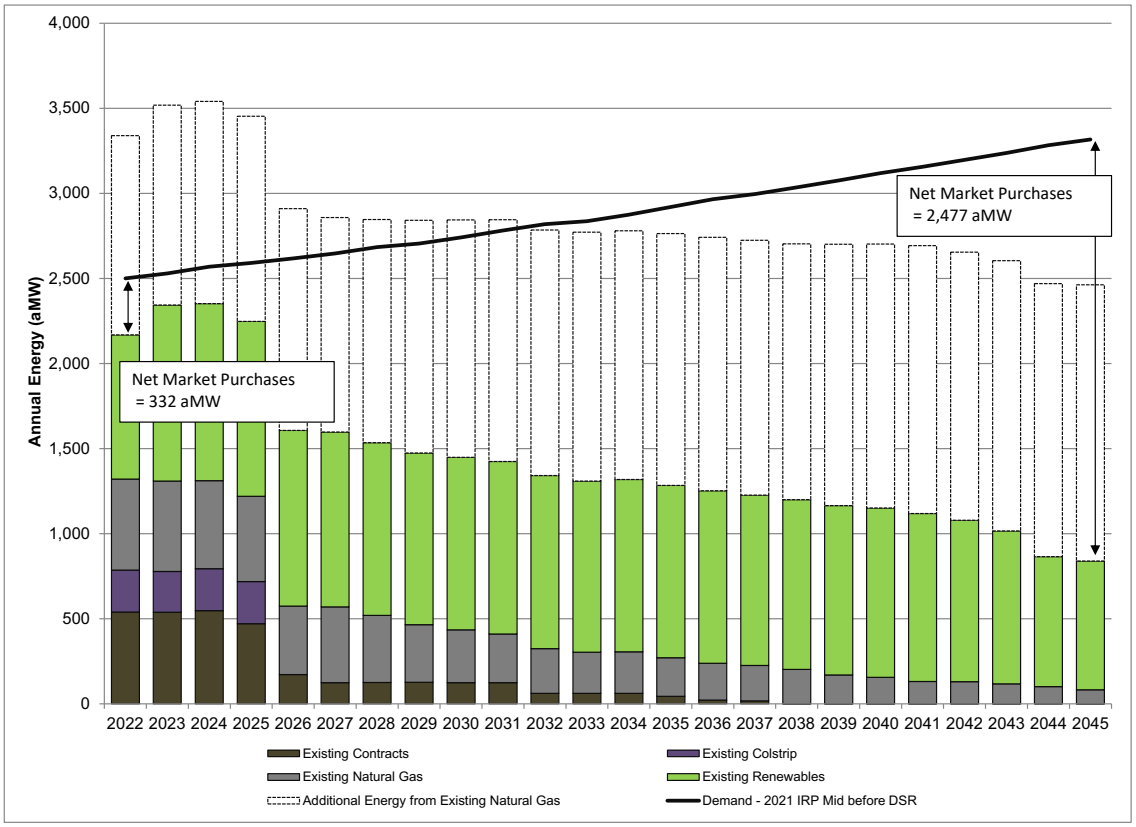
Electric Energy Need

Customers' energy need must be met every hour. PSE's analytical models require portfolios to supply the amount of energy needed to meet physical loads, and also examine how to do this most economically through existing resources, new resources, and purchasing and selling energy from the wholesale market at the Mid-C trading hub.

PSE's existing portfolio of supply-side and demand-side resources could generate more energy than needed to meet load on an hourly basis through to 2031; however, it is often more cost-effective to purchase wholesale market energy than dispatch our existing resources. To model how PSE may make these dispatch or purchase decisions in the future, we do not constrain the model to dispatch resources that are not economic; if it is less expensive to buy power than to dispatch a generator, the model will choose to buy power in the market. In recent years, the region has experienced periods of high price volatility and limited market liquidity. This presents a potential future risk for PSE's customers, and PSE may have to adjust its market purchase strategy going forward. PSE is evaluating the potential impacts of market purchases becoming unavailable to the portfolio. The full analysis will be available in the final IRP.

Figure 1-2 illustrates the company's energy position across the planning horizon, based on the energy load forecasts and economic dispatches of the Mid Scenario presented in Chapter 5, Key Analytical Assumptions. The white dashed box at the top of each bar indicates the total energy available from PSE's thermal resources if they were run without regard to economic dispatch. This chart shows that without any additional demand-side or supply-side resources, PSE could generate enough energy on an annual basis through 2031.

