# Executive Summary

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*Since 2008, the energy marketplace has evolved considerably. The historical growth that pressured the region to increase generating capacity has subsided and given way to a "new normal" in the aftermath of the recession of 2008 and secular industry decline. Energy efficiency, diminished demand due to the recession, and the rapid growth of zero variable cost renewable energy result in the Pacific Northwest being surplus on generation resources. This has led to so called "surplus energy" events which occur when the supply of electricity is greater than the demand and tend to drive market prices to low or even negative levels. Events like these are common in a hydro-electric based system, like the Pacific Northwest, but the situation has been exacerbated by the recent development of renewable resources intended to meet state renewable energy targets. Significant operational challenges and portfolio value implications exist for both the company and the regional transmission provider, as the region seeks ways to better integrate renewable resources in a manner that balances compliance with environmental mandates yet does not create winners or losers in the regions energy and renewable market place. These surpluses are expected to last for the foreseeable future and will undoubtedly create downward pressure on short-term market prices. The outlook for natural gas supply and price has also changed significantly now that new technology has allowed economic access to large shale bed deposits in British Columbia, and across North America.*

The potential benefits of these market developments are captured in this plan for our electric customers. As in the past, our plan relies on continued acquisition of demand-side resources and those renewable resources needed to meet legal requirements. Also as in the recent past, the company must manage the expiration of supply agreements

that create the prospect of a significant capacity shortfall. This plan, however, unlike its predecessor, suggests that capacity shortfalls may be most economically met by adding peaking resources and transmission capacity to the extent that expiring resources cannot be economically renewed or are otherwise unavailable or undesirable. Such a strategy would enable PSE to capture for customers the value presented by lower market prices created by the region's energy surplus. Production technology advances and increased production of natural gas have largely allayed concerns expressed in prior plans about supply diversity and cost.

Integrated resource plans are a means of examining the potential outcomes over time of different resource decisions within a matrix of varying assumptions and risk scenarios. Accordingly, our plan avoids point estimates and a fixed view of the future. Actual resource additions and portfolio costs will surely vary from any single estimate we may make today. Markets are dynamic and we use our RFP process and unanticipated market opportunities to create value propositions for our customers in real time. Furthermore, as rapid and significant changes in the marketplace make clear, change is constant and we must remain flexible. The great value of the bi-annual planning process is that we take the time and make the effort to consider market developments, technology advances, and ever-improving analytical methods to create a fresh and flexible view of the 20-year horizon ahead and the challenges and opportunities that are surely to arise.

