Chapter 3 – The Need: Ensuring Long-term Reliable Service

For over one hundred years, City Light has delivered reliable, low-cost power to its ratepayer/owners. For most of those years, power generated by the Utility's own hydroelectric facilities, together with power purchased under contract and from the wholesale power market, was sufficient to meet the electric power needs of the service area.

Beginning in the early 1980s, the Utility initiated conservation programs to encourage its customers to use power more efficiently. This strategy was intended to defer as much as possible the acquisition of expensive new resources, especially those having a negative impact on the environment.

Policy direction from elected officials since then has reaffirmed the goal of using energy efficiently through continued funding of conservation programs. Seattle City Council Resolution 30144, April 3, 2000 (Appendix B), states that the Utility should use "cost-effective energy efficiency and renewable resources to meet load growth as much as possible." City Light subsequently contracted for the purchase of output from the Stateline Wind Project.

Among the initial steps in developing this Integrated Resource Plan (IRP) were to (1) forecast long-term load growth in the Utility's service area, and (2) evaluate the ability of the existing resource portfolio to serve future load at a predetermined level of reliability. Because it would be much too costly to acquire resources that guarantee 100 percent resource reliability, the Utility selected a level of reliability that reflects the amount of risk it is willing to accept that load will not be served. This level of reliability is embodied in a measure that is referred to as resource adequacy.

City Light's long-term forecast of service area load is discussed in this chapter, followed by descriptions of the Utility's existing portfolio of conservation, generation and market resources, power generated by these resources, and the need as measured by a target for resource adequacy.

Load Forecast

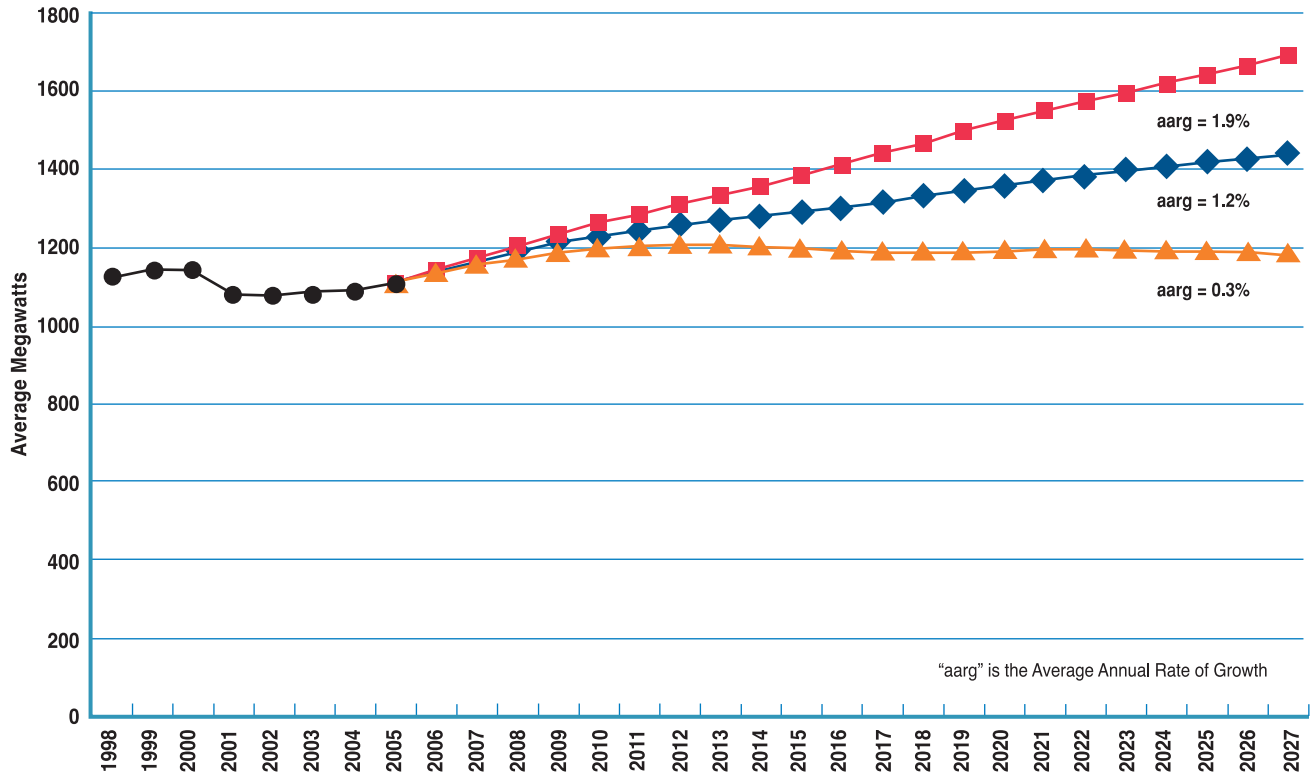
In order to plan for the acquisition of new resources, which can take many years, City Light forecasts future power consumption (or load) in its service area 20 years into the future.