Figure 1-2: Annual Energy Position with Energy from All Existing Thermal Resources



Renewable Need

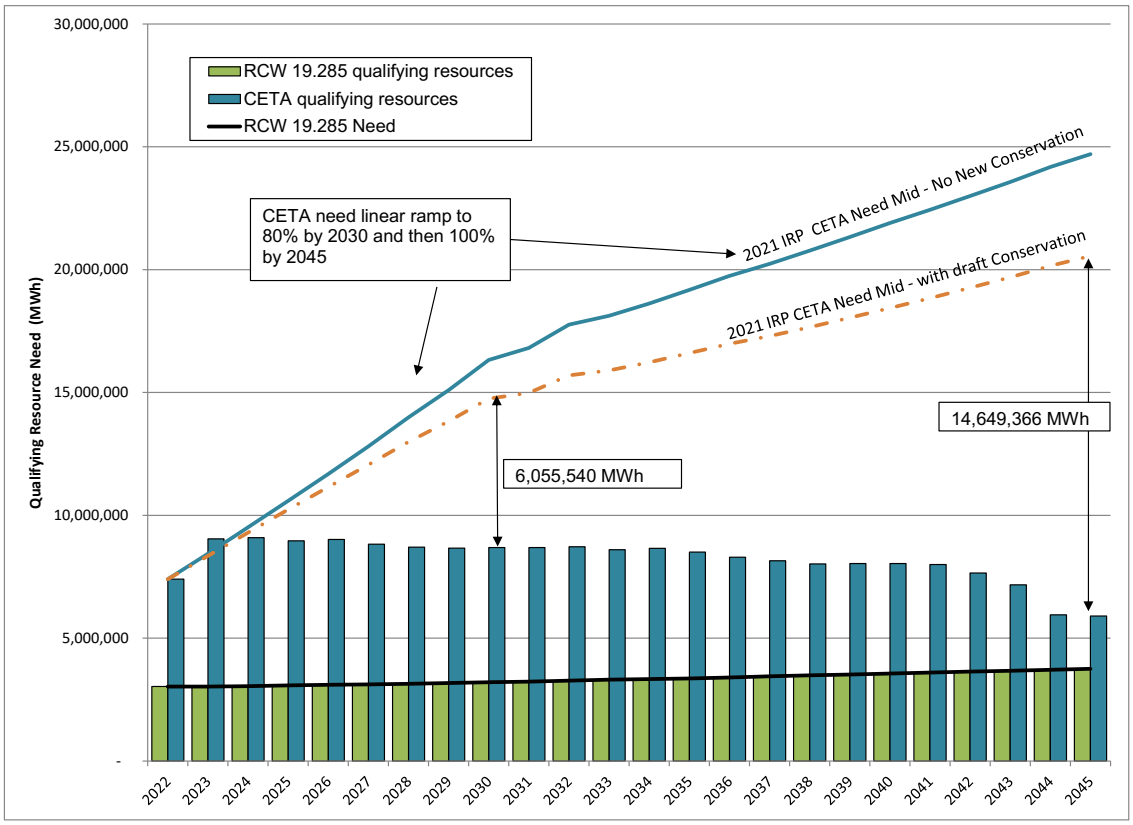
In addition to reliably meeting the physical needs of our customers, RCW 19.285 – the Washington State Energy Independence Act – establishes three specific targets for qualifying renewable energy, commonly referred to as the state's renewable portfolio standard. Sufficient "qualifying renewable energy" must equal at least 3 percent of retail sales in 2012, 9 percent in 2016, and 15 percent in 2020. Existing hydroelectric resources may not be counted towards RPS goals except under certain circumstances for new run of river plants and efficiency upgrades to existing hydro plants. PSE has sufficient qualifying renewable resources to meet RPS requirements.

Washington State's Clean Energy Transformation Act (CETA) requires that at least 80 percent of electric sales (delivered load) in Washington state must be met by non-emitting or renewable resources by 2030 and 100 percent by 2045. Demand-side resources decrease electric delivered load, which then decreases the amount of renewable resources needed. One important difference between CETA and RCW 19.285 is that hydro resources are qualifying renewable

resources for compliance with CETA, and other non-emitting resources can also be used to meet CETA requirements.

Figure 1-3 illustrates the renewable energy need for both RCW 19.285 and CETA based on the 2021 IRP mid demand forecast. PSE assumed a linear ramp to achieve the Clean Energy Transformation Standards. Figure 1-3 shows the renewable need with draft 2021 IRP cost-effective conservation, which includes energy efficiency, codes and standards, distribution efficiency and customer-owned solar PV. By including these conservation resources, PSE's need for new renewable or non-emitting resources in 2030 drops from 7.6 million MWh to 6.1 million MWh to achieve an 80 percent renewable or non-emitting resource portfolio.

