CHAPTER 1

Executive Summary

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This Integrated Resource Plan (IRP or plan) presents a long-term forecast of the lowest reasonable cost combination of resources necessary to meet the needs of Puget Sound Energy's customers over the next 20 years. The plan presented here will change as circumstances change, and actual resource acquisitions will take place in the real – rather than the hypothetical – marketplace. But, examining the long-term implications of our customer's energy needs every two years makes it possible to identify many challenges as they appear on the horizon, study them as they approach, and better prepare to meet them. Among the insights from this planning cycle are the following.

The Northwest energy marketplace is changing.

For more than a decade, the Pacific Northwest has been capable of generating more electric energy than the region's utilities required for meeting customer demand. Now, however, the Regional Resource Adequacy Forum's 5-year forecast indicates the region will soon reach load-resource balance. Looking out to 2020, a recent analysis by the Northwest Power and Conservation Council found the planned retirement of as much as 2,000 MW of electric generation in Washington and Oregon may lead to a significant degradation in reliability of the electrical system, unless the retiring generation is replaced. In addition, planned retirements in the Southwest energy market, plus more intermittent renewable resources and stricter environmental regulations may impact winter imports that the Northwest has relied on for decades. Utilities across the region will probably

need to either construct new resources or support their development financially with long-term purchased power agreements.

Market purchases remain a least cost choice for the present, but this strategy will need to change in the future.

The region's electric "surplus" has kept market prices low and made transmission contracts plus short-term power purchases a more cost effective alternative for filling peak capacity need than building new generation. This has been true not just for PSE, but for other regional utilities as well. The strategy remains sound for now, but as regional resource adequacy reaches load-resource balance and moves toward capacity deficits, physical reliability risks will grow and costs will increase. The action plan for this IRP makes a number of recommendations directed at developing a strategy for reducing reliance on market.

There is long-term uncertainty for coal generation in general, but Colstrip reduces cost and market risk in most likely scenarios.

A number of factors may impact the future operations of coal-fired generation throughout the United States; this IRP investigates their potential impact on the economic operation of PSE's Colstrip facility. For this analysis, PSE developed four environmental compliance cost cases to test the economic viability of Colstrip under a variety of potential regulatory requirements. Overall, the analysis found that Colstrip reduces cost and market risk for our customers. Three key risk factors have the greatest effect on Colstrip's performance as an economic, least-cost resource: very high CO_2 costs, very high disposal costs for coal combustion residuals, and very low natural gas prices for a very long time. At this time, the analysis indicates that continuing current operations at Colstrip saves PSE customers about $131 million per year. Put a different way, replacing Colstrip with another resource would result in approximately a 5 percent annual rate increase, apart from any other rate pressures. Conditions may change in the future, but for this planning cycle, it does not appear PSE should begin developing resources to replace Colstrip.

CHAPTER 1 – EXECUTIVE SUMMARY

As natural gas usage expands, prices will increase and infrastructure issues will become more pressing.

Production from North American shale bed deposits has increased natural gas supplies and lowered prices, but it is not realistic to expect natural gas prices to remain this low over the long term. The very affordability of this fuel means that usage is also increasing, especially in the transportation and utility sectors. Along with the possibility of exports of gas from North America, increased usage will create upward pressure on prices over time. Of greater concern, perhaps, is that as greater volumes of gas move through the system, physical reliability risks will increase as capacity of existing infrastructure strains to keep up.

The electric plan presented here is similar to past plans since resource alternatives remain limited. The plan relies on continued acquisition of demand-side resources; it adds renewable resources as needed to meet statutory requirements; and it recommends adding peaking resources. Renewing transmission capacity contracts to support additional generating units or to facilitate market power purchases makes sense in the near term, but long-term reliance on short-term markets clearly requires further study and action given the expected retirements of coal plants in our region and concerns about the availability of resources from Southwestern markets.

It is important to recognize that the IRP does not make purchasing or investment decisions for the next two decades. The IRP process enables us to construct a portfolio that meets future challenges as we understand them today. Actual resource acquisitions and investment decisions are informed by the foresight developed in the IRP, but those acquisitions must respond to the market conditions that exist at the time when the decision is made.