The load forecast is based on forecasts of several key economic and demographic variables, primarily employment and the number of households in the service area. Recovery from the 2001-03 recession is still underway, with Seattle experiencing a construction boom in both the commercial and residential sectors. Downtown office towers are being built, despite a double-digit vacancy rate. Throughout the city, multifamily housing is displacing single-family housing and commercial buildings. Growth is expected to remain strong in the near term, with the rate of growth slowing somewhat by at least 2010.

Load Forecast Range

Figure 3-1 shows the Utility's 20-year base forecast of annual average load, with a high and low forecast to reflect uncertainty about the future. These forecasts define the range in which actual load will most likely fall. The range widens for each year into the future as uncertainty increases. Updated for each IRP, this is the Utility's best estimate of what future load will be. The forecasts do not reflect the effect of any future programmatic conservation, so that future conservation can be considered on the same basis as future generating resources in deciding how much of each to use in the IRP.

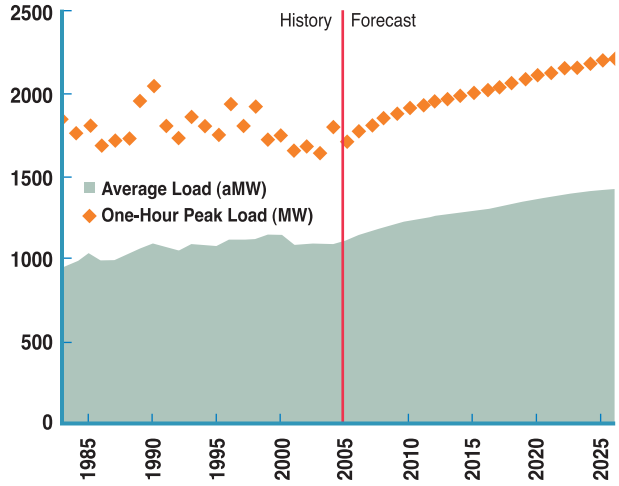
Figure 3-1. Base, High and Low Forecast (with no new conservation resources)



Peak Load Forecast

Figure 3-2 shows the average load history from 1983 through 2005 and the forecast through 2026, as well as the one-hour peak load (average load over a one-hour period). The historical data represent actual consumption and therefore reflect the impact of conservation programs in the past. As in Figure 3-1, the forecast does not reflect the effect of any future programmatic conservation. Programmatic conservation was evaluated along with other types of resources for inclusion in City Light's portfolio, as described in Chapter 4.

Figure 3-2. System Annual Load History and Forecast (with no new conservation program resources)

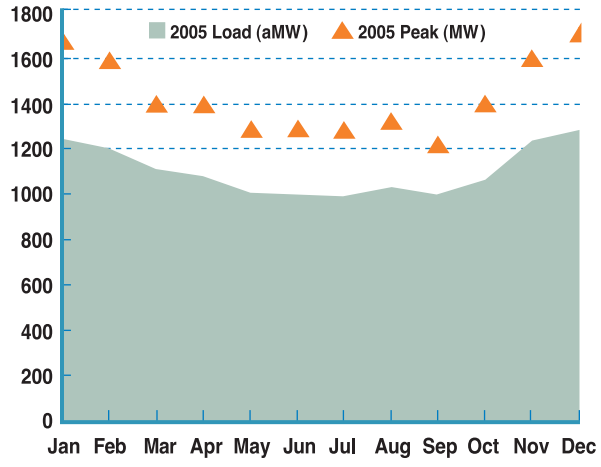


Monthly Load Shape

In planning for resource acquisition, City Light needs to know more about future load than just average annual consumption provided by the long-range load forecast. The Utility also needs to consider load shape throughout the year. Consumption in the winter is greater than in the summer because of greater customer need for heating and lighting in the winter. Average monthly variability in load is fairly predicable; typically it is about 20 percent higher in December and January than in July and August.