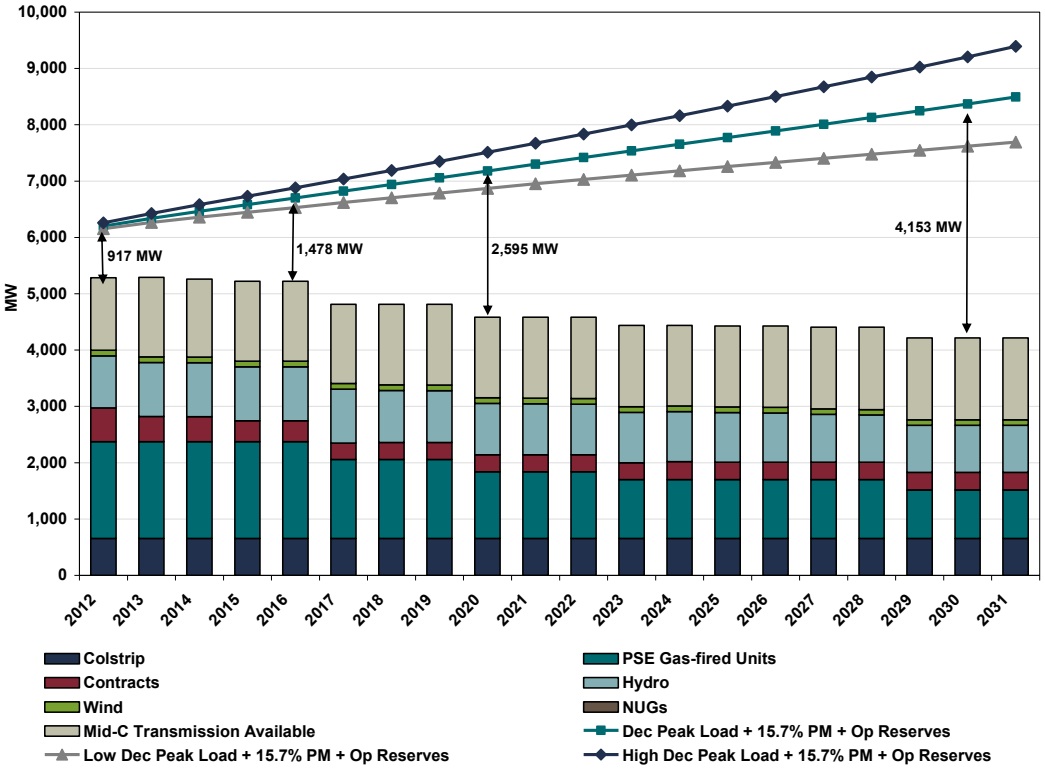
# *1. Electric Resource Plan*

## *Electric Resource Need*

PSE must meet the physical needs of our customers reliably. Those physical needs are simplified and expressed in terms of peak hour capacity and energy for resource planning purposes. 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 energy credits. 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.** Notwithstanding the regional surplus of energy the company's electric resource outlook indicates the need for an additional 917 MW of peak hour capacity by 2012, 1,478 MW by 2016, and 2,595 MW by 2020. 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.[1] Figure 1-1 illustrates the effective peak hour capacity need, based on existing supply-side resources. Wind is hard to discern because its contribution to capacity need is small.[2]

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

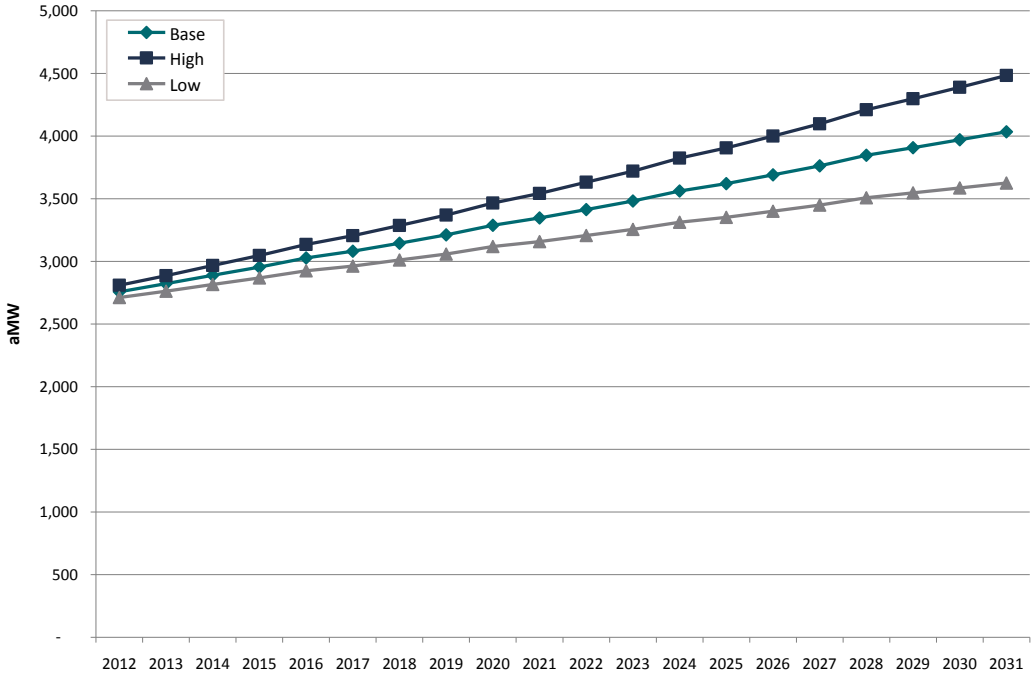



[1] *Refer to Chapter 5 for a description of electric planning standards.*
[2] *See Appendix I for a summary of PSE's Effective Load-carrying Capability of Wind analysis.*

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 demand electric service in more than just one hour each year—they expect reliable electric service during all hours. Figure 1-2 illustrates the company's annual energy forecast. This "energy need" is translated to an hourly basis for analytical purposes. Load forecasts in this chart are aggregated to an annual basis.

