

VISION 2020 + 20 Update  
Issue Paper on Energy Consumption and Infrastructure Capacities

Puget Sound Regional Council

July 7, 2005

Growth Management Policy Board adopted *Action to Proceed* August 25, 2005



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# 1. Summary

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This report examines energy consumption patterns, trends, and capacity for electric power and natural gas in the Puget Sound region. For the most significant utilities, it was possible to characterize baseline existing system capacities and forecasts from information that is publicly available. Some of the studies obtained for this report extrapolate scenarios for years beyond available planning horizons. However, in most cases the uncertainties occur well within the nominal 20-year planning horizons used by most of the utilities. In some cases, significant resource decisions are needed within the next five years. The major utilities created a range of planning scenarios to develop recommendations for future resource and conservation options. When all of the utilities have completed their planning efforts, it will be possible to develop and compare qualitative rankings of cost and environmental impacts of resource scenarios.

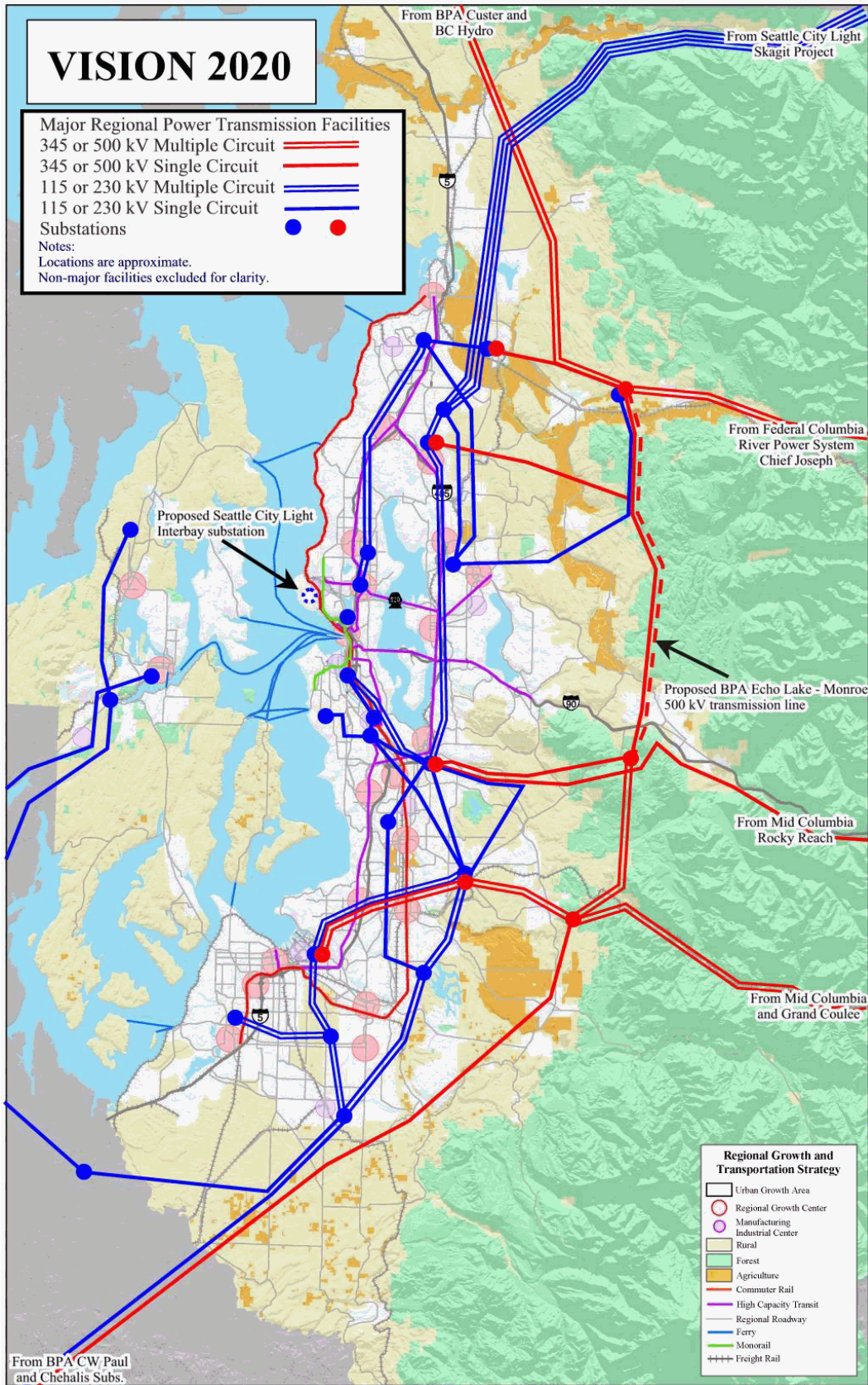


Figure 1. Major Puget Sound Power Transmission Facilities

## 2. Physical Characteristics

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The characteristics of the electricity and natural gas energy suppliers in the region vary considerably in regional scope, corporate structure, capitalization and function. The area is served by both large and small, for-profit and not-for-profit utilities. The Federal Government, through the Bonneville Power Administration, Army Corps of Engineers and Bureau of Reclamation, owns significant power generation and transmission resources that the region depends upon. Both the electric power and natural gas infrastructures are multi-state and international creating significant cross-border interdependencies for both reliability and economy. The systems are highly interconnected networks covering vast regions of the western United States, Canada and portions of Mexico.

### 2.1 Electric Utilities

Six electric utilities provide electric power in the Puget Sound region: Puget Sound Energy, Seattle City Light, Snohomish Public Utilities District, Tacoma Power, Peninsula Power, and Bonneville Power Administration. With the exception of a few Direct Service Industrial customers, the Bonneville Power Administration does not directly serve retail loads in the region, but delivers substantial quantities of wholesale power to the other utilities listed through its transmission network. The major electric power delivery infrastructure for the Puget Sound region is shown in Figure 1 on the opposite page. The facilities in this region include very few power generating plants. For the most part, power is generated outside the region and transmitted over high-voltage transmission lines to the Puget Sound region.

Demand for electric power generally peaks in the winter months, however, some of the dense, urban centers (e.g., Seattle and Bellevue) now reach their peak demands in the summer due to increased cooling loads. The winter peaking characteristic of Puget Sound utilities is illustrated by the chart below from Puget Sound Energy's 2005 least cost plan.