1. Electric Resource Plan

Electric resource need

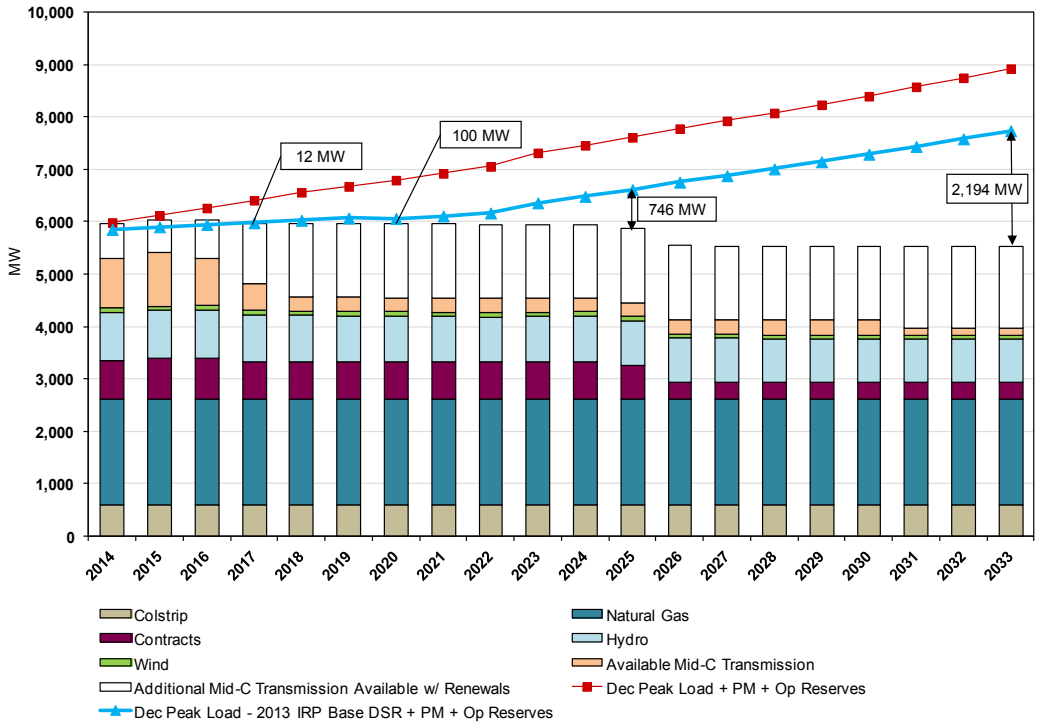
PSE must meet the physical needs of our customers reliably. For resource planning purposes, those physical needs are simplified and expressed in terms of peak hour capacity and energy. Operating reserves are included in physical needs; these are required by contract with the Northwest Power Pool and by the North American Electric Reliability Corporation (NERC), to ensure total system reliability. In addition to meeting customers' physical needs, Washington state law (RCW 19.285) also requires utilities to acquire specified amounts of renewable resources or equivalent renewable energy credits (RECs). There are details in the law such that complying with RCW 19.285 may not directly correspond to meeting physical needs, so this is expressed as a separate category of resource need.

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. The company's electric resource outlook indicates the need for an additional 12 MW of peak hour capacity by 2017, assuming that approximately 1,600 MW of PSE's capacity need is met by short-term purchases over firm transmission. The need grows to 100 MW by 2020 after acquisition of all cost-effective demand-side resources identified in the analysis – again, assuming 1,600 MW of short-term purchases on firm transmission. This includes the resources required to meet peak hour customer demand events, and the planning margin and operating reserves that must be maintained to achieve acceptable reliability.[2] Figure 1-1 illustrates the important role demand-side resources play in moderating the need to add supply-side resources in the future.

[1] *Resource capacities illustrated here reflect the contribution to peak, not nameplate capacity, so PSE's approximate 780 MW of owned and contracted wind appear very small on this chart. Refer to Chapter 5 for how peak capacity contributions were assessed.*
[2] *Refer to Appendix K for a description of electric planning standards.*

Figure 1-1
Electric Peak Hour Capacity Resource Need
Projected peak hour need and effective capacity of existing resources