The Utility needs to have sufficient resources to be able to serve its customers during times of peak consumption. The one-hour peak load in any month can be many megawatts greater than the average load. Figure 3-3 shows the monthly load shape and monthly one-hour peaks for 2005. In January the one-hour peak was about 435 megawatts higher than the January average; in August the one-hour peak was nearly 300 megawatts higher than the August average. The range of variability in peak loads for November through February is much greater than in the other months. The highest historical peak of 2,055 MW occurred on December 21, 1990, when the temperature dropped to 12 degrees Fahrenheit.

Figure 3-3. 2005 Monthly Average Load and Monthly Peaks

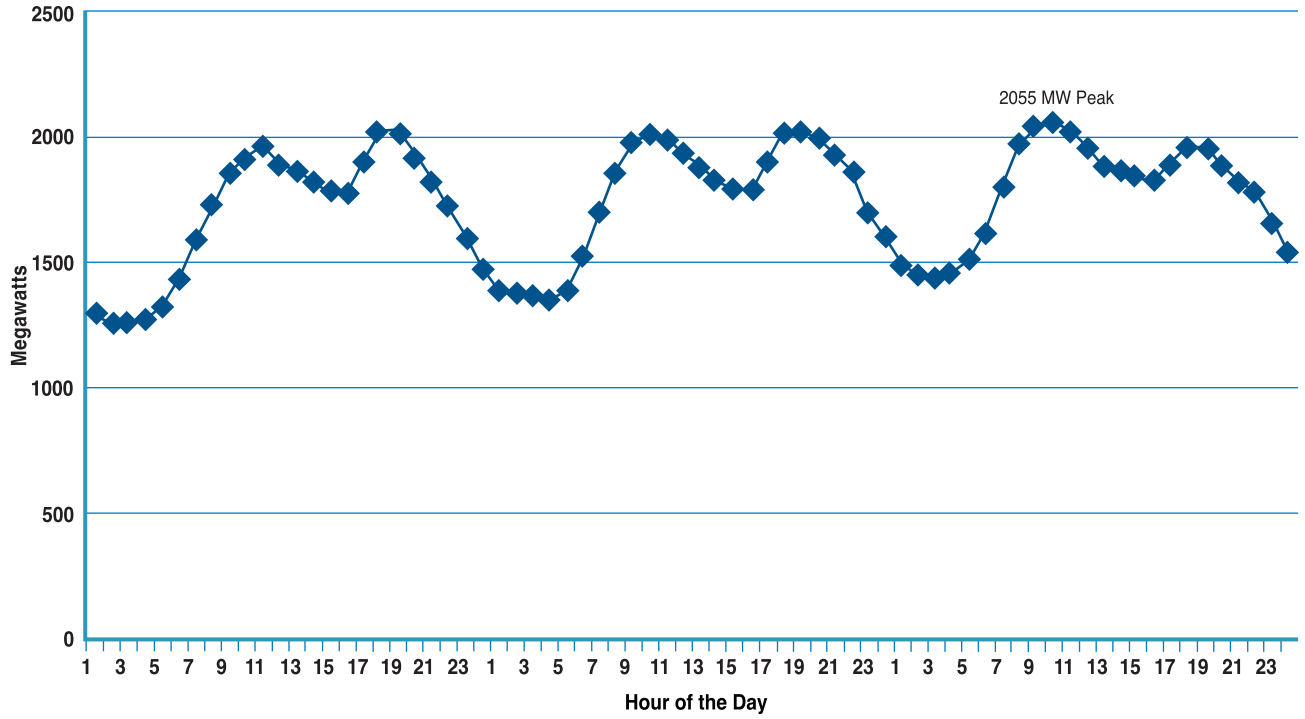


Meeting Load during Extremes of Weather

In order to assure resource reliability, the City Light must be able to serve peak loads under extreme conditions – severely cold weather that can be counted on to occur every few years, usually with little or no advance warning. Very cold weather can push hourly load as much as 50 percent higher than average monthly load. Fortunately such peaks are short-lived, and cold snaps rarely last much longer than three days. Figure 3-4 on the following page shows the hourly load shape for December 19-21, 1990, when peak load exceeded 2,000 megawatts for three consecutive weekdays.