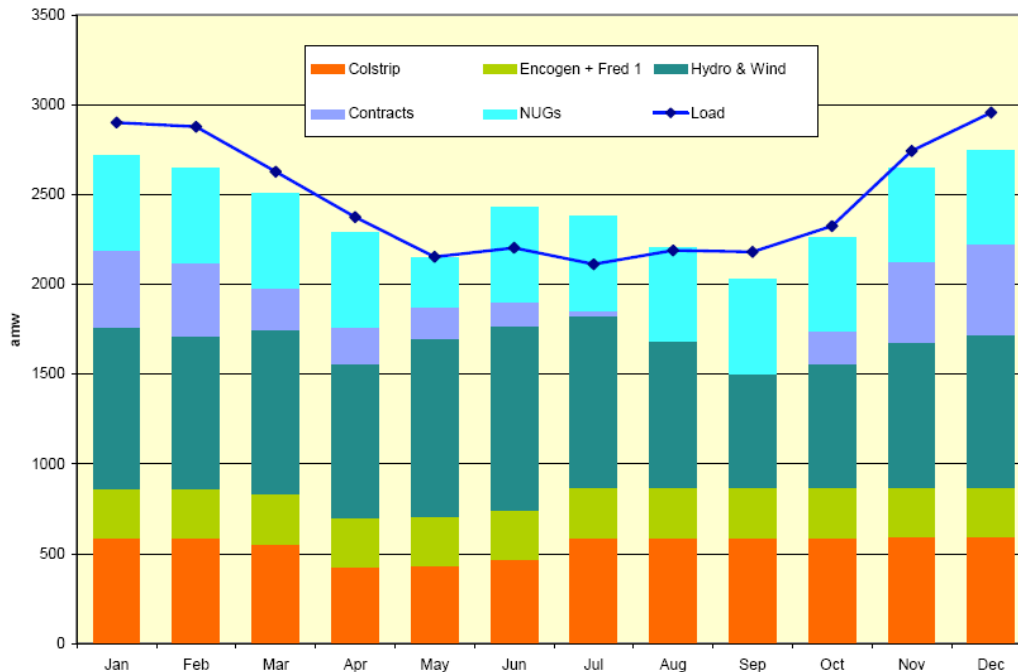


Figure 2. Exhibit II-2: 2006 Monthly Load Resource Balance

## 2.2 Natural Gas Utilities

Three natural gas operating entities provide most of the region's requirements: Puget Sound Energy, Cascade Natural Gas, and Williams. Like the Bonneville Power Administration's electric transmission function, the Williams Northwest Pipeline delivers wholesale gas to the other companies which distribute the product to retail consumers in the region. Unlike the high-voltage power transmission network, there is only a single main bidirectional pipeline serving the Puget Sound region with lateral feeders. A map showing the regional natural gas pipeline infrastructure is provided in Figure 3.

## 2.3 Corporate Planning Profiles: Service Areas and Resource Mixes

The utilities studied in the Puget Sound region have completed varying degrees of load forecasting and resource planning applicable to this review. Puget Sound Energy, Seattle City Light, Snohomish Public Utilities District and Tacoma Power (Tacoma) all periodically prepare a document called an integrated resource plan. An integrated resource plan "is used to determine a utility's long-term strategy for the portfolio of electric resources – including conservation and power supplies – it intends to use to serve its retail customers' future needs."<sup>1</sup> Puget Sound Energy's integrated resource plan is called a least cost plan and it covers both its electric and gas utilities.

<sup>1</sup> Charles J. Black Energy Economics. Recent Integrated Resource Plans by Western Electric Utilities: Review of Scope, Issues and Processes. Prepared for Seattle City Light, December 8, 2004.



**5-Year HP Supply  
Construction Plan  
2005 - 2009**

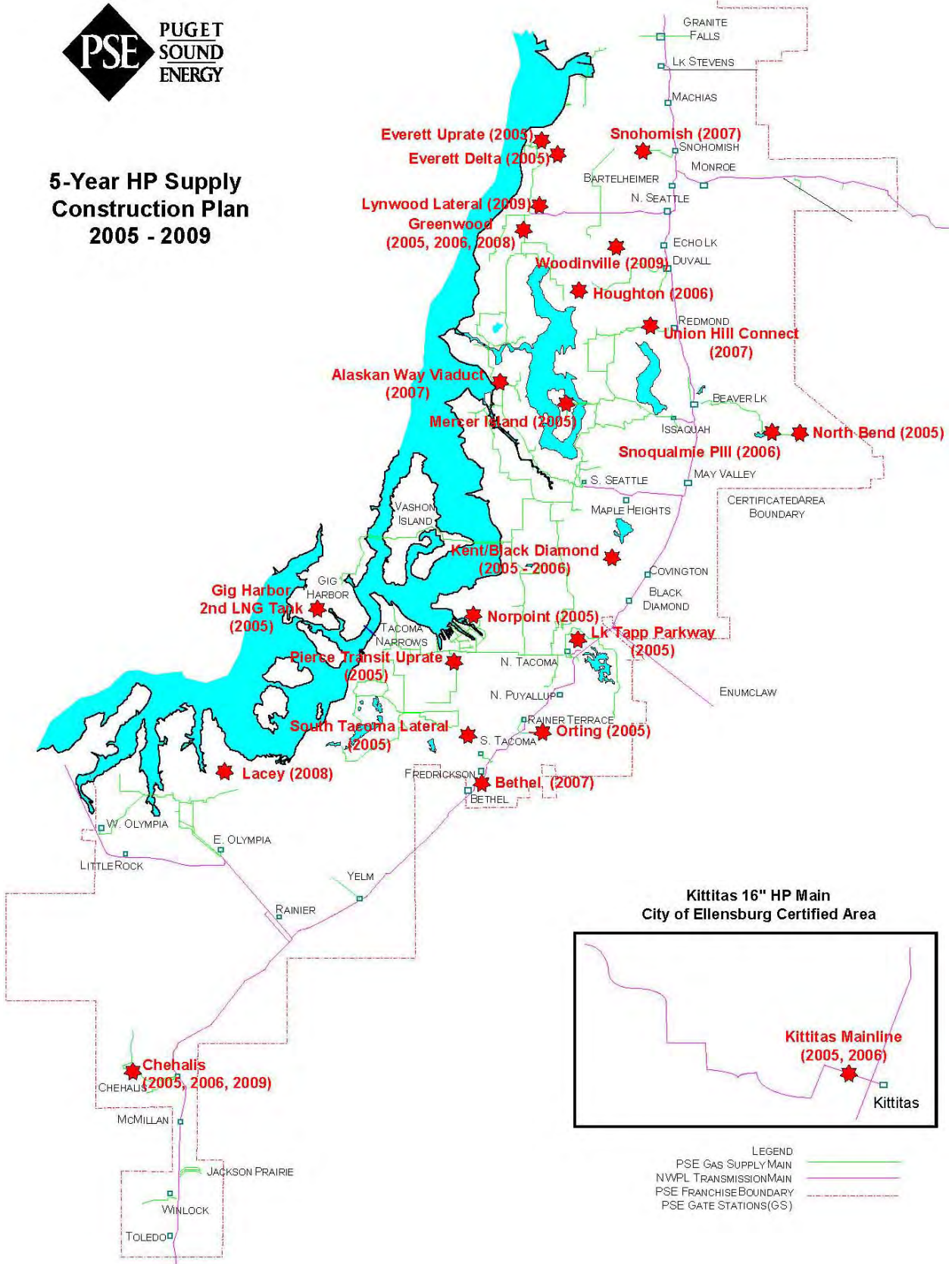


Figure 3. Five-Year HP Supply Construction Plan, 2005-2009

### 2.3.1 Puget Sound Energy

As shown in the map below, Puget Sound Energy provides electricity and natural gas to portions of all four counties in the Regional Council.



- Combined electric and natural gas service
- Electric service
- Natural gas service

Puget Sound Energy is Washington state's largest energy utility, providing electric and natural gas service to more than 1.2 million customers, primarily in Washington state's Puget Sound region.

Puget Sound Energy's service territories:

**Electric Service:** Island, Jefferson, parts of King (not Seattle), Kitsap, Kittitas, Pierce (not Tacoma), Thurston, Skagit and Whatcom counties. (Public utility districts also serve parts of some counties.)