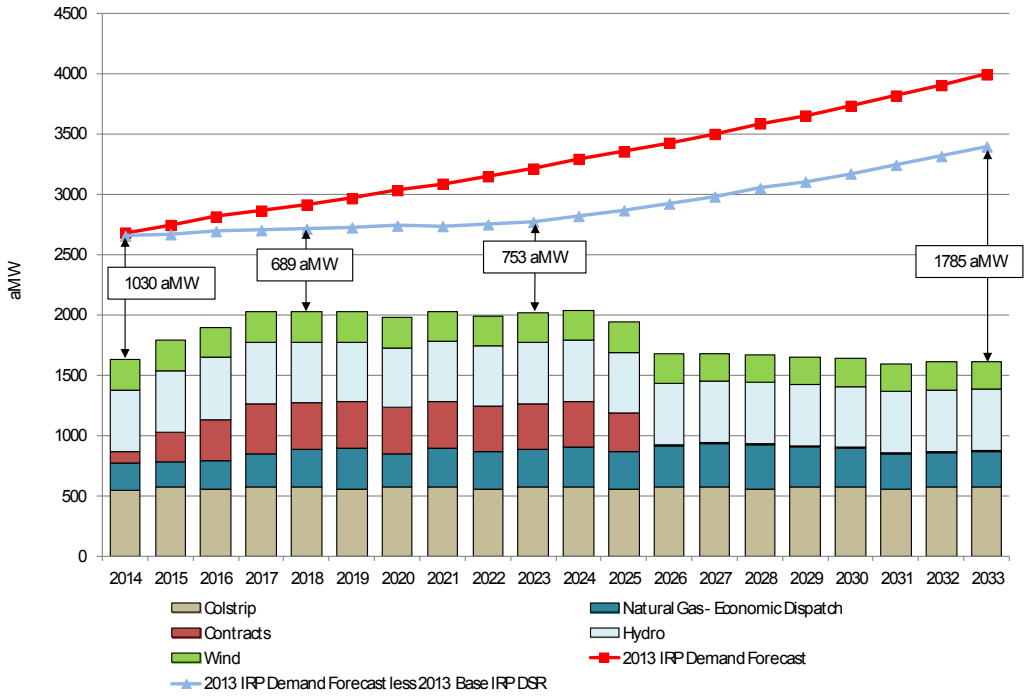
Electric energy need

Peak hour capacity is an important aspect of PSE's ability to adequately meet the physical needs of our customers. However, our customers require electric service in more than just one hour each year – they expect reliable, economic electric service during all hours. Figure 1-2 compares the company's annual forecast of energy sales to retail electric customers with expected generation for the year by resource type.[3] This "Energy Position" reflects the most economical dispatch of our electric resource portfolio based on expected market conditions, it is not a physical need. PSE's resources are physically capable of generating significantly more energy, but from a cost perspective, it

[3] *Wind in this chart shows more prominently than in the capacity need chart, because this reflects the expected annual generation of wind, not just what can be relied upon to meet peak capacity needs.*

makes sense to dispatch plants based on specific market conditions. Load forecasts in this chart are aggregated to an annual basis.