Figure 1-3: Renewable Need after Cost-effective Demand-side Resources



Electric Preferred Portfolio

As explained above, the lowest reasonable cost portfolio produced by the IRP analysis is not an action plan; rather, it is a forecast of resource additions developed by the modeling that appears most cost effective in the future, given the resource and market trends observed today.

As discussed earlier, several components of the IRP analysis will be completed for the final IRP, due to be filed with the WUTC on April 1, 2021. The preferred portfolio presented in this section may change once all of the analyses are complete.

Figure 1-4 summarizes the forecast for additions to the electric resource portfolio in terms of peak hour capacity over the next 24 years. This forecast is the "integrated resource planning solution."[3] It reflects the lowest reasonable cost portfolio of demand- and supply-side resources that meets the projected capacity, energy and renewable resource needs described above.

There are many exciting changes in the resource outlook:

- **ACCELERATED ACQUISITION OF ENERGY CONSERVATION**. This plan includes aggressive, accelerated investment in helping customers use energy more efficiently.
- **EMERGENCE OF DISTRIBUTED ENERGY RESOURCES**. Distributed energy resources, such as battery energy storage and rooftop as well as ground-mounted solar, play an important role in balancing large-scale utility investments and transmission constraints. They may also meet specific, long-term needs identified on the transmission and distribution system.
- **INCREASED DEMAND RESPONSE**. Compared to previous plans, increased demand response appears as a cost-effective resource earlier in the planning horizon.
- **NEED FOR FLEXIBLE, DEPENDABLE CAPACITY**. 750 MW of coal is removed from PSE's portfolio in 2026, which creates a large capacity deficit. While utility-scale renewable resources, distributed energy resources and demand response all contribute to meeting peak hour capacity need, additional flexible capacity is needed to maintain an adequate resource system.
- **SIGNIFICANT INVESTMENTS IN RENEWABLE RESOURCES**. Meeting the clean energy transformation standards will take large amounts of utility-scale renewable resources located both inside and outside of Washington state. Montana and Wyoming wind power is expected to be more cost effective than wind and solar from the Pacific Northwest because it provides a higher contribution to peak capacity needs.

3 / Chapter 3 includes a detailed explanation of the reasoning that supports each element of the preferred portfolio.

Figure 1-4: Electric Preferred Portfolio,
Incremental Nameplate Capacity of Resource Additions

Resource Additions (MW)	2022-2025	2026-2030	2031-2045	Total
Distributed Energy Resources				
Demand Side Resources	256 MW	360 MW	1,168 MW	1,784 MW
Battery Energy Storage	75 MW	125 MW	550 MW	750 MW
Solar - ground and rooftop	80 MW	150 MW	450 MW	680 MW
Demand Response	10 MW	161 MW	44 MW	215 MW
DSP Non-Wire Alternatives	22 MW	24 MW	72 MW	118 MW
Total DER	443 MW	820 MW	2,284 MW	3,547 MW
Renewable Resources	600 MW	1,100 MW	2,762 MW	4,462 MW
Flexible Capacity	0 MW	237 MW	711 MW	948 MW

Demand-side Resources (DSR): Energy Efficiency

The draft IRP analysis looks at the amount of energy efficiency that is cost effective to meet the portfolio's capacity and energy needs, optimizing lowest cost against distributed and centralized resources. PSE's draft analysis indicates that although current market power prices are low, accelerating acquisition of DSR continues to be a least-cost strategy to meet the renewable requirements. Analysis in this IRP applies a 10-year ramp rate for acquisition of DSR discretionary measures. Demand-side resources include energy efficiency, the Washington State Energy Code (WSEC) and federal and state equipment codes and standards, distribution efficiency and the customer-owned solar PV forecast.

Distributed Energy Resources: Battery Energy Storage

Two battery storage technology systems were analyzed: lithium-ion and flow technology. These systems are modular and made up of individual units that are generally small. Batteries provide both peak capacity and sub-hourly flexibility value. In addition, since they are small enough to be installed at substations, they can potentially defer local transmission or distribution system investments. PSE analyzed 2-hour and 4-hour lithium-ion batteries, as well as 4-hour and 6-hour flow battery systems.

Distributed Energy Resources: Solar–Ground-mounted and Rooftop

Distributed solar was modeled as a residential-scale resource in western Washington. Although utility-scale solar is a lower cost option for meeting CETA renewable requirements, given the transmission constraints outside of PSE's service territory, distributed solar resources have become an important part of the plan. PSE modeled both ground-mounted and rooftop solar as an option to both help meet CETA and help with local distributed solutions.