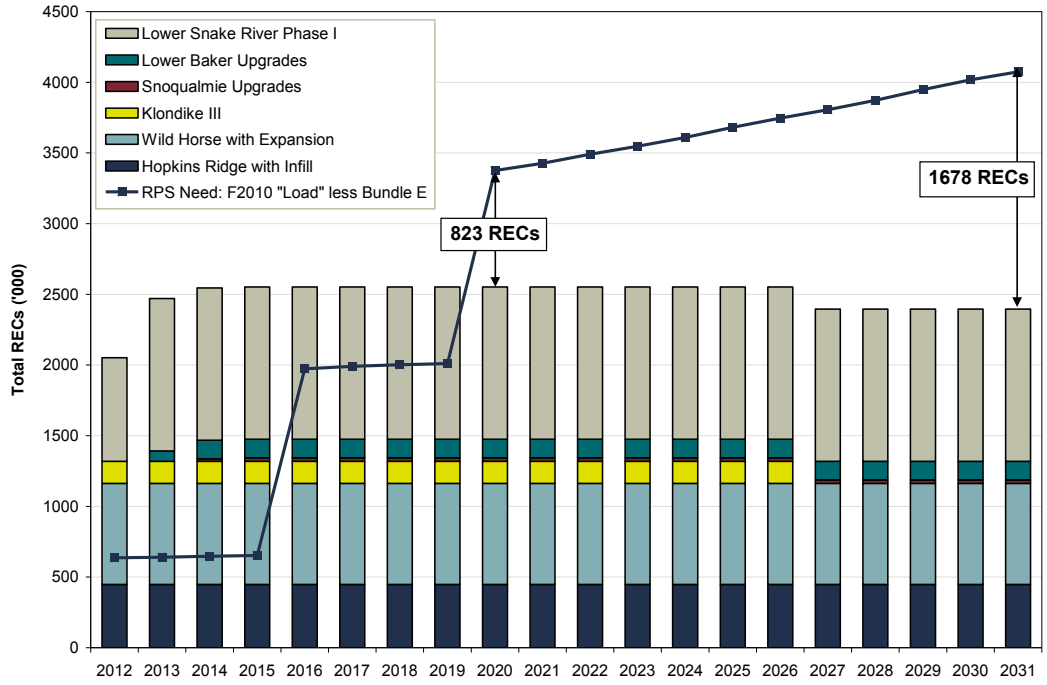
**Figure 1-2**

**Energy Need--Annual MWh sales forecasts**



**Renewable resources.** In addition to reliably meeting the physical needs of our customers, Washington state's renewable portfolio standard (RPS) requires that PSE meet specific targets for qualifying renewable energy. The company must have sufficient "qualifying renewable energy" to equal at least 3% of sales by 2012, 9% by 2016, and 15% by 2020. Figure 1-3 compares existing qualifying renewable resources with these requirements. 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 1.2x 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 RECs toward meeting need. Note that this is a long-term view. PSE has sold surplus RECs to various counterparties, which is not reflected on this chart.

**Figure 1-3**
**Renewable Resource/REC Need**



**Operational Needs as Balancing Authority.** PSE's IRP is focused on the Company's resource needs as a merchant, load-serving utility. PSE did not go far down the path of reflecting additional kinds of resource needs—such as renewable resource integration service—that are required of a balancing authority. As a balancing authority, PSE may be called upon to integrate our own intermittent renewable resources, as well as those of third parties that may request to interconnect to our transmission system. This may become increasingly important in the future and could influence resource needs and alternatives. Additional dialogue and investigation in this area will be helpful in future resource plans.

## *Electric Plan Portfolio*

Figure 1-4 summarizes the electric resource plan, in terms of peak hour capacity. This plan is the "integrated resource planning solution." 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.