**Natural Gas Service:** King, Lewis, Pierce, Snohomish, Thurston and parts of Kittitas counties.



Figure 4. Puget Sound Energy Service Territory

Of all utilities researched, Puget Sound Energy provided the most comprehensive planning documents to support its plan.<sup>2</sup> By statute, Puget Sound Energy is required to revise the plan every two years. Note that the illustrations in this section are identified by the exhibit numbers appearing in the least cost plan.

### 2.3.1.1 Puget Sound Energy Electric Power Analysis

#### 2.3.1.1.1 Current Resource Mix

Puget Sound Energy uses a diversified resource mix to serve its customers. Electricity is produced or purchased by Puget Sound Energy from generators using the following mix of prime mover equipment.

Prime Mover Type	Percent of Power Supplied
Hydroelectric	42.4%
Coal	34.4%
Natural Gas Cogeneration	17.0%
Natural Gas	4.3%
Nuclear	0.9%
Waste	0.6%
Biomass	0.2%
Landfill Gas	0.1%
Petroleum	0.1%

To meet the objectives of its least cost plan, Puget Sound Energy is currently acquiring wind and other power generating resources to further expand and diversify its portfolio. The near-term projected portfolio is shown in the pie chart below.

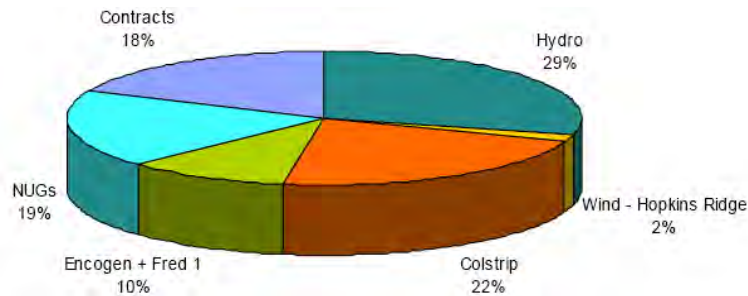


Figure 5. Exhibit II-3: December 2006 Supply Resource Mix

NUGs, or non-utility generators, in the Puget Sound Energy service area use natural gas to produce power and sell that power under contract to Puget Sound Energy. Contractually, Puget Sound Energy also relies on significant amounts of hydroelectric power generated by non-federal projects on the Columbia River. These contracts begin to expire in 2011.

<sup>2</sup> Puget Sound Energy. Least Cost Plan: April 2005. 783 pages. Available for download at <http://www.pse.com/about/supply/resourceplanning.html>.

### 2.3.1.1.2 Load/Resource Balance

The chart below illustrates the extent to which Puget Sound Energy will own insufficient capacity resources to meet peak load in both the near and long-term without acquiring additional production capability. This situation does not imply that blackouts are likely however. The electrical interconnection as a whole, has substantial surplus generating capacity. The uncertainty lies in whether such capacity can be delivered to Puget Sound Energy at a reasonable price.

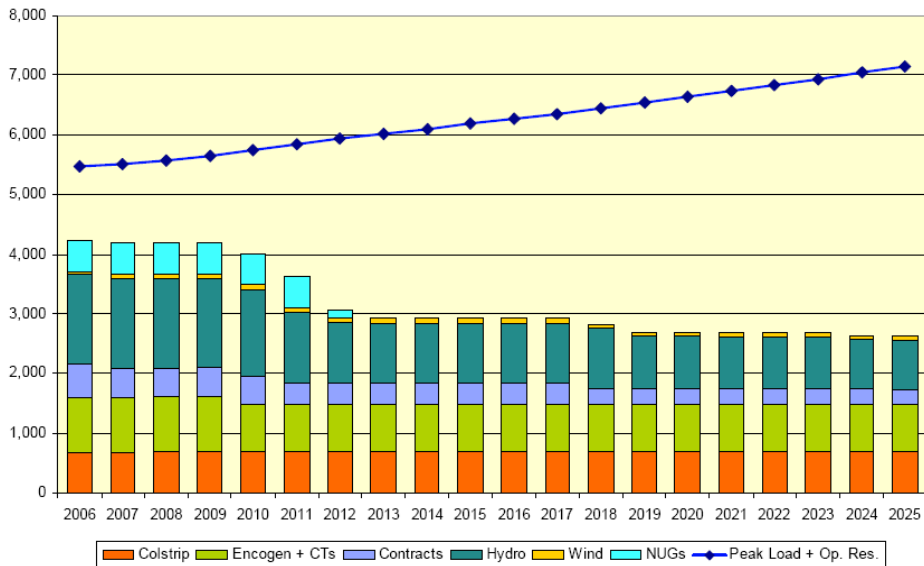


Figure 6. Exhibit II-4: Peak: 2006-2025 Load-Resource Balance

Similarly, the energy producing resources owned or under contract to Puget Sound Energy will be increasingly insufficient to meet future load requirements as shown in the chart below.

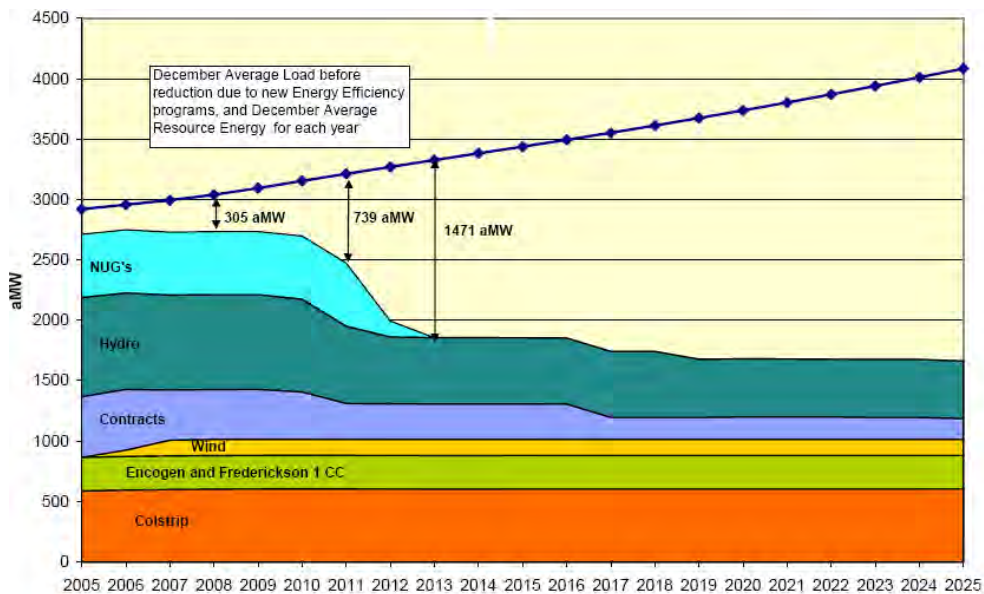


Figure 7. Exhibit II-1: Energy: 2006-2025 Load-Resource Balance

### 2.3.1.1.3 Long-term Resource Strategies and Costs

The least cost plan report concludes that “Overall, considering both cost and risk, the analysis supports the selection of a portfolio including accelerated energy efficiency, early fuel conversion, 10 percent renewable generation, and 50/50 gas and coal. This portfolio performs well across all the scenarios.” Such a scenario is illustrated below.