Figure 1-2
Annual Energy Position for 2013 IRP Base Scenario

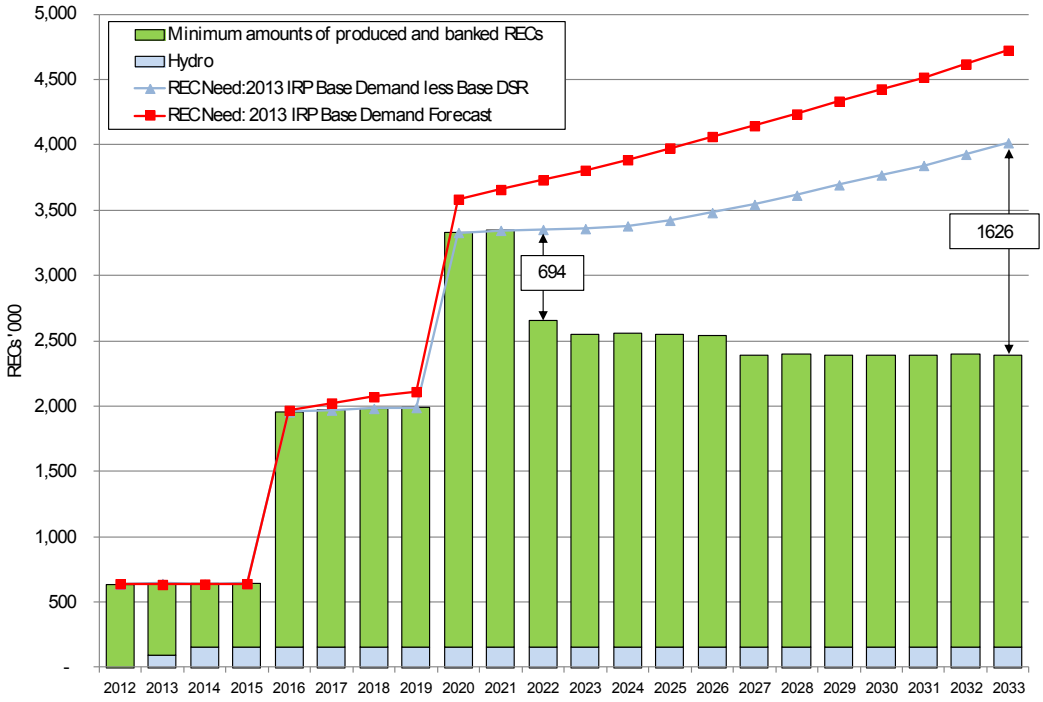


Renewable resources

In addition to reliably meeting the physical needs of our customers, RCW 19.285 – Washington State's Energy Independence Act (EIA) – establishes three specific targets for qualifying renewable energy. These are commonly referred to as the state's renewable portfolio standard (RPS). Sufficient "qualifying renewable energy" must equal at least 3 percent of retail sales in 2012, 9 percent in 2016, and 15 percent in 2020. Figure 1-3 compares existing qualifying renewable resources with this annual target, and shows that PSE has acquired enough eligible renewable resources and RECs to meet the requirements of the law through 2022. The need in 2022 amounts to 693,550 RECs, assuming a 30 percent capacity factor and the 1.2 multiplier allowed for certain construction practices; this translates to 2,011 MW of wind resources.

Qualifying renewable energy is expressed in annual qualifying renewable energy credits (RECs) rather than Megawatt hours, because the state law incorporates multipliers that apply in some cases. For example, PSE's Lower Snake River project receives a 1.2 REC multiplier, because qualifying apprentice labor was used in construction. Thus the project is expected to generate approximately 900,000 MWh per year of electricity, but would contribute about 1,080,000 equivalent RECs toward meeting the renewable energy target. Note this is a long-term compliance view. PSE has sold surplus RECs to various counterparties in excess of those needed for compliance and will continue to do so as appropriate to minimize costs to customers.

Figure 1-3
Renewable Resource/REC Need



Electric plan resource additions

Figure 1-4 summarizes changes to the electric resource portfolio in terms of peak hour capacity. This plan is the "integrated resource planning solution."[4] It reflects the lowest reasonable cost portfolio of resources that meets the projected capacity, energy, and renewable resource needs described above. Except for demand-side resources, which significantly reduce risk, most of the other resources show the same risk profile. The resource plan reflects the expectation that Colstrip will continue to be a least-cost resource in the portfolio. In this IRP, we have chosen to reflect gas storage for generation fuel as part of the electric resource plan. While gas storage is not a "supply-side resource" for generation (and therefore not required to be addressed by the IRP rule), it is important to highlight this aspect of the company's resource plan.

Figure 1-4
Electric Resource Plan, Cumulative Nameplate Capacity of Resource Additions

	2017	2023	2027	2033
Demand-Side Resources (MW)	327	800	887	1,007
Wind (MW)	0	300	500	600
Peakers (CT in MW)	221	442	1,327	2,212
Transmission Renewals (MW)	1,141	1,407	1,407	1,567
Gas Storage (MDth/day Gas)	100	100	100	150

Demand-side resources (DSR)

This plan – like prior plans – includes acquiring conservation to levels such that much of what is available will be acquired. That is, significant changes in avoided cost had little impact on how much could be acquired cost effectively. PSE's analysis indicates that although current market power prices are low, accelerating acquisition of DSR continues to be a least-cost strategy.

[4] *Chapter 2 includes a detailed explanation of the reasoning that supports each individual element of the resource plan.*

Renewable resources

Timing of renewable resource additions is driven by requirements of RCW 19.285. PSE's analysis shows that while additional wind is not a least-cost resource, we anticipate remaining comfortably below the revenue requirement compliance mechanism included in the law. PSE has acquired enough eligible renewable resources and RECs to meet the requirements of the law through 2022.

Peakers appear more cost effective than combined-cycle plants.

This finding holds as long as the peakers are equipped with oil back-up and a sufficient amount of interruptible natural gas pipeline capacity is available for fuel delivery. This should certainly be the case for the first few additions, but adding several hundred MW of new peakers may over-tax the natural gas infrastructure. Should peakers require firm pipeline capacity, some level of combined-cycle combustion turbine (CCCT) plants may be found to be cost effective.

Transmission contract renewals backed by market purchases appear cost effective.

In the short to intermediate term, transmission contract renewals do appear least cost. These contracts only need to be renewed for 5-year terms to preserve PSE's unilateral roll-over rights in the future. If and when Unit 1 of TransAlta's Centralia coal plant retires in 2020, regional resource adequacy is expected to decline abruptly. Unless replacement generation is developed, it is unlikely that heavy reliance on short-term markets over firm transmission will continue to be a viable resource strategy. There also may be concerns about longer-term generation plant closures in the California market; this could reduce the Northwest region's ability to import power from that region, as has been done traditionally for decades. The action plan below states PSE will file an update to the 2013 IRP later this year to focus specifically on this issue.

Colstrip is expected to continue to be a least-cost resource.