Distributed Energy Resources: Demand Response

This IRP includes 16 potential demand response programs available in PSE service territory. The preferred portfolio includes 14 of the 16 programs, which means that 215 MW of the total 222 MW of available demand response nameplate capacity is included. The only two programs not included cost over $300/kw-yr. The model selected four of the programs starting in 2022 and the remaining ten programs starting in 2025. The first four programs were part of the least cost optimization in most of the portfolio sensitivities. Demand response takes a couple of years to set up before savings are achieved, so although these four programs start in 2022, the total nameplate by 2025 is only 10 MW. As the demand response programs are gradually ramped, they grow to 150 MW nameplate by 2030 and 215 MW nameplate by 2045. The demand response programs in the 2021 IRP demand response assessment have been maximized for all but 7 MW of the total potential savings. A new assessment will be completed for the next IRP, which will capture new demand response developments and technologies.

Delivery System Planning (DSP) Non-Wire Alternatives

The role of distributed energy resources (DER) in meeting system needs is changing, and the planning process is evolving to reflect that change. Non-wires alternatives are being considered when developing solutions to specific, long-term needs identified on the transmission and distribution systems. The resources under study have the advantage of being able to address system deficiencies while simultaneously supporting resource needs and can be deployed across both the transmission and distribution systems, providing some flexibility in how system deficiencies are addressed. The non-wires alternatives considered during the planning process include energy storage systems and solar generation.

Renewable Resources

The timing of renewable resource additions is driven by CETA renewable requirements. Although renewable resources do contribute to meeting capacity needs, compared to the existing, retiring coal-fired resources and other dispatchable resources, a portfolio that relies on increasing amounts of renewable resources has higher portfolio balancing requirements, which can drive up portfolio costs. Wind was modeled in seven locations throughout the northwest United States, including eastern Washington, central Montana, eastern Montana, Idaho, eastern Wyoming, western Wyoming and off the coast of Washington. Solar was modeled as a centralized, utility-

scale resource at several locations throughout the northwest United States, including eastern and western Washington, Idaho and Wyoming.

This IRP found that Montana and Wyoming wind power is expected to be more cost effective than wind and solar from the Pacific Northwest because it offers higher capacity value and brings resource diversity to supply. However, existing transmission constraints also impact the availability of resources to serve load. Given these transmission constraints, resources located outside of the Pacific Northwest region are limited. After the Montana and Wyoming wind, costs between eastern Washington wind and solar are very close.

Flexible Capacity

Beyond 2025, all sensitivities show a need for flexible, peaking capacity when 750 MW of coal is removed from PSE's portfolio in 2026. PSE is committed to pursuing all non-emitting capacity resources first. The current modeling results show alternative fuel enabled combustion turbines as the most cost-effective resource to meet capacity resource needs that cannot be otherwise met by demand-side resources and distributed and renewable resources. The model selected dispatchable combustion turbines in particular as the least cost resource to meet peak reliability needs, especially during periods of high load due to extremely cold weather conditions when renewable generation may be limited. Further analysis is needed to understand the availability of alternative fuel enabled combustion turbines and associated fuel supply. The IRP analysis shows that additional capacity is needed regardless of fuel source and PSE will strive to fill all capacity shortages with clean resources.

Transmission Constraints

Transmission capacity constraints have become an important modeling consideration as PSE transitions away from thermal resources and toward clean, renewable resources to meet clean energy transformation targets. In contrast to thermal resources, which can generally be sited in locations convenient to transmission, produce power at a controllable rate, and be dispatched as needed to meet shifting demand, renewable resources are site-specific and have variable generation patterns that depend on local wind or solar conditions, therefore they cannot always follow load. The limiting factors of renewable resources have two significant impacts on the power system: 1) a much greater quantity of renewable resources must be acquired to meet the same peak capacity needs as thermal resources, and 2) the best renewable resources to meet PSE's loads may not be located near PSE's service territory. This makes it important to consider whether there is enough transmission capacity available to carry power from remote renewable resources to PSE's service territory. Transmission within PSE service territory will be needed, but was assumed unconstrained due to delivery system planning processes and specific identified projects.

The available transmission to eastern Washington can range from 700 MW to over 3,200 MW, depending on the availability of new transmission contracts, upgrades to the system and repurposing existing contracts. PSE modeled a potentially available 750 MW of transmission to Montana and 400 MW of transmission to Wyoming. The full 750 MW of wind in Montana and 400 MW of wind in Wyoming appear to be cost-effective in this portfolio. There is significant risk with Wyoming wind because new transmission will need to be constructed to Wyoming, and PSE will also need to acquire new firm transmission contracts. After Montana and Wyoming wind there is still an additional 700 MW of wind to eastern Washington and 200 MW of solar in eastern Washington needed by 2030. The location and type of renewable resources will depend on available transmission. Given the risk in available transmission, over 200 MW of distributed solar is added to the portfolio to meet the 80 percent CETA renewable target in 2030.