Future peak load is only part of the equation for assessing the need for additional resources with a high level of reliability. In addition to understanding how much power might be needed under the stress of very cold weather, City Light needs to understand how existing resources operate under stress. Because almost all of the Utility's resources are hydroelectric, the system is most stressed during periods of drought. Computer modeling for the IRP used the joint probabilities for load and resource levels, together with the resource adequacy measure, to predict how much additional power the Utility will need and when it will be needed to serve fluctuating customer demand.

Figure 3-4. Peak Hourly Load – Cold Snap December 19-21, 1990



Existing Resources

City Light relies on a variety of resources to meet its power needs. The current portfolio includes conservation, generation resources and market resources. For nearly 30 years, City Light policy makers have been unwavering in their commitment to conservation as a resource. Generation resources include low-cost City Light-owned hydroelectric projects, power purchased at preference rates from the Bonneville Power Administration (BPA), and contract purchases from other entities. The Utility supplements these resources with power exchange agreements and purchases made in the wholesale power market. Existing conservation, generation and market resources are described in this section.

Conservation

In 1972, the Seattle 2000 Commission Report established conservation as the first choice resource to meet City Light's energy requirements. Since then, the Utility has been a leader in energy conservation at the local, regional and national levels, operating conservation programs on a broad scale as part of its resource portfolio. This section reviews the current conservation programs and the results of conservation efforts to date. See Chapter 4 for a summary of the 2006 assessment of future conservation resource potential.

Energy Saved by Conservation Programs

From 1977 through 2005, City Light's conservation programs saved over 10 million megawatt-hours by increasing the efficiency of electricity use in Seattle homes, businesses and industries. Conservation programs address specific energy end-uses such as efficient lighting, water heaters and laundry appliances, HVAC, motors and manufacturing equipment. They also encourage weatherization and high-efficiency construction methods. Monetary incentives to Utility customers include rebates, loans or outright purchase of savings for installed energy efficient measures.

In 2005, still-active energy efficiency measures installed under City Light conservation programs served over 10 percent of City Light's customer load, or 115 aMW. Table 3-1 shows the energy savings achieved by City Light conservation programs in 2005, and the current load served by still-active energy efficiency measures installed under a City Light conservation program in 2005 or before.

Table 3-1. Energy Savings from City Light's Energy Conservation Programs, 2005

Customer Group	Estimated New Energy Savings (aMW)	City Light Total Load Met with Conservation (aMW)
Commercial & Industrial	4.5	78
Residential & Small Commercial	1.8	37
Total Savings	6.3	115

In the early years of conservation acquisition, energy efficiency programs pursued the lower cost measures that were the most easily attained. After nearly 20 years of offering conservation programs to its customers, City Light needed a more systematic approach to selecting its conservation offerings. In late 1999, City Light and the Northwest Power Planning Council (NPPC) joined forces to develop the 2000 Conservation Potential Assessment (CPA), an analysis of the cost-effective conservation potential achievable in City Light's service territory over the next two decades. The 2000 CPA demonstrated that substantial cost-effective conservation was still available across all end uses to sustain a robust conservation program over the next several years.

Generation Resources

Most of City Light's power is generated by its own low-cost hydroelectric facilities, located mainly in Washington. As a municipal utility, it enjoys preference status in contracting for the purchase of additional low-cost power marketed by BPA. The Utility also has contracts with several other owners of hydroelectric projects in the region. City Light added wind power to its portfolio in 2002, with the signing of a 20-year contract for the purchase of output from the Stateline Wind Project. These resources, and the power generated by each, are shown in Figure 3-5 and described below. See Chapter 4 and Appendix C for generation resources that can potentially be added to City Light's portfolio in the future.

Figure 3-5. City Light Generation Resources

City Light Owned Resources

Boundary

The Boundary Project is located on the Pend Oreille River in Pend Oreille County in northeastern Washington. It is City Light's largest resource, with a peaking capability of 1,055 MW and average generation of about 490 aMW annually. As a run-of-the-river project, its power production is affected by the other projects in the river system. Because this project is located in the Columbia River Basin, it is subject to the flow regulations established by the Biological Opinion issued by the National Marine Fisheries Service for the protection of fish populations. Like most hydroelectric projects, the Boundary Project is licensed by the Federal Energy Regulatory Commission (FERC); the current license expires in October 2011.