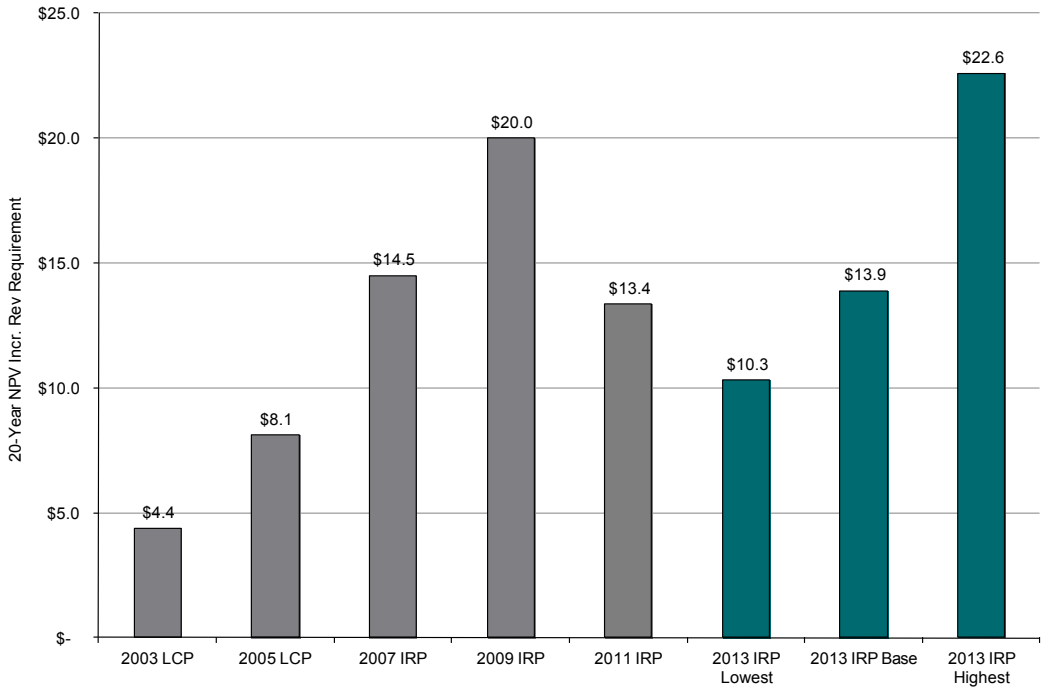
In the near term, Colstrip owners do not anticipate making multiple-year payback capital investments. Such decisions will not be required until the 2016 time frame, after the requirements for new regional haze regulations have been clarified. Longer term, high carbon costs, high costs for disposal of coal combustion residuals, and very low gas prices for a very long time are key risks for Colstrip. As policies and market conditions change, the owners group of the Colstrip facility will factor those conditions into their decision-making process.

Portfolio costs and carbon emissions

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 carbon regulation. Conservation, gas-fired generation and wind have been the primary resource alternatives since 2005. Figure 1-5 illustrates how incremental portfolio costs have changed over time, along with the context for the range of costs examined in this IRP.

Figure 1-5
Incremental Portfolio Costs Over Time.



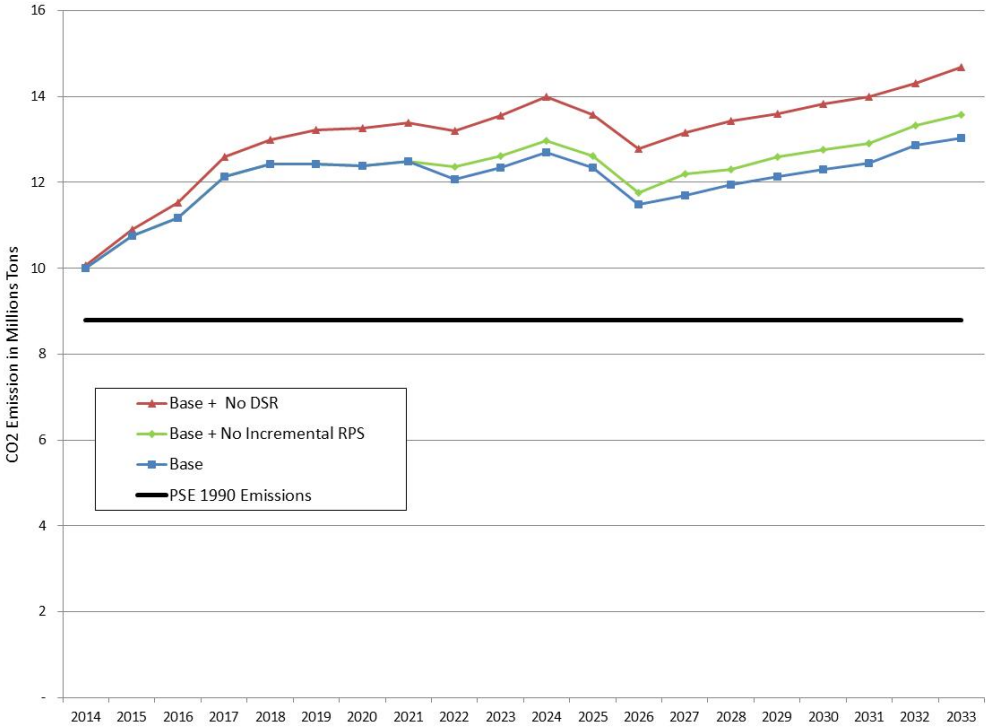
Carbon emissions associated with electric service