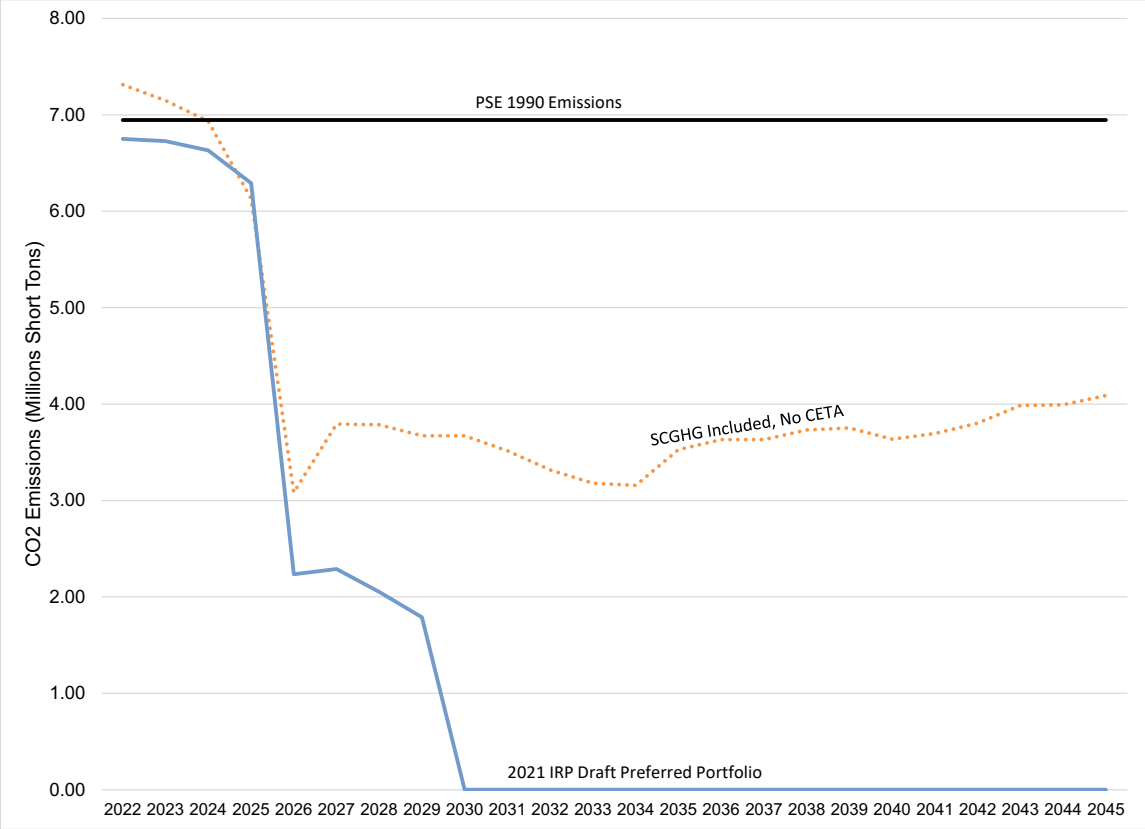
Carbon Emissions and Portfolio Costs

Portfolio Carbon Emissions Associated with Electric Service

The draft preferred portfolio achieves significant emission reductions, as shown in Figure 1-5. There is a substantial drop in emissions at the end of 2019, with the retirement of Colstrip 1 & 2. In 2026, there is another significant decrease in emissions due to the exit of Colstrip 3 & 4 and the end of the coal-transition contract with TransAlta, along with a significantly lower economic dispatch of existing fossil-fueled resources. Altogether this reduces total portfolio emissions by more than 60 percent by 2029. Market purchases are not included in the calculation of direct emissions, because the specific resources used to meet the market purchases are unknown, and PSE does not want to assume a fixed emission rate which will in fact change over time.

From 2030 through to 2045, alternative compliance options can be used to satisfy up to 20 percent of the carbon neutral standard. In 2030, PSE will achieve a carbon neutral electric portfolio. For modeling purposes, alternative compliance mechanisms are represented through renewable energy credits and included as an associated cost. However, actual compliance may be met through renewable resources, energy efficiency, unbundled RECs or transformation projects.