**Figure 1-4**
**Cumulative Capacity of Resource Additions (MW)**

| | 2016 | 2020 | 2025 | 2031 |
|---|---|---|---|---|
| **Demand-side Resources** | 423 | 815 | 1106 | 1319 |
| **Wind** | 0 | 300 | 300 | 400 |
| **Biomass** | 0 | 25 | 25 | 50 |
| **Transmission + Market** | 0 | 500 | 500 | 500 |
| **Peakers** | 1065 | 1278 | 1704 | 2443 |

## *Electric Plan Highlights*

- Demand-side resources (DSR). This plan—like prior plans—includes so much conservation that significant changes in avoided cost had little impact on how much could be acquired cost effectively. PSE's analysis indicates that acquiring demand-side resources on a more aggressive pace than assumed in the Northwest Power Planning Council's 6th Power Plan would be cost effective, and this is reflected in the resource plan.
- Renewable resources. Temporary federal investment incentives can affect timing of when it is most cost effective to bring additional renewable resources into the portfolio. As such incentives have not been extended, the plan includes additional renewable resources essentially just in time to meet RPS requirements.
- Additional transmission capacity. Expanded transmission to access the surplus of generating resources in the region was found cost effective across all scenarios. Transmission also provides additional strategic benefits, as described in Chapter 2.
- Peakers are more cost effective than CCCT plants: Peakers for peak hour capacity with market purchases for remaining energy needs (after demand-side and renewable resources) is more cost effective than a combination of new CCCT plants, natural gas, and market energy.

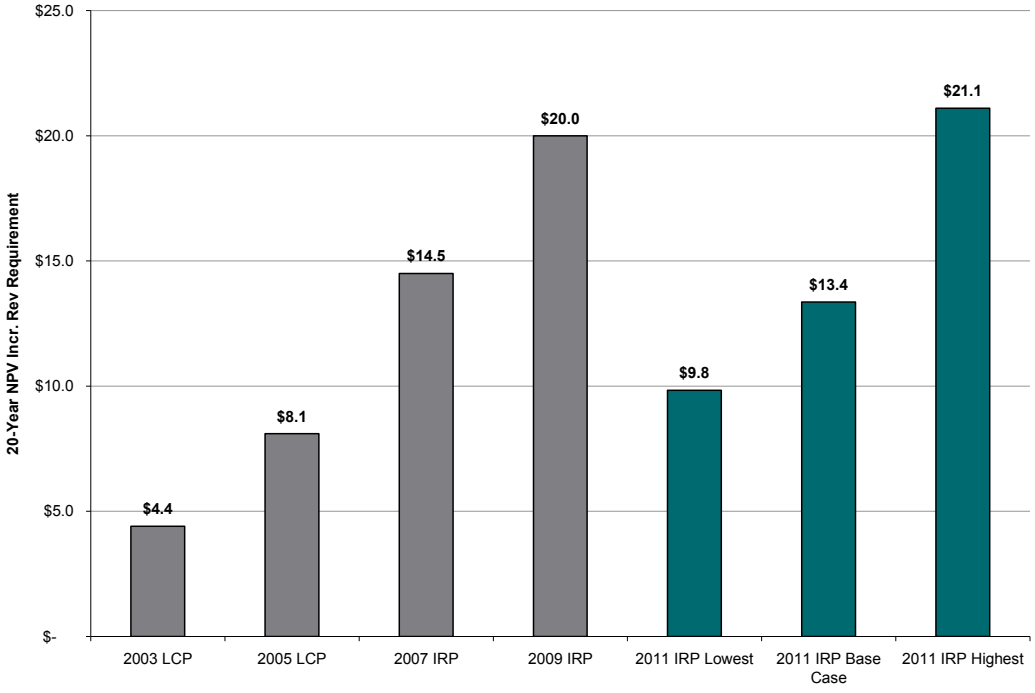
## *Electric Planning Key Findings*

- Durability across future scenarios. The lowest cost plans are very similar across a wide range of future market conditions.[3] That is, external market conditions have little impact on the lowest cost mix of resources.
- Importance of actual acquisitions. How resource need gets filled in the acquisition process can have significant impacts. Long-term contracts from existing resources or extending the life of older peaking units could significantly change the need for generation fuel/pipeline capacity, have different implications for long-term transmission and distribution planning, and create different needs for financial planning.
- Reliance on regional surplus. The Plan allows PSE's customers to take advantage of the growing surplus of generating resources in the region. This approach, however, requires PSE to be vigilant about regional resource adequacy, in order to adjust resource plans when (or if) the region begins to become deficit during critical winter periods.
- Shutting down regional coal plants could have significant implications: Carbon regulation via price was shown to have large impacts on costs, but little impact on resource plans. We did consider a case where Boardman, Centralia, and Colstrip are all shuttered by 2020. In this case, several thousand MW of CCCT capacity would be needed in the region, including replacement of PSE's share of Colstrip units with CCCT generation, either owned or contracted. This would increase PSE's portfolio costs by over $200 million per year, but would result in lower $CO_2$ emissions.[4] PSE was not, however, able to analyze impacts on the reliability of the regional transmission grid, which could be significant.