A number of Washington state laws address carbon emissions. RCW 70.235 adopts a state goal for reducing emissions. RCW 80.80 sets an emissions performance standard (EPS) that prevents utilities from entering into long-term financial commitments for base-load electric generation unless the generation source complies with the greenhouse gas emissions performance standard set by the state, effectively banning purchases from additional coal plants or older gas CCCT plants. In 2011, the legislature amended the EPS to achieve permanent reduction of certain CO_2 emissions by retiring the TransAlta coal plant in Centralia, Wash. Utilities are allowed to enter into long-term contracts for "coal transition power" from TransAlta, and TransAlta will shut down one generating boiler at the Centralia coal plant by the end of 2020 and the other by the end of 2025. TransAlta also will provide financial assistance for local economic development and clean energy. RCW 19.285, the Energy Independence Act, requires electric utilities to reach certain targets for renewable resources and acquire all cost-effective achievable conservation. Meanwhile, according to WAC 480-100-238, "Each electric utility regulated

by the commission has the responsibility to meet its system demand with a least cost mix of energy supply resources and conservation."

The combined impact of these laws, rules and policies on PSE's CO_2 emissions from electric operations is shown in Figure 1-6. The initial ramp-up in CO_2 emissions followed by a reduction is due to PSE's coal transition power agreement with TransAlta; ultimately, this contributes to the retirement of the nearly 1,400 MW plant and a permanent reduction of emissions. The chart also shows a significant reduction in emissions from acquisition of all cost-effective conservation. By 2033, the cumulative CO_2 savings from conservation is approximately 20.82 million tons. Finally, additional wind required by the state's RPS in 2020 also reduces CO_2 emissions somewhat (approximately 4.59 million tons in total by 2033). The wind addition has much more limited impact because adding wind to a region rich in hydro power has a more limited impact than it would in other regions.

Figure 1-6
Projected Annual CO_2 Emissions and Savings from Cost-effective Demand-side Resources and the 2020 Requirement for Renewable Resources from RCW 19.285