Figure 1-5: Projected Annual Total PSE Portfolio CO_2 Emissions and Savings from Conservation

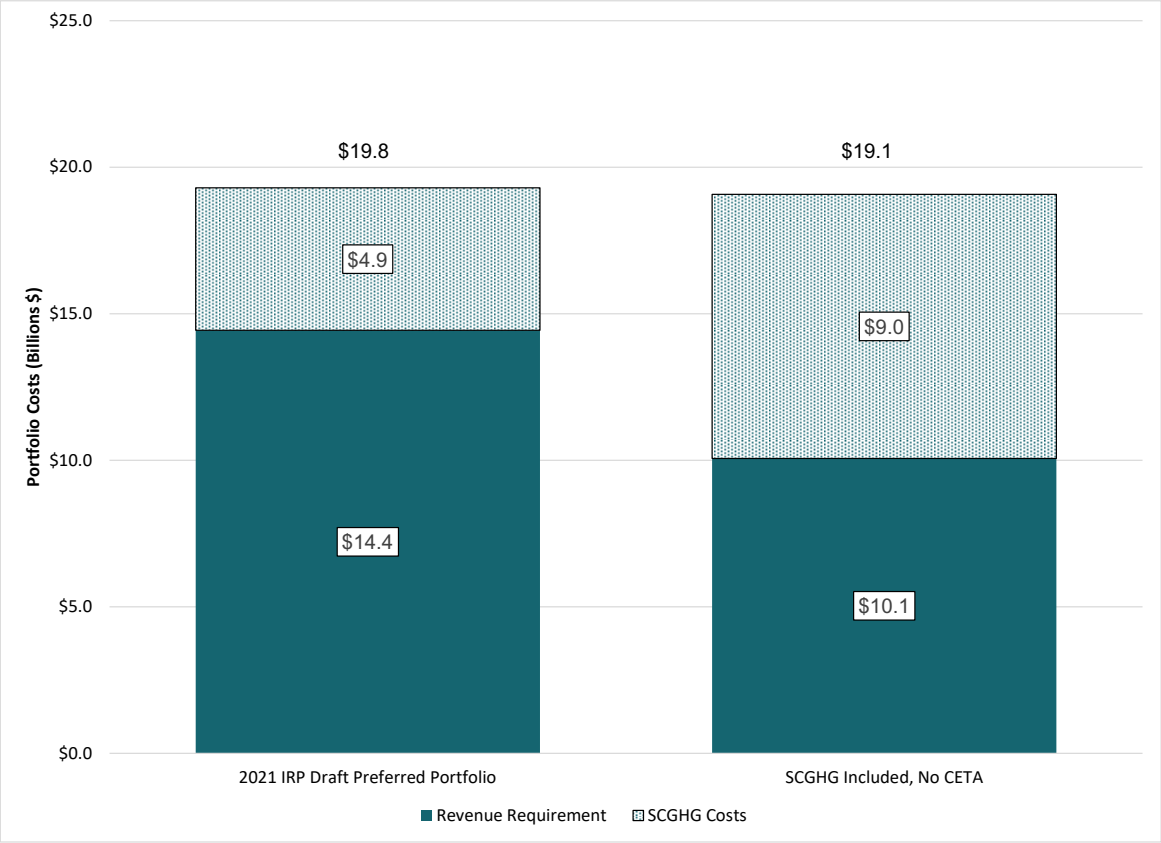


Portfolio Costs

The long-term outlook for incremental portfolio costs has been dynamic across IRP planning cycles since 2003, driven by changing expectations about natural gas prices and costs associated with potential carbon regulation. Since the passage of the Clean Energy Transformation Act, it is difficult to compare the 2021 IRP portfolio costs to other IRPs because the regulations have changed so drastically since the 2017 IRP. A more meaningful comparison may be to compare the cost of the preferred portfolio to a portfolio developed using the same modeling framework and underlying assumptions but removing the renewable requirements from CETA. The social cost of greenhouse gases (SCGHG) is used when evaluating resource options and is included in the portfolio modeling as an additional fixed cost of emissions on emitting resources.

Figure 1-6 illustrates how portfolio costs change without CETA. The SCGHG is shown as a separate cost in the light teal bar on top of the solid teal bar.