Under the license, part of Boundary output must be sold to Pend Oreille County Public Utility District (PUD) No. 1 to meet its load growth. In addition, about 5 aMW of energy must be delivered to the PUD in compensation for encroachment of its Box Canyon Dam caused by the Boundary Project. Energy from Boundary is wheeled to consumers over BPA's transmission grid.

Skagit

The Skagit Project, including the Ross, Diablo and Gorge projects, operates as a single system on the Skagit River, about 80 miles northeast of Seattle in Whatcom County. Water released from the large Ross water reservoir flows to Diablo and Gorge. The combined one-hour peak capability is 690 MW. The license for these projects was renewed in 1995 and will be in effect for 30 years. City Light has committed to mitigation measures for fisheries, wildlife, erosion control, archaeology, historical preservation, recreation, visual quality and environmental education. Power generated from the Skagit Project is sent to Seattle over transmission lines owned by City Light.

Newhalem

This project is located on Newhalem Creek, a tributary of the Skagit River. It was built in 1921 to provide power for construction of the Skagit Project. In 1970 it was modernized and now operates under a FERC license that will expire in 2027. Power is delivered through transmission lines owned by City Light.

South Fork of the Tolt

This project, located in east King County, began commercial operation in 1995. Its one-hour peaking capability is less than 17 MW. Project costs are being offset by billing credits received from the BPA. The Northwest Power Planning and Conservation Act of 1980 authorized BPA to pay credits to its customers to encourage the development of new resources. The credits basically compensate the Utility for the difference between the cost of the new resource and the cost of buying the same power from BPA. Power from this project is delivered over a line owned by Puget Sound Energy.

Cedar Falls

Cedar Falls was built in 1905 on the Cedar River, about 30 miles southeast of Seattle in King County. It was constructed before the adoption of the Federal Power Act of 1920 and therefore does not require a license from FERC to operate. Power is transmitted by Puget Sound Energy.

Contracted Resources

Bonneville Power Administration

City Light's largest power purchase contract is with BPA. It allows the Utility to receive power from 29 hydroelectric projects and several thermal and renewable projects in the Pacific Northwest. Energy is delivered through BPA's transmission grid. A Power Sales Agreement with BPA provides for purchases of power by City Light over the ten years beginning October 1, 2001.

Under the contract, power is delivered in two forms: a shaped Block and a Slice. Through the Block product, power is delivered in monthly amounts shaped to the City Light's monthly net requirement, defined as the difference between the Utility's projected monthly load and the resources available to serve that load under critical water conditions. Under the Slice product, the City Light receives a fixed percentage of the actual output of the federal system and pays the same percentage of the actual costs of the system. Payments for the Slice product are subject to an annual true-up adjustment to reflect actual costs. Power available under the Slice product varies with water conditions, federal generating capabilities, and requirements for fish and wildlife protection and restoration.

City Light is scheduled to sign a new contract with BPA by October 2011. BPA is conducting a Regional Dialogue to address issues involved in structuring 20-year contracts that will fairly apportion its least expensive base system generation among its customers. All other power marketed by BPA will be available as variously designed products. Power will be sold primarily at two rate levels – one for the base system generation and the other a market rate for power from other resources. Any Slice product will probably be structured differently from the current product.

High Ross Agreement

In the early 1980s City Light planned to raise the height of its Ross Dam to maximize the potential output of the plant. The Canadian Province of British Columbia protested on environmental grounds. After a period of negotiations that ended with the signing of the 80-year High Ross Agreement in 1986, City Light agreed to abandon its plans and instead to purchase power from British Hydro (Powerex). Power would be delivered and priced to mimic the generation and costs that would have resulted from construction of the High Ross Dam.

The power received from this contract has a relatively high cost through 2020. At that point the cost will be drastically reduced to a few dollars per MWh because the cost portion equivalent to the service on the debt that would have been issued to build the High Ross Dam will terminate. The agreement is subject to review by the parties every ten years. The most recent review, concluded in 1998, did not result in any changes to the agreement. Power is wheeled by BPA.