[3] *Please refer to Chapter 4, Key Assumptions, for additional information on the variety of scenarios and sensitivities explored in this IRP.*
[4] *Please refer to Chapter 5 for details on projected $CO_2$ emissions.*

**Electric portfolio costs.** The long-term outlook for incremental portfolio costs had been increasing with each resource plan since 2003. Figure 1-5, below, shows a more moderate outlook, but with considerable uncertainty. The primary reason the 2011 IRP Base Case is considerably lower than the 2009 IRP is that taxes on $CO_2$ or cap-and-trade regulation on $CO_2$ no longer looks imminent, as it did in prior IRPs. Note, the 2011 IRP Highest cost shown below uses the same carbon cost as that shown from the 2009 IRP. While the outlook for costs is lower than in the 2009 IRP, uncertainty is still key. The highest cost scenario is more than twice as high as the lowest.

**Figure 1-5**
**Incremental Portfolio Costs over Time**

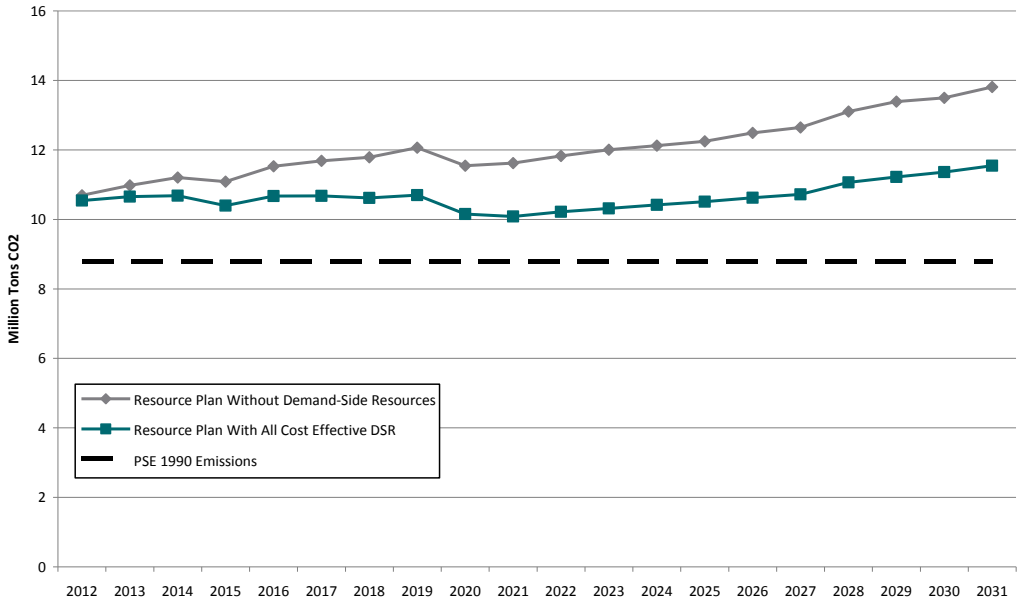


## Carbon emissions associated with electric service.

Reducing carbon emissions in Washington state is a legal goal under RCW 70.235. There are no requirements for electric utilities to take any specific actions or limit emissions, so PSE's Base Case scenario includes no such specific constraints. Demand-side resources, however, play an important role in reducing carbon emissions. Figure 1-6 demonstrates that demand-side resources would reduce PSE's carbon emissions by about 1.4 million tons of $CO_2$ per year by 2020, which is approximately a 12% reduction in forecast emissions. Note, Figure 1-6 illustrates a forecast of direct and indirect $CO_2$ emissions from market purchases and sales.