Figure 1-6: Portfolio Costs Comparison



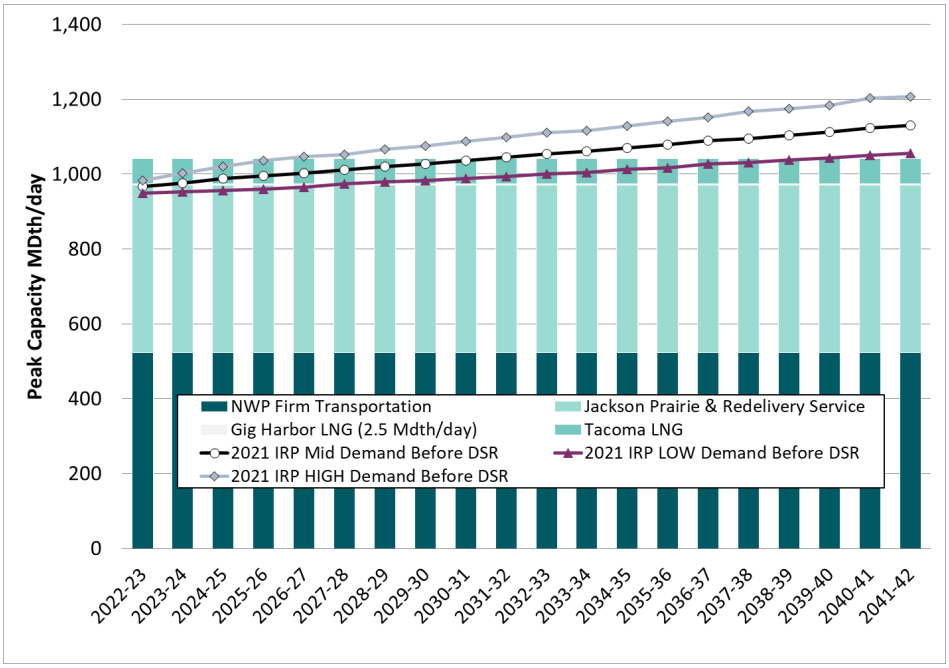
3. NATURAL GAS SALES PREFERRED PORTFOLIO

PSE develops a separate integrated resource plan to address the needs of more than 840,000 retail natural gas sales customers. This plan is developed in accordance with WAC 480-90-238, the IRP rule for natural gas utilities. (See Chapter 9 for PSE's natural gas sales analysis.)

Natural Gas Sales Resource Need – Peak Day Capacity

Natural gas sales resource need is driven by design peak day demand. The current design standard ensures that supply is planned to meet firm loads on a 13-degree design peak day, which corresponds to a 52 Heating Degree Day (HDD). Like electric service, gas service must be reliable every day, but design peak drives the need to acquire resources. Figure 1-7 illustrates the load-resource balance for the gas sales portfolio. The chart demonstrates PSE has a small resource need beginning in the winter of 2031/32.

Figure 1-7: Gas Sales Design Peak Day Resource Need



Natural Gas Sales Resource Additions Forecast

Figure 1-8 summarizes the natural gas resource plan additions PSE forecasts to be cost effective in the future in terms of peak day capacity and MDth per day. As with the electric resource plan, this is the "integrated resource planning solution." The natural gas resource plan, which is a

forecast of resource additions that look like they will be cost effective in the future, given what we know about resource trends and market trends today, calls for increased and continued conservation investment to meet all future peak day capacity needs.

Figure 1-8: Gas Resource Plan Forecast, Cumulative Additions in MDth/Day of Capacity

	2025/26	2030/31	2041/42
Conservation (DSR)	21	53	107

Demand-side Resources (DSR)

Analysis in this IRP applies a 10-year ramp rate for acquisition of DSR measures. Analysis of 10- and 20-year ramp rates in prior IRPs has consistently found the 10-year rate to be more cost effective. Ten years has been chosen because it has aligned with the amount of savings that can practically be acquired at the program implementation level; however, this IRP also tests a sensitivity that models an accelerated 6-year ramp rate.