Lucky Peak

The Lucky Peak Project was built in the mid-1980s by several irrigation districts. Power operations began in 1988 under a FERC license that terminates in 2030. Generation of power is secondary to the project's irrigation purpose, and most of the power output is available only in the summer months. Project costs were reduced when the outstanding long-term bonds were refinanced in early 2002. Power from this project, about 38.5 aMW, is wheeled over facilities owned by Idaho Power and BPA.

Priest Rapids

The Priest Rapids Project is owned and operated by Grant County PUD. The Project consists of the Priest Rapids Development and the Wanapum Development. City Light purchases power from this project under a 2002 agreement with Grant PUD. Since November 1, 2005, 70 percent of the Priest Rapids Project output has been allocated to Grant PUD. City Light is entitled to a share of the difference between the allocation to Grant PUD and Grant PUD's load requirements. As Grant PUD's load grows, the amount of power available to City Light will decrease.

City Light's share will come from the Priest Rapids Development from November 1, 2005 through October 31, 2009. Effective November 1, 2009, City Light's share will come from both the Priest Rapids Development and the Wanapum Development. The term of the contract runs through the end of the new FERC license period. (License renewal is currently underway.) City Light's share is expected to be about 2 to 3 aMW in 2007-2009, with a small increase in 2010, followed by gradual reduction as Grant PUD's load increases.

Grand Coulee Project Hydroelectric Authority (GCPHA)

City Light has 40-year contracts to buy half of the output from five hydroelectric projects in the Columbia River Basin built by irrigation districts. The City of Tacoma buys the other half. City Light's contracts expire over the period 2022-2027. Electric generation is mainly in the summer months and is wheeled by local entities and BPA. City Light receives about 27 aMW from this contract.

Stateline Wind Project

City Light has an agreement with PPM Energy to purchase wind energy and associated environmental attributes from the Stateline Wind Project in Walla Walla County, Washington and Umatilla County, Oregon. Through December 2021, City Light will receive wind energy with an aggregate maximum delivery rate of 175 MW per hour. Energy delivered under the contract is expected to average about 26 percent of the maximum delivery rate. City Light has also entered into an agreement through 2011 to purchase integration and exchange services from PacifiCorp and another agreement to sell integration and exchange services to PPM.

Power from Existing Generation Resources

Table 3-2 shows the recent history of power produced annually from each of the generation resources described above, as well as some that are no longer part of City Light's portfolio. The table

shows how the portfolio has changed in recent years, and illustrates the variability in power production caused by weather.

Since City Light's current resource portfolio is predominantly hydro, it has the advantage of operational flexibility because of the hydro storage capability. On the other hand, it has the disadvantage of being significantly affected by weather conditions. The amount of water available for power generation is affected by the amount and the timing of precipitation, run-off from snow melt, and regulations governing the recreational use of lakes, irrigation, protection of fish habitat and other environmental concerns.

While operational flexibility allows the Utility to meet peak load easily most of the time, the ability to serve peak load can be greatly diminished at times when water levels are low. Also, the Utility's resource portfolio must be able to serve load under the prolonged drought conditions that occur periodically in the Pacific Northwest. Prior to 2006, the West experienced six consecutive years of drought conditions, with 2001 as the most severe by far.

Table 3-2. Power Generated Annually from Existing Resources (Average Megawatts)