**Figure 1-6**

**Projected $CO_2$ Emissions and Savings from Cost-effective Demand-side Resources**



# 2. Gas Sales Resource Plan

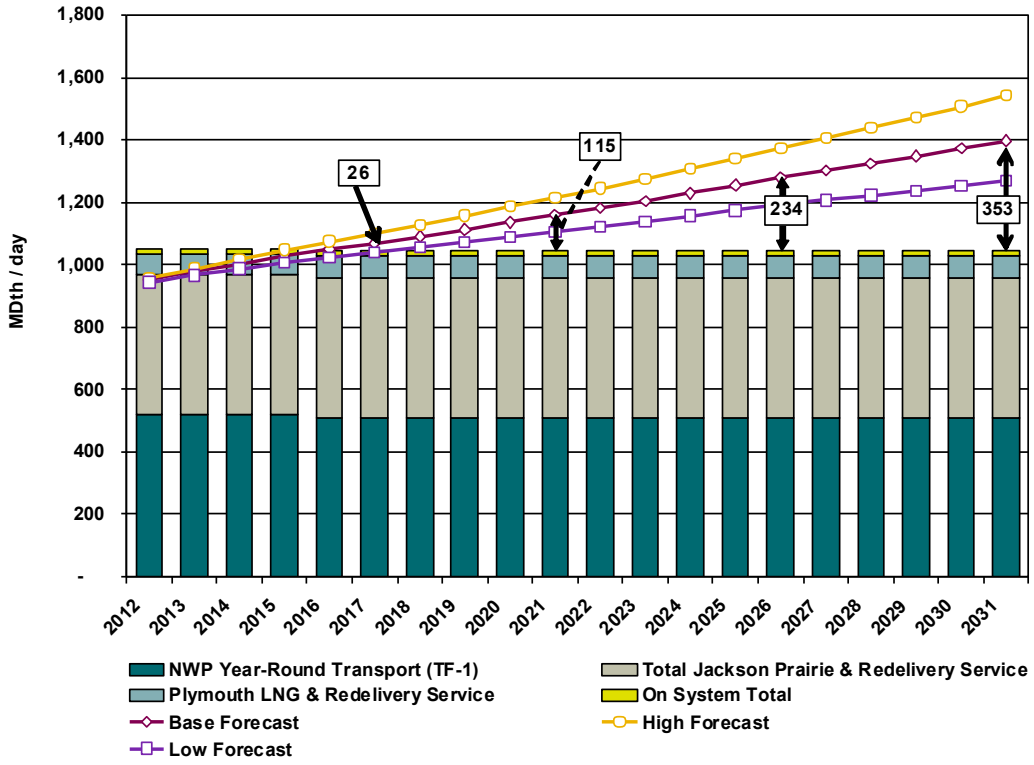
PSE develops a separate integrated resource plan to address the needs of more than 750,000 retail gas sales customers. The needs of gas sales customers are more straightforward and easier to predict than those of the electric utility. This plan is developed in accordance with WAC 480-90-238, the IRP rule for gas utilities. In the 2009 IRP, PSE presented a combined sales and generation-fuel resource plan, in addition to a stand-alone gas sales resource plan. In this IRP, PSE is not highlighting the generation fuel aspect. Generation fuel requirements are very specific to generation that is actually acquired, rather than what is projected in the electric resource plan. That is, if all the electric resource need is met with contracts from existing resources, PSE's electric needs may not require any additional gas infrastructure in the region.[5]

[5] *PSE did perform generation fuel analysis, which is presented in Chapter 6. Results in the Executive Summary focus only on the resource plan for the gas sales portfolio.*

## *Gas Sales Resource Need*

Resource need for the gas sales portfolio is based on peak-day capacity. We plan supply to meet firm loads on a 13 degree design peak day, which corresponds to a 52 Heating Degree Day. Given that PSE's portfolio includes a significant amount of storage and the region's climate is relatively moderate, this planning standard is adequate to reliably meet the needs of our gas customers. Figure 1-7 illustrates that PSE's load and resources are in balance until about 2017.