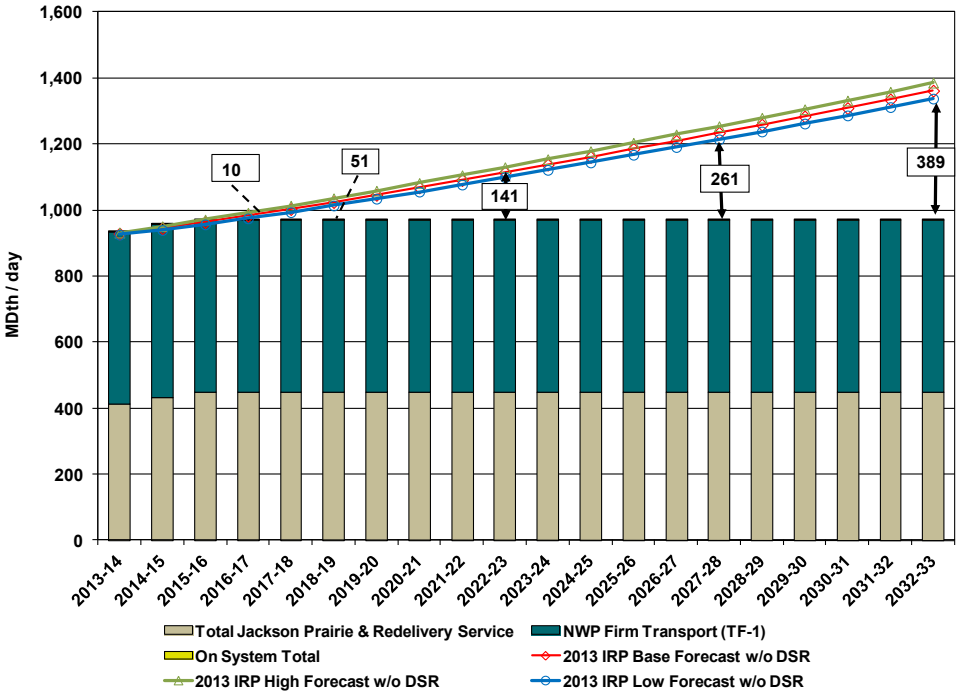
2. Gas Sales Resource Plan

PSE develops a separate integrated resource plan to address the needs of more than 770,000 retail gas sales customers. The resource needs of gas sales customers are relatively more straightforward than those of the electric utility, because delivery of electric service involves so many types of generation. This plan is developed in accordance with WAC 480-90-238, the IRP rule for gas utilities. (See Chapter 6 for PSE's analysis of gas for power need.)

Gas sales resource need

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 gas sales portfolio. The chart demonstrates a need for resources beginning in the winter of 2016-17.

Figure 1-7
Gas Sales Design Peak Day Resource Need



Gas plan resource additions

Figure 1-8 summarizes the gas resource plan additions in terms of peak day capacity in MDth per day. As with the electric resource plan, this is the "integrated resource planning solution." It combines the amount of demand-side resources that are cost effective with supply-side resources in order to minimize the cost of meeting projected need.

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

	2018-19	2022-23	2027-28	2032-33
Demand-Side Resources	15	28	33	37
PSE LNG Peaking Project	50	50	50	50
Swarr Upgrade	30	30	30	30
Mist Storage Expansion	50	50	50	50
NWP/Westcoast Expansion	0	54	150	150
NWP/KORP Expansion	0	0	0	78

Demand-side resources (DSR)

Analysis in the 2013 IRP supports continuation of the accelerated 10-year ramp rate for acquiring demand-side resources. We also examined a 20-year ramp rate and a 10-year rate that delayed acquisition of "discretionary"[5] gas DSR measures for two years, given that gas prices are so low early in the planning period. The 10-year ramp rate proved most cost effective.

[5] Discretionary resources *are retrofit opportunities in existing facilities that, theoretically, remain available at any point over the course of the study period.* Lost opportunity resources *are those with pre-determined availability, such as replacements after equipment failure and opportunities in new construction.*

PSE LNG Peaking Project

PSE is considering development of a liquefied natural gas (LNG) project to provide peak day supply as part of a larger LNG project that would support the needs of emerging transportation markets. Converting local maritime traffic and truck transport to natural gas fuel will significantly improve local air quality and reduce greenhouse gas emissions. If such a multi-purpose project is constructed, this IRP finds the project's capacity to provide peaking supplies would be cost effective for our gas customers.

Swarr Upgrade

This IRP finds that restoring the Swarr LP-Air facility to its original 30 MDth per day capability may be a cost effective resource. Swarr is a propane-air injection facility on PSE's gas distribution system that operates as a needle-peaking facility. Propane and air are combined in a prescribed ratio to ensure the mixture injected into the distribution system maintains the same heat content as natural gas. Based on this IRP analysis, PSE needs to refine assumptions and perform additional analysis to ensure Swarr could be upgraded to perform safely, efficiently, and cost effectively.

Mist storage and Northwest Pipeline capacity

Storage capacity at Northwest Natural's Mist storage project, along with firm pipeline capacity on Northwest Pipeline from the Portland area, also appeared to be part of the least-cost solution. The timing of this resource addition may hinge on updated cost assumptions and whether or not the PSE LNG Peaking Project and/or Swarr Upgrade move forward. If either resource is unavailable, additional Mist storage with transport would be desirable earlier.

Northwest Pipeline/Westcoast Expansion

Additional transportation capacity from the producing regions in British Columbia (BC) at Station 2 south to PSE's system are also in the plan, but a bit further out in the 2022-23 heating season. Similar to Mist, if the PSE LNG Peaking Project and/or Swarr Upgrade do not move forward, additional Northwest Pipeline capacity from the Canadian border and capacity on Westcoast Pipeline south from Station 2 would be needed sooner.