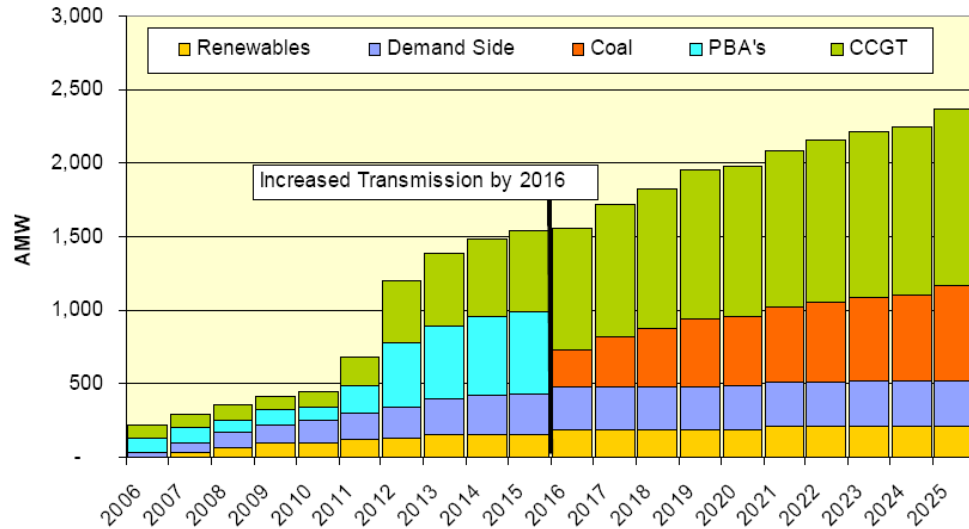


Figure 8. Exhibit II-9: 2006-2025 Resource Strategy, Accelerated Conservation and Fuel Conversion

Puget Sound Energy’s forecasts show a significant need for additional resources in both the near and long-term. Section IV.E. of the least cost plan analyzes the imputed debt that will result from existing low-cost power supply contracts that will expire between 2011 and 2019. One result of this deficit position is significant forward price risk in wholesale power markets. Transmission constraints can further exacerbate these risks by concentrating market power within the Puget Sound region. The inevitable need for additional capacity, combined with increases in credit and price risk will result in upward pressure on future electricity rates. Puget Sound Energy provides the following forecast of retail electric and gas rates.

Table 1. Exhibit VI-4: Retail Rate Forecasts

(nominal)	2004	2005	2010	2015	2020	2024	aarg
<b>Residential</b>							
Electric, cent/kwh	6.30	6.95	8.95	10.18	11.60	12.78	3.6%
Natural Gas, \$/therm	0.90	1.10	0.93	1.17	1.34	1.41	2.3%
<b>Commercial</b>							
Electric, cent/kwh	7.04	7.40	8.07	9.27	10.90	12.46	2.9%
Natural Gas, \$/therm	0.80	0.98	0.80	1.04	1.20	1.27	2.4%
<b>Industrial</b>							
Electric, cent/kwh	6.67	7.03	7.67	8.82	10.36	11.85	2.9%
Natural Gas, \$/therm	0.73	0.92	0.73	0.97	1.14	1.20	2.5%

aarg: average annual rate of growth



on actual market quotes), gas prices are expected to rise steadily under most forecast scenarios.

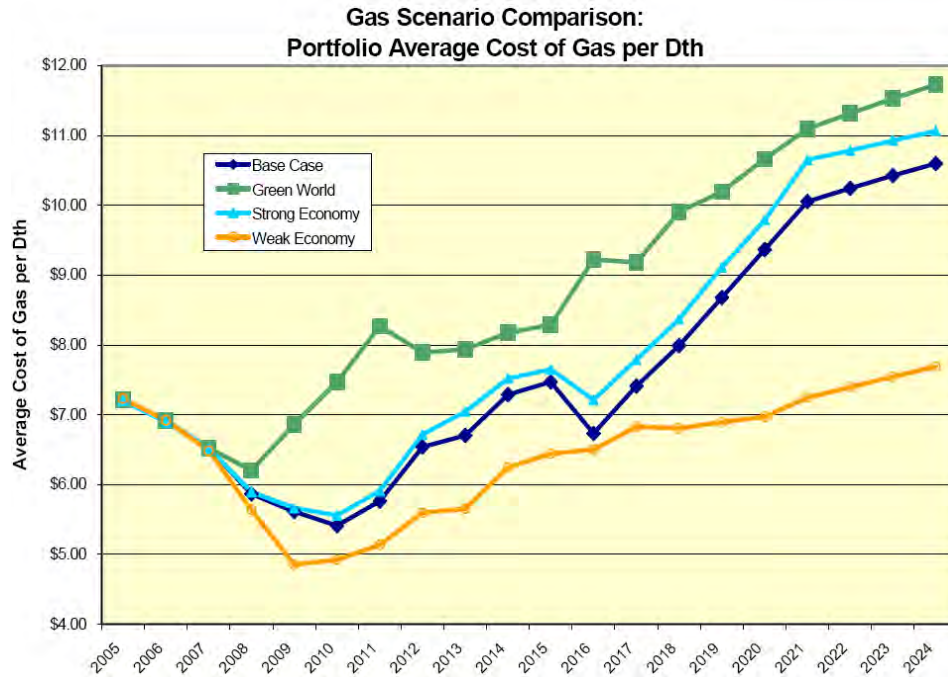


Figure 10. Exhibit II-15: Range of Costs-Optimal Portfolios Across Scenarios

### 2.3.1.2.1 Natural Gas Load/Resource Balance

The Base Case load/resource balance for Puget Sound Energy’s natural gas supply infrastructure shown below illustrates the significant near-term shortfalls in system capacity by the 2007/2008 winter heating season if no additional resources are developed or acquired.<sup>4</sup> To meet increasing system peak requirements, a combination of gas resources from producers, pipeline capacity, and storage facilities can be considered. To moderate the increases in peak demand, energy efficiency and conservation measures can reduce energy consumption while maintaining comfort and productivity. While natural gas resources in North America are considered adequate, development of new gas resources and liquefied natural gas facilities will exert upward pressure on gas prices over the long-term.

<sup>4</sup> Puget Sound Energy. Least Cost Plan: April 2005. Executive Summary, Section C, Natural Gas Least Cost Plan.