**Figure 1-7**
**Gas Sales Resource Need**



## Gas Plan Portfolio

Figure 1-8 summarizes the gas resource plan 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**

| | 2016/17 | 2020/21 | 2024/5 | 2030/31 |
|---|---|---|---|---|
| **Demand-side Resources** | 31 | 56 | 65 | 78 |
| **NWP + Westcoast Exp** | 34 | 112 | 145 | 182 |
| **Cross-Cascades** | 0 | 0 | 0 | 31 |
| **Local LNG Storage** | 0 | 0 | 51 | 51 |

## Gas Resource Plan Highlights

- Demand-side resources. Cost-effective DSR on the gas side is much more sensitive to avoided costs than on the electric side. In this IRP, Base Case avoided costs are lower, which reduces 20-year conservation relative to the 2009 IRP. However, testing more aggressive ramp rates found that accelerating acquisition of demand-side resources led to lower total costs for customers in the long run. While the total 20-year conservation is lower, more is assumed to be acquired in the near-term. This means the annual amount of demand-side resources for the first few years of this plan is close to that shown in the 2009 IRP.
- Increasing reliance on Northern B.C., at least early. In the first half of the planning period, additional capacity to northern British Columbia appears more cost effective than capacity east to the Rockies or Alberta. Later in the planning horizon, a Cross-Cascades pipeline expansion appears to be part of the lowest reasonable cost solution. This would allow PSE to access more Alberta and/or Rocky Mountain supplies.
- Storage resources. The lowest reasonable cost plan includes liquefied natural gas (LNG) storage in the outer years of the plan.

## *Gas Resource Planning Key Findings*

- Sensitivity to assumptions. Unlike the electric side, the cost effectiveness of demand-side resources is significantly impacted by market conditions on the gas side. The range of impacts is broad. Under the Base Case scenario, approx. 23 percent of peak capacity needs by 2031 are met with demand-side resources. On the extreme high end, in the Green World Scenario demand-side resources could meet approximately 80 percent of capacity needs. On the extreme low end, approximately 8 percent of capacity needs would be met with demand-side resources in the Very Low Gas Price sensitivity.
- Diversity of supply. Increasing reliance on Northern B.C., appears cost effective. Concern about maintaining diversity remains, but it does not appear cost effective to pursue until later in the planning horizon under IRP assumptions.
- Actual results may vary . . . The resource plan is based on assumptions of what various resources and pipeline expansions might cost. It is also based on current forecasts of market prices, and relative prices across different supply basins. If relative costs of supply alternatives turn out to be different during the acquisition process, actual acquisitions may be different from the plan presented here.
- . . . Especially for generation fuel. Gas infrastructure for generation fuel is extremely difficult to predict. It must be based on actual electric resources acquired. Plant types (peakers vs. CCCT), whether the unit has oil back-up, whether the underlying plant exists or is new (without regard to ownership), contract types (sales or tolls), and physical locations (again without regard to ownership), all can dramatically influence PSE's need for generation fuel. Dispatchable gas-fired generation can create significant swings as units are economically dispatched one day, and then turned off the next, which leads to the possible need for additional gas storage in the future to manage them.

# 3. Action Plans

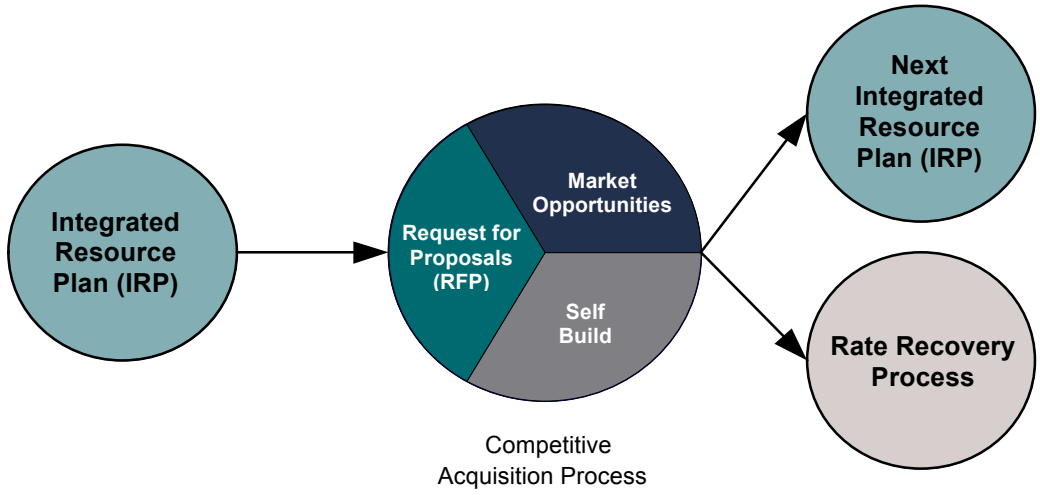
One of PSE's main objectives is to pursue acquisition of both demand- and supply-side resources that will accrue long-term benefits to our customers. The short-term, two-year electric and gas plans presented below outline specific actions for implementing the long-range integrated resource plans discussed in this 2011 IRP. Developing the Integrated Resource Plan is an important process that gives PSE a structured opportunity to:

- Think broadly. To consider different futures and understand the implications those futures might have on alternative resource strategies.
- Consider different perspectives. To obtain input from stakeholders that have a variety of experienced, informed perspectives about long-term energy markets, environmental issues, and other issues related to resource planning.
- Make reasoned judgments. To combine robust quantitative analysis and reasoned qualitative analysis into clear, well-supported conclusions that will help meet customer demands at the lowest reasonable cost.
- Inform the resource acquisition process. To develop and refine analytical approaches and information that will assist the resource acquisition processes.
- Communicate. To describe the market conditions we face, and our thinking about the implications these conditions have for the resource decisions that must be made.

In some states, integrated resource planning is nearly synonymous with resource acquisition analysis. In Washington state, the IRP informs the acquisition processes rather than simply providing a shopping list of resources to acquire. Analysis in this IRP relies on generic resources to explore strategic issues, such as natural gas supply diversity. The resource acquisition process employs specific information about specific resources. The primary function of the IRP, beyond simply meeting regulatory requirements, is to inform our resource acquisition process.

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 is 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. As shown below, the IRP's primary purpose is to inform the acquisition process; it is not a substitute for the resource-specific analysis done to support specific acquisitions.

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



## *Electric Resource Action Plan*

- Resource adequacy. Continue to refine PSE's analysis of resource need, including the impacts of demand-response. Also, remain actively engaged in regional groups and forums focused on regional resource adequacy for energy and capacity.
- Demand-side resources. Work with external stakeholders in the CRAG process to separate demand-side resources in the plan into non-programmatic and programmatic potentials. Consider real-world risks to achieving conservation potentials as we work with the CRAG in establishing goals and targets for compliance and tariff filings, using this IRP as a starting point. Also, begin ramping up efforts to increase demand-response programs based on cost effectiveness. Issue RFPs, as appropriate, to assist with efficient acquisition of demand-side resources.
- Renewable resources. Continue to work toward meeting renewable energy targets via the formal RFP process and by looking for market opportunities to capture cost-effective renewable resource acquisitions for our customers. Continue refining our forecasting capabilities for wind-related ancillary service needs.
- Transmission to market. Develop actionable alternatives for additional transmission to market. Consider those alternatives along-side other supply-side resource alternatives in the acquisition process.
- Thermal resources/additional resources. Use the formal RFP process, seek market opportunities, and consider self-build alternatives for base-load and peaking resources to capture cost-effective thermal resource acquisitions for our customers, and to ensure reliable and stable operation of the electric system. Develop actionable thermal resource plans informed by results of the RFP/acquisition process.
- Resource Needs as Balancing Authority: Engage in discussions with the Commission and other stakeholders on how balancing authority-level operational issues should be addressed in the Company's resource planning process. Work toward investigating whether it is worthwhile to reflect this level of operating detail in the resource planning framework.

## *Gas Sales Resource Action Plan*

- Demand-side resources. Work with external stakeholders in the CRAG process to separate demand-side resources in the plan into non-programmatic and programmatic potentials. Consider real-world risks to achieving conservation potentials as we work with the CRAG in establishing 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.
- Supply-side resource alternatives. Prepare for potential need for additional capacity in the future. Work with other owners of Jackson Prairie to study the feasibility and possible costs of future expansion. Look for opportunities to possibly acquire existing capacity in the next two years which may be more cost effective than waiting until 2013/2014 to begin pipeline expansion/acquisition designed to meet 2016/17 needs.
- Generation fuel supply. Coordinate fuel supply planning with energy supply acquisitions. As additional gas-fired generation requirements are added to the portfolio, additional regional storage resources may be needed to manage the physical swings in gas supply needed for generation fuel.