Northwest Pipeline/KORP expansion

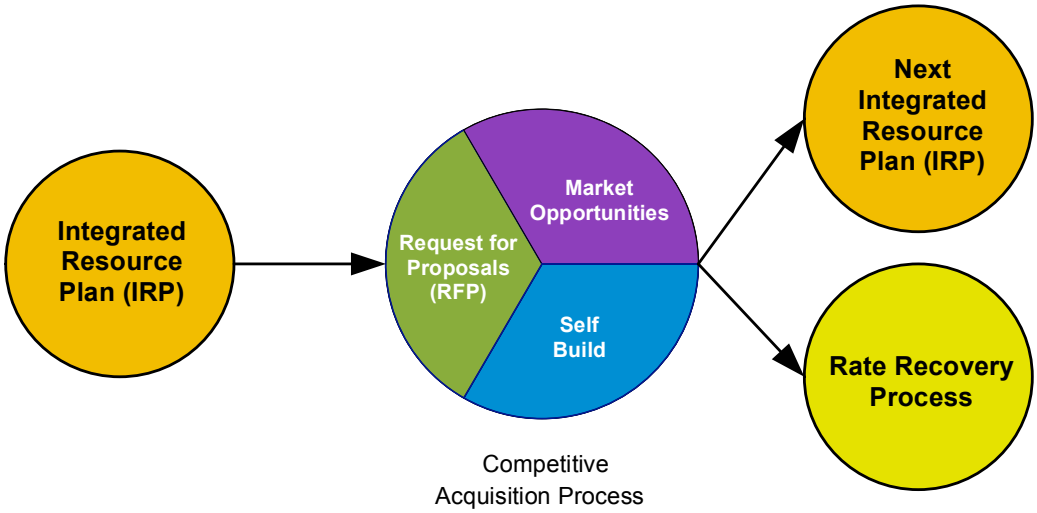
This is an expansion of Northwest Pipeline south from the Canadian border, along with an upstream expansion west across southern BC on a line built by Fortis to bring additional Alberta supplies to the I-5 corridor. Analysis in this IRP found that late in the planning horizon, such a resource may look cost effective; however, this issue will be revisited in several future IRPs before any decision needs to be made.

3. Action Plans

The IRP is not a substitute for the resource-specific analysis done to support specific acquisitions; the IRP's primary purpose is to inform the acquisition process. The action plans presented here focus on identifying key decision-points PSE may face during the 20-year planning horizon, so that PSE can meet needs in a timely fashion.

Figure 1-9 illustrates the relationship between the IRP and activities related to resource acquisitions. Specifically, the chart shows how the IRP directly informs the formal RFP process. In Washington, the formal RFP process 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) must also be considered when making prudent resource acquisition decisions. Figure 1-9 also illustrates how the resource acquisition process itself informs subsequent IRPs. While Figure 1-9 is focused on supply-side resources, the same diagram applies to demand-side resources. The energy efficiency program design process can include both RFP and market opportunities, though most are PSE programs – similar to "self-build" generation.

Figure 1-9
Relationship between the IRP and the Acquisition Process



Electric Resource Action Plan

- Pursue cost-effective demand-side resources based on IRP guidance. Work with external stakeholders in the CRAG process to establish targets and tariff filings, using this IRP as a starting point. Issue RFPs as appropriate to assist with efficient acquisition of demand-side resources.
- Develop a strategy to reduce reliance on market in the intermediate to long-term, including coordination with others in the region as appropriate. File an update or addendum to the 2013 IRP early in the fourth quarter of 2013 to address concerns about relying on market to meet capacity needs.
- Ensure that the timeline for resource acquisitions is long enough to accommodate the type of infrastructure development that may be required due to anticipated changes in regional resource adequacy.
- Pursue the prudent acquisition of gas storage for generation.
- Develop a robust work plan for the 2015 IRP to clarify the roles and expectations of the public participation process and to provide greater transparency regarding PSE's analytical processes.

Gas Sales Resource Action Plan

- Pursue cost-effective demand-side resources based on IRP guidance. Work with external stakeholders in the CRAG process to establish goals, targets and tariff filings, using this IRP as a starting point. Issue RFPs as appropriate to assist with efficient acquisition of demand-side resources.
- Continue working toward developing the potential PSE LNG Project to support gas utility peaking and transportation sector needs. Update and refine cost/resource estimates on expanding the facility's potential to provide peaking capabilities for the gas utility portfolio as the project proceeds.
- Further analyze the costs and resource issues associated with investing in Swarr to restore its original 30 MDth per day capability. Decide whether such investments will provide a safe, cost effective resource for meeting the needs of customers.
- Continue working with Northwest Natural Gas and Northwest Pipeline on the possibility of participating in an expansion of the Mist storage facility and transportation to PSE's service territory.
- Remain active in the market to ensure PSE can acquire existing surplus firm pipeline capacity in case the PSE LNG Peaking Project or Swarr opportunities do not move forward.
- Complete analysis of whether the gas planning standard should include additional aspects, such as sustained peaking or cold snap metrics.
- Develop a robust work plan for the 2015 IRP to clarify the roles and expectations of the public participation process and to provide greater transparency regarding PSE's analytical processes.