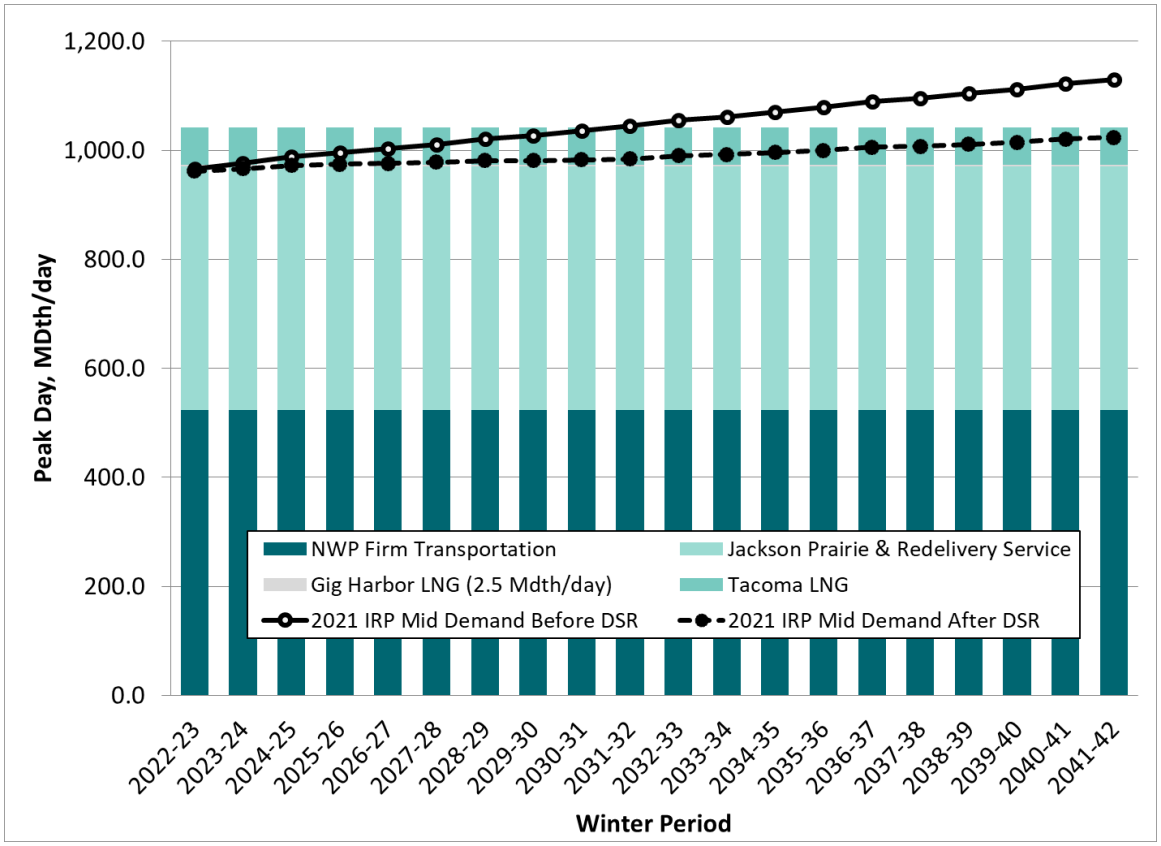
Carbon costs have a big impact on the amount of cost-effective DSR. In the 2021 IRP carbon costs are significantly higher relative to natural gas prices, which is a function of both declining natural gas prices and higher carbon cost assumptions resulting from carbon legislation passed in the state of Washington in 2019, RCW 80.28.380. This legislation requires the inclusion of SCGHG and upstream related carbon emissions in determining cost-effective conservation. These two adders result in a total natural gas cost that is more three times the cost of the natural gas itself, which almost doubles the cost-effective conservation compared to current targets.

Figure 1-9: Short-term Comparison of Natural Gas Energy Efficiency in MDth

Short-term Comparison of Natural Gas Energy Efficiency	MDth over 2-year program
2018-2019 Actual Achievement	699
2020-2021 Target	795
2022-2023 Economic Potential in 2021 IRP Scenarios	1,192

The important role that cost-effective, reliable demand-side resources play in moderating the need to add supply-side resources in the future can be seen in the dashed black demand line in Figure 1-10.

Figure 1-10: Natural Gas Sales Resource Plan



4. ACTION PLANS

The electric and natural gas Action Plans will be presented in the final IRP on April 1, 2021.

5. THE IRP, RESOURCE ACQUISITIONS AND THE CLEAN ENERGY IMPLEMENTATION PLAN

The IRP determines the supply-side capacity, renewable energy and energy need which set the supply-side targets for future detailed planning in the Clean Energy Implementation Plan (CEIP), as well as for the acquisition process. The formal RFP processes for demand-side and supply-side resources are just one source of information for making acquisition decisions. Market opportunities outside the RFP and self-build (or PSE demand-side resource programs) should also be considered when making prudent resource acquisition decisions.

The CEIP will build on the IRP analysis and CEAP and add near-term detail concerning resource portfolio assumptions, modeling, sensitivities and costs. The models used in the IRP consider groups of resources with generic pricing for a 24-year outlook. The CEIP, which focuses on the next four years, will update the resource portfolio modeling by including the CEIP planned investments. The CEIP will use costs based on specific resources and program information, where available. These costs may be derived from projects submitted through the RFP process or through other program plans, though this ability will be limited in the at first due to the compressed timeline of the current planning cycle after the CEIP rulemaking.

The CETA legislation adds a new dynamic to resource planning in the form of evaluating and determining equitable distribution of benefits for all customers, specifically in identifying highly impacted communities and vulnerable populations. In developing the CEIP, PSE will also consider the equitable distribution of benefits to customers for the proposed projects and programs, including the equitable distribution of non-energy. The IRP/CEAP will include an assessment of the current conditions based on economic, health, environmental, energy security and resiliency, and other metrics, and the CEIP will use the criteria from this assessment, in determining the programs and projects to implement over the next four years. The CEIP takes into consideration the mix of resources from the IRP/CEAP, and applies the layer of customer benefits.