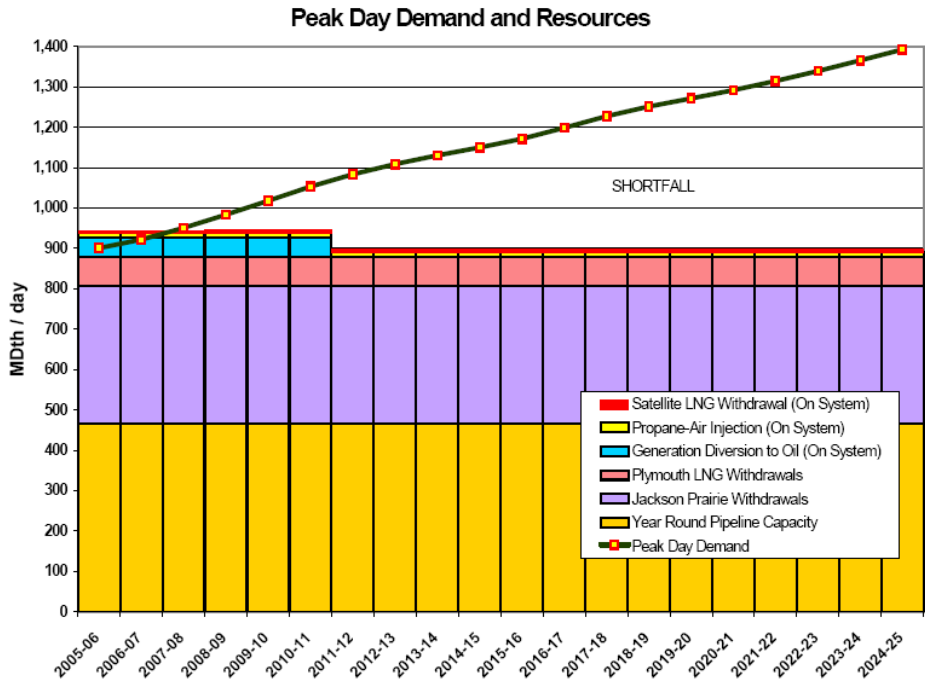


Figure 11. Exhibit II-13: Natural Gas Load/Resource Balance—Base Case

Puget Sound Energy is proposing a portfolio of energy efficiency (demand side) and supply side additions to its system to balance resources and demand over the planning horizon. These portfolio additions are illustrated in the chart below (Figure 12). As with electric system capacity additions, projects must be built in discrete, economically sized increments. This leads to a “lumpiness” in resource additions which causes short-term over-capacity which is present until demands grow to consume the surplus.

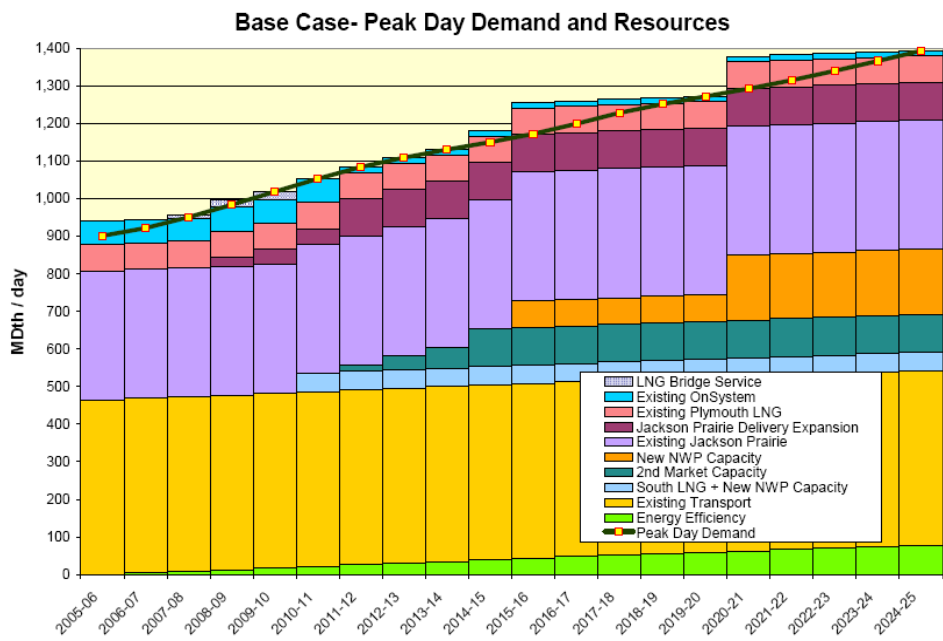


Figure 12. Exhibit II-14: Optimized Portfolio—Base Case

### 2.3.2 Seattle City Light

Seattle City Light supplies electricity to approximately 365,000 customers. Seattle City Light is in the process of preparing an integrated resource plan, but currently has few documents that shed light on its long-term load/resource balance. The following table was taken from the 2003 Annual Report and shows how Seattle City Light’s current resource portfolio lacks the diversification found in Puget Sound Energy’s portfolio.

Generation Type	Percentage
Hydro	89.29%
Natural Gas	5.00%
Nuclear	2.99%
Wind	1.78%
Coal	0.74%
Waste Incineration	0.11%
Biomass	0.09%

During normal and high water years, the Seattle City Light portfolio produces surplus energy that can be sold in wholesale markets to offset the cost of power delivered to consumers. However, during drought years the Seattle City Light portfolio exposes the utility and its customers to power supply risks. From the information posted at [www.seattle.gov/light/ctracks.html](http://www.seattle.gov/light/ctracks.html), the 2004-2005 water year appears to be approaching drought conditions of similar proportions to those occurring in 2000-2001.

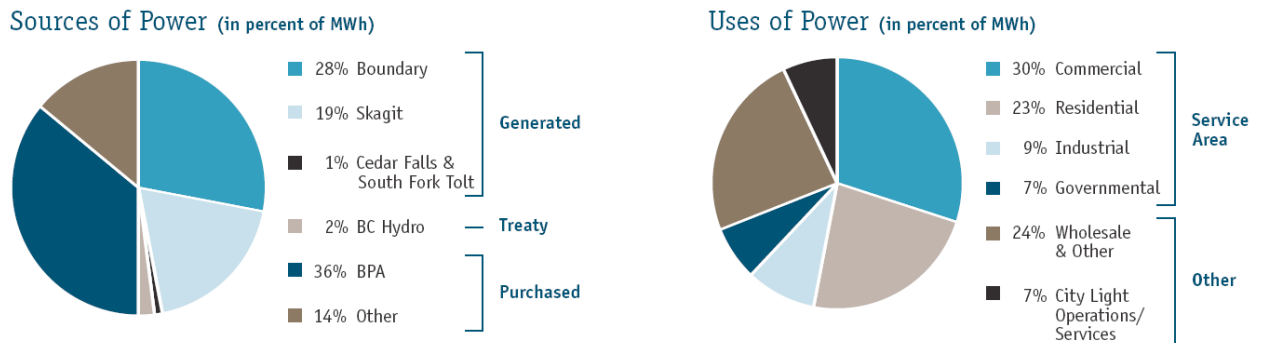


Figure 13. Seattle City Light Sources and Uses of Power

In the long-term, Seattle City Light will need to apply for a new license for its Boundary hydroelectric facility in Eastern Washington in 2009. Conditions that may apply to the new license are not known at this time.

### 2.3.3 Snohomish Public Utilities District

Snohomish Public Utilities District is currently in the process of reviewing its integrated resource plan documents and has recently (4/28/05) posted a draft integrated resource plan at [www.snopud.com/AboutthePUD/CommissionMeetingInformation/irp.ashx?p=2326](http://www.snopud.com/AboutthePUD/CommissionMeetingInformation/irp.ashx?p=2326). The following was noted from the review draft:

- The plan covers the period from 2009-2028. The Public Utilities District is committed to developing and updating its integrated resource plan every two years.
- New generating resources are not expected to be required until sometime between 2013 and 2017 depending on the effectiveness of conservation measures.
- The amount and cost of power obtained from the Bonneville Power Administration after 2011 greatly affects the Snohomish Public Utilities District's resource strategy. Bonneville Power Administration power purchases currently make up about 80 percent of the District's portfolio.

### 2.3.4 Tacoma Power

Tacoma Power serves approximately 150,000 customers in the city of Tacoma and portions of Pierce County.

Tacoma owns four hydroelectric projects with a total nameplate capacity of 713 MW, and the Cowlitz Project (the largest at 462 MW), is in need of refurbishment. Over half of Tacoma's retail load is served by power purchased from the Bonneville Power Administration. Additional purchased power comes from the Grant County Public Utilities District Priest Rapids hydroelectric, Columbia Basin Irrigation Districts, and wholesale contracts.

In July 2004, Tacoma Power completed its 2004 Integrated Resource Plan.

- The integrated resource plan covers a ten-year period from 2004-2013.
- Nine load/resource balance scenarios were analyzed.
- On an annual average basis, output from Tacoma's firm power resources will exceed the forecast loads.
- Surplus conditions during certain months (spring and summer) can be used to cover deficits in other months or sold in wholesale energy markets to optimize Tacoma's power supply portfolio.
- Resource acquisition is not required or recommended at this time.
- Tacoma continues to promote a variety of energy conservation programs.

As discussed in the section below on the Bonneville Power Administration's Regional Dialogue, Tacoma's primary supply uncertainty occurs as it negotiates its share of Bonneville Power Administration power for the years after 2011.

### 2.3.5 Peninsula Light Company

Peninsula Light Company serves over 26,000 member homes and businesses, covering 112 square miles in Western Pierce County, Washington. Its territory extends roughly from the Tacoma Narrows (on the south) to the Kitsap County line (to the north). Peninsula Light Company is the second largest cooperative in the state of Washington. No planning documents for Peninsula Light were obtained.

Information about the utility is found at <http://www.penlight.org/>.

### 2.3.6 Williams Northwest Pipeline

First completed in 1957, the Northwest pipeline now transports 85 percent of all natural gas consumed in Washington. It delivers wholesale gas distributed by Puget Sound Energy and Cascade Natural Gas. Northwest developed its Capacity Replacement Project in response to an amended corrective action order issued by the Office of Pipeline Safety which, requires Northwest to permanently abandon its 26-inch pipeline in the Sumas-Washougal corridor, and install replacement facilities as necessary to meet future capacity requirements. Northwest states that the estimated total cost of the proposed Capacity Replacement Project is approximately \$333.1 million. Work on the Capacity Replacement Project is expected to be completed by the end of 2006. The project affects substantial portions of the pipeline in Snohomish, King and Pierce counties as shown on the map included with this report, retirement\_map\_public.pdf. The integration of this interstate pipeline facility with the gas distribution system of Puget Sound Energy are illustrated in Figure 3.

### 2.3.7 Cascade Natural Gas

Distributes natural gas to consumers in Bangor, Belfair, Bremerton, Chico, Gorst, Keyport, Manchester, Port Orchard, Poulsbo, Silverdale, Sunnyslope. No long-term planning documents were obtained.

Information about Cascade Natural Gas can be found at <http://www.cngc.com/company/servicemap.asp>.

## 2.4 Regional Organizations

The activities of a number of regional entities have substantial impacts on the energy infrastructure serving the Puget Sound Region. A few of the key organizations are described below.

### 2.4.1 Bonneville Power Administration and other Federal Entities

The Federal Government, through the Bonneville Power Administration, Army Corps of Engineers and Bureau of Reclamation, owns significant power generation and transmission resources that the region depends upon. Federal hydroelectric facilities as far east as Montana are used to meet the demand of customers in the Puget Sound region. An excellent overview of the Bonneville Power Administration's role and the

projects that it manages for the Federal government can be found at [http://www.bpa.gov/corporate/About\\_BPA/](http://www.bpa.gov/corporate/About_BPA/).

The Bonneville Power Administration is currently divided into two main business lines—power and transmission—under a single administrator. The Power Business Line operates the power plants in the Federal Columbia River Power System—23,000 megawatts of installed generating capacity at 29 federal dams and 7 nonfederal power plants, including a major nuclear project. Similarly, the Transmission Business Line operates the transmission system that is a major part of the Western Interconnection in the Northwest Region.<sup>5</sup>

In spite of being perceived as major power supplier for the region, the Bonneville Power Administration has adopted an integrated resource planning approach that considers both supply-side and demand-side options for meeting future requirements. And given the effects of large hydroelectric facilities on fish and wildlife in the Columbia Basin, the Bonneville Power Administration devotes considerable resources to environmental efforts. The Northwest Power and Conservation Council (see next section) frequently makes planning recommendations to the Bonneville Power Administration. The Bonneville Power Administration is required to conduct extensive public processes for planning and policy development. It is currently working on policies for system adequacy, business practices for transmission services, and a regional dialog on

#### 2.4.2 Northwest Power and Conservation Council

Originally called the Northwest Power Planning Council (Council), the Northwest Power and Conservation Council was created by Congress to give the citizens of Idaho, Montana, Oregon and Washington a stronger voice in determining the future of key resources common to all four states — namely, the electricity generated at and fish and wildlife affected by the Columbia River Basin hydropower dams. Additional background information about the Council can be found at [www.nwcouncil.org](http://www.nwcouncil.org).

The Council released its Fifth Power Plan on May 13, 2005. In the current plan, the Council identifies a range of uncertainties that exist and describes flexible resource strategies that address these uncertainties. The Council also addresses policy issues including: standards for resource adequacy; planning, funding, and operation of transmission; the interaction of fish and wildlife and power; and the future role of the Bonneville Power Administration in power supply.

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<sup>5</sup> The Western Interconnection includes all major electric transmission facilities from British Columbia, south through the Pacific coast and Rock Mountain states and into portions of Mexico. The eastern edge of the Western Interconnection passes through Alberta, Montana, South Dakota, Nebraska, Colorado and New Mexico. See [http://www.wecc.biz/documents/constant/nerc\\_int.pdf](http://www.wecc.biz/documents/constant/nerc_int.pdf) for a map of the North American Interconnections.

The plan contains the following recommendations:

- **Conservation.** Increase and sustain efforts to secure cost-effective conservation immediately.
- **Demand Response.** Develop demand-response programs - agreements between utilities and customers to reduce demand for power during periods of high prices and limited supply.
- **Wind Power.** The plan includes more than 1,100 MW of wind generating capacity between 2005 and 2014. During the next five years the region should gain experience and gather more information about the performance of these projects.
- **Preparation for New Power Plants.** The region should secure options for construction of new power plants. If additional generating capacity is needed, the region should have planning, siting and permitting issues associated with both the generating facilities and transmission needs well in advance of construction.

The plan is not meant to replace utility integrated resource plan efforts, but provides a resource for considering future supply and demand-side options, evaluation of risks, and approaches to key policy issues.

### 2.4.3 Grid West

Grid West is a proposal to create a new, independent, non-profit corporation designed by regional grid owners and users to manage use of the transmission grid and plan for its future. Grid West basic features include:

- Transmission system management practices that more accurately align commercial commitments with physical power flows,
- Control area consolidation to improve reliability and efficiency,
- Transmission planning and capacity expansion services, and
- Regional market monitoring and dispute resolution.

The proposal is a product of work by a comprehensive cross-section of the region's transmission stakeholders, including transmission providers, power producers, end users, public power, environmental and other public interest organizations, and state, provincial, and tribal officials from across Idaho, Oregon, Washington, Montana, Utah, Wyoming, Nevada, British Columbia, and Alberta.

The Grid West proposal would not replace existing bilateral, wholesale power markets in the Northwest. However, the Grid West proposal would better manage the transmission capacity needed by those markets. Grid West would also facilitate voluntary control area consolidation, which would include voluntary markets for ancillary services (reserves and imbalance energy).

Under the proposed Grid West approach, existing long-term transmission contracts would be preserved. Transmission users would also be able to request and obtain long-term transmission contracts to deliver new generating or contract resources to load. In

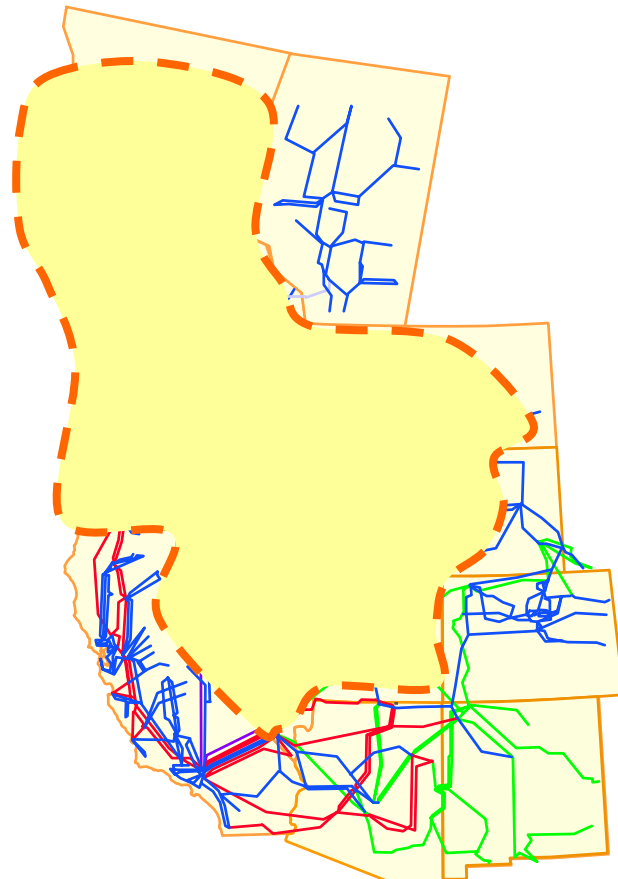
addition, processes would be provided to allow parties with unused transmission rights to release them for purchase by other users, thereby making better use of existing transmission capacity.

Utilities considering formation of Grid West own over 62,000 circuit miles of transmission lines that are operated at or above 46 kV, with a net plant investment value of almost \$7.5 billion. The Grid West “footprint” includes most transmission facilities shown in the region below that are owned by the following companies:

- Avista Corporation
- Bonneville Power Administration
- BC Hydro
- Idaho Power Corporation
- Nevada Power
- NorthWestern Energy
- PacifiCorp
- Portland General Electric
- Puget Sound Energy
- Sierra Pacific

In addition to including U.S. entities, Grid West has been designed to accommodate participation by Canadian transmission owners and operators. B.C. Hydro (and more recently B.C. Transmission Corporation) has supported Grid West development as a filing utility. There have also been discussions with representatives from Alberta concerning the potential for Alberta to participate.

Information about Grid West can be found at [www.gridwest.org](http://www.gridwest.org).



#### 2.4.4 Western Electricity Coordinating Council

Originally formed as the Western Systems Coordinating Council, the Western Electricity Coordinating Council is the regional reliability organization for the Western Interconnection.

#### 2.4.5 Northwest Gas Association

The Northwest Gas Association is a trade association that represents the natural gas industry in the Northwest. A map of the major natural gas facilities in the region can be found at [http://www.nwga.org/about\\_nwga.php](http://www.nwga.org/about_nwga.php).

## 3. Electric Power Issues

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In the wake of the 2000-2001 crisis that left electric utilities reeling from power shortages and soaring prices, planning efforts of these utilities are framed by the need to hedge uncertainty and risk. Construction of new power resources requires investment—and rates to support these investments—that is substantially more costly per unit of capacity than the resources embedded in current power portfolios. The Northwest Power and Conservation Council continues to estimate that conservation can be the most cost effective approach to future power plans.<sup>6</sup> At the same time, existing generating resources will be retired and new customers will take service during the planning period. There is substantial planning activity in the region to establish future resource portfolios that include: conservation, power supply contracts, and generating resource development.

### 3.1 Expiration of Bonneville Power Administration Power Supply Contracts—Regional Dialogue

The current Bonneville Power Administration “Regional Dialogue” is setting the stage for renegotiating a substantial number of power supply contracts with its customers that will expire in 2011.<sup>7</sup> Beginning in 2006, the Bonneville Power Administration will offer new contracts to these customers who must then choose whether to continue to take service under tiered rates from the Bonneville Power Administration, seek competitive power supply contracts, or some combination of these approaches. The strategic direction that the Bonneville Power Administration has taken with respect to its future role in marketing power in the region was driven by the 2000-2001 crisis when the Bonneville Power Administration was forced into high priced wholesale power markets to cover customer demands.<sup>8</sup> The Bonneville Power Administration describes significant challenges that will be addressed between now and October 2008 when the new long-term contracts and rates have been established. This policy will affect customers of all utilities in the Puget Sound Region.

### 3.2 Regional Electric Transmission Issues

For utilities in the Puget Sound Region, most of the electrical power consumed is generated at powerplants that are many miles from consumers. All of the planning documents described various regional transmission challenges. For those seeking new renewable energy and other distant power supply resources, transmission bottlenecks

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<sup>6</sup> NWPCC. *Fifth Power Plan*. Table OV-2: Resource Supply Curve 2025. Page 26.

<sup>7</sup> BPA posts information about the Regional Dialogue on its website at [www.bpa.gov/power/pl/regionaldialogue/announcements.shtml](http://www.bpa.gov/power/pl/regionaldialogue/announcements.shtml).

<sup>8</sup> BPA. *Bonneville Power Administration’s Policy for Power Supply Role for Fiscal Years 2007–2011*. Notice of Final Policy. February 14, 2005. Federal Register / Vol. 70, No. 29 at 7489.

severely constrain the amount of capacity that can be delivered to the Puget Sound Region. As described in the recent Bonneville Power Administration publication, Keeping Current, “problems facing the transmission grid today go beyond the borders of any one utility.” Two initiatives, Grid West and the Transmission Improvements Group, are in the process of developing proposals to address a raft of regional problems and opportunities identified by the Grid West Regional Representatives Group in September 2003.<sup>9</sup>

### 3.3 Effects of Drought

The amount of water available for power generation in the Northwest varies substantially from wet to dry years. For example, a 50-year sample of streamflow data for Northwest watersheds such as the Columbia River basin, the lowest water year will typically provide only one-third of the water discharged in the wettest year. In the Bonneville Power Administration’s 2003 White Book the projected energy surpluses and deficits are illustrated in Figure 14 below as a function of potential variations in water conditions.

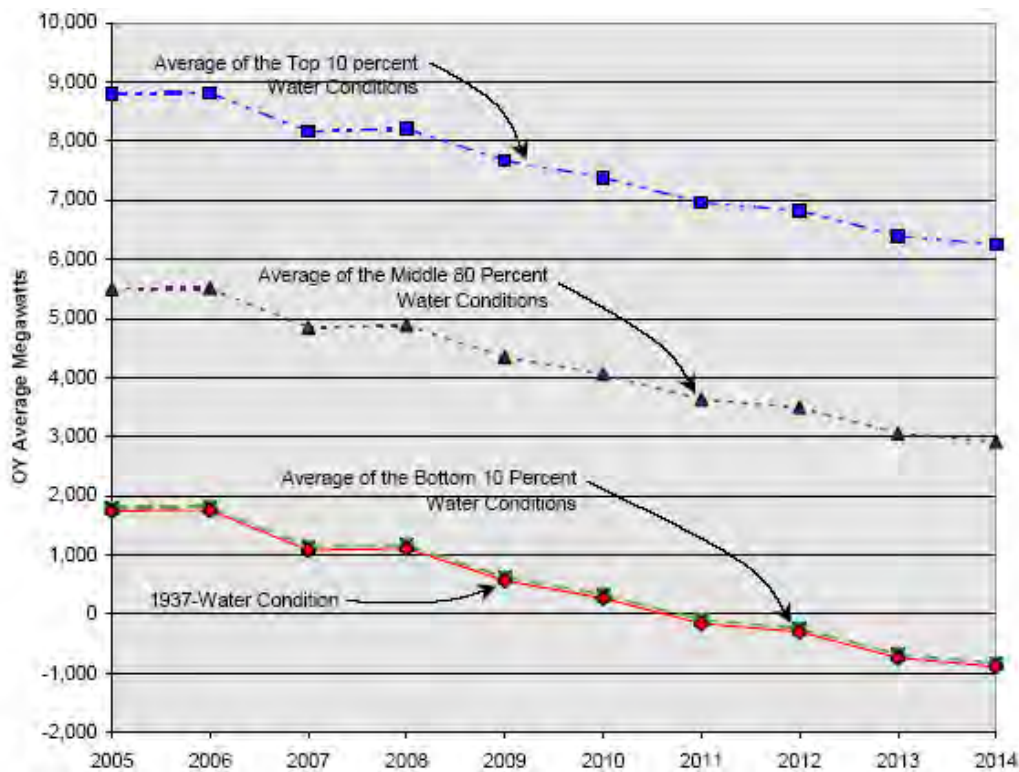


Figure 14. Variability of Regional Annual Energy Surplus/Deficit Utilizing Differing Water Conditions for OY 2005 through 2014

<sup>9</sup> [www.gridwest.com/Doc/Reference\\_Document\\_Sept52003.pdf](http://www.gridwest.com/Doc/Reference_Document_Sept52003.pdf).

Because Puget Sound regional electric utilities depend heavily on hydroelectric generation, this variability creates considerable uncertainty for power supply planners. The Pacific Northwest Coordination Agreement establishes water storage and power transfer rights and obligations that help prevent floods during high flow years and mitigate shortages during low flow years.

Between the summer of 2000 and summer 2001, a drought resulted in substantial underproduction of hydroelectric energy. This event combined with wholesale power market manipulation in the west, resulted in extremely volatile electric power prices that were found unjust and unreasonable by the Federal Energy Regulatory Commission.<sup>10</sup> Seattle City Light alone spent more than \$480 million in excess of its budgeted purchased power expenses during that period. Today the resulting external debt is virtually paid off and additional resources have been purchased to reduce the risk of near-term resource deficiencies.

The 2004-2005 water year in the Northwest again shows drought characteristics. While it is expected that the interconnected electric system will have sufficient capacity to meet peak demands this year, energy production will shift from hydroelectric resources to fossil fueled powerplants possibly resulting in substantial short-term market purchases by utilities dependent on hydroelectric resources during the winter when hydroelectric production is at a minimum.

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<sup>10</sup> See FERC Docket No. PA02-02 Final Report at <http://www.ferc.gov/industries/electric/indus-act/wec/chron/2003.asp>. March 26, 2003.

## 4. Natural Gas Issues

The primary issue for consumers with respect to natural gas is price. The chart below appears in the Northwest Power and Conservation Council Fifth Power Plan and shows the quantum jump in wholesale gas prices beginning in 2000. Current gas prices range from \$5.50 to \$6.00 per MMBtu in the region.

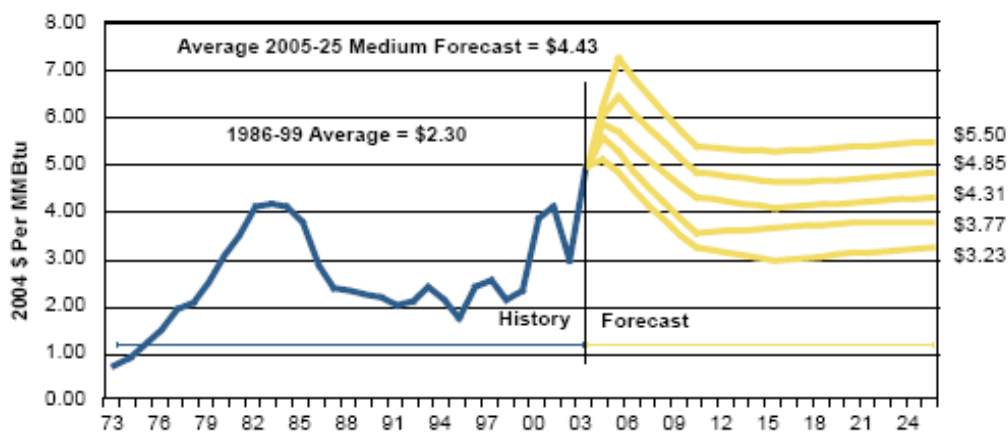


Figure 15. Historical and Forecast Natural Gas Prices

Part of the reason for gas price increases is the desirability of gas as a fuel for electric power generation. While fuel efficiency has tended to reduce per capita demand in the residential and commercial sectors, consumption for power production has increased. The U.S. is a net importer of natural gas and with domestic production nearly constant, liquefied natural gas imports will increase over the long-term to meet expected increases in consumption. There are currently proposals to locate large liquefied natural gas terminal facilities on the Columbia River to increase supply in the long-term.

## 5. Conclusion and Recommendations

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Recent planning studies by most of the principle electric and gas utilities serving the Puget Sound region indicate significant potential for generating and natural gas resource shortfalls in the near future. These utilities are actively soliciting offers for additional economic resources as part of their integrated resource planning efforts. Nevertheless, new resources will result in upward pressure on energy rates that may affect economic activity in the region.

Between now and 2040, we will likely see additional advancements in energy conservation and the further development of alternative energy sources - particularly in the areas of solar, wind power, tidal and perhaps even geothermal energy-all of which are currently being implemented on some scale. While it was beyond the purview of this paper to speculate on how significant a contribution such alternative forms may be playing 35 years from now, nevertheless there is value today to consider the opportunities and challenges that may be at hand for our children and subsequent generations.

It is recommended that the Council convene a roundtable discussion including all of the principle energy providers in the region to discuss the status of their planning and resource acquisition efforts. To the extent that potential energy price impacts can be estimated, as has been done by Puget Sound Energy, the impacts on economic activity in the region should be analyzed.