	1999	2000	2001	2002	2003	2004	2005
OWNED GENERATION							
Boundary	508.1	431.7	267.1	452.2	408.1	398.8	395.1
Skagit - Gorge	135.4	109.3	70.4	117.0	106.3	105.2	88.7
Skagit - Diablo	116.7	92.7	54.5	102.8	84.9	8.5	74.8
Skagit - Ross	109.9	84.4	44.9	95.6	83.1	77.6	64.3
Newhalem		0.4	1.1	1.1	0.9	1.4	0.7
South Fork Tolt	8.0	5.0	4.6	8.9	5.6	6.9	5.1
Cedar Falls	8.1	5.7	7.4	9.1	7.3	7.0	4.2
Centralia (sold 2000)	78.7	31.5					
TOTAL OWNED GENERATION	965.1	760.8	449.9	786.7	696.2	685.3	633.0
PURCHASE CONTRACTS							
Bonneville Power Administration	180.6	193.7					
Bonneville Power Administration Block			200.7	152.3	147.1	137.8	109.4
Bonneville Power Administration Slice			71.5	322.4	390.9	392.8	385.1
High Ross (BC Hydro)	35.2	33.8	5.1	33.9	36.0	34.8	35.4
Boundary Encroachment (BC Hydro)	1.7	2.0	0.9	1.2	1.6	1.5	1.7
Lucky Peak	48.6	38.8	21.5	33.0	3.4	31.3	25.8
Priest Rapids (Grant County PUD)	47.1	41.4	29.9	37.3	35.5	36.0	32.9
Grand Coulee Project Hydroelectric Authority	28.6	27.2	30.9	28.3	26.9	28.9	28.5
Stateline Wind				12.2	24.7	39.7	37.4
EXPIRED CONTRACTS							
Klamath Falls (expired 2006)			37.2	81.0	74.7	81.8	66.4
Pend Oreille PUD (expired 2005)	8.1	6.6	4.9	5.0	5.4	6.7	3.0
Metro CoGeneration (expired 2004)	0.9	0.8	1.4	1.7	1.6	0.7	
Columbia Storage Power Exchange (expired 2003)	16.1	12.1	11.6	11.3	3.0		
TOTAL PURCHASE CONTRACTS	366.9	356.5	445.8	719.5	780.8	792.0	725.6

As shown in Table 3-2, the amount of power produced from owned generation in 1999 was about twice the amount produced in 2001, illustrating the risks associated with hydropower production. To make up the shortfall in 2001, City Light increased its purchases from BPA, but was nevertheless forced to make purchases from the market. By 2002, City Light had signed a new contract with BPA that nearly doubled its purchases from the federal agency. Wind power from Stateline came online in 2002, and power from that source increased over the next two years to its current level.

Outlook for Existing Generation Resources

Over the next 20 years, not all of the generation resources described above will remain as they are in the existing portfolio. Changes are likely in some contract resources, and climate change may impact hydroelectric resources in ways that are difficult to predict.

Contract Resources

City Light's license to operate Boundary Dam expires in 2011, but the Utility is confident the license for this facility will be renewed. Some contracts will expire or be modified over the planning period. For example, the Stateline wind contract for about 45 aMW expires in December 2021. City Light's share of Priest Rapids generation output will gradually decline over the 20-year period at the rate of load growth of Grant County PUD. Contracts with the Grand Coulee Project Hydroelectric Authority begin expiring in 2022.

Of potentially greater impact are the possible changes in the BPA contract. A new 20-year contract is scheduled to be in place in October 2011. Features of new contracts between BPA and its clients are currently under discussion, as described in Chapter 2. The 2006 IRP assumes City Light will continue to purchase power from BPA at present levels after 2011.

Climate Change

In the long term, climate change is expected to impact hydroelectric generation on both the federal Columbia River power system and the City Light system. As part of the integrated resource planning process, City Light is addressing the potential impacts of climate change on hydropower output and demand for electricity. The challenge is representing these potential changes in IRP modeling.

In October 2005, local experts in climate change evaluation, the University of Washington Climate Impacts Group, issued a report stating that "projected climate and hydrologic changes will likely alter the annual patterns of electricity demand and streamflow. . . . Projected warming due to climate change will likely lower electricity demand during the winter and increase demand during the summer in Washington."

While these general observations can help planners evaluate their assumptions and identify areas for additional analysis in future IRPs, the analytical model requires more specific forecasts of the monthly effects on precipitation patterns and river and stream flow. The University of Washington is developing these more detailed regional forecasts, with support from City Light and other local, state and federal agencies.

Forecasts for the Skagit and Columbia/Pend Oreille river systems are important to understanding City Light's owned hydropower and BPA power output. City Light is funding work by the University of Washington on modeling for the Skagit, and BPA and the Northwest Power and Conservation Council may pursue similar studies for the Columbia River system.

Although climate change data are not yet available for most of the hydropower systems from which City Light receives power, the hydro distribution of the Skagit system that was used in the IRP model did include a range of flow conditions predicted by climate change models. The input data were based on historic data, but were not limited strictly to the recorded extremes. This approach allowed planners to see how the extremes (both lower and higher flow conditions) would effect the various resource portfolio options in terms of reliability, cost, risk and environmental impact.

Given the complexity of the large-scale global climate models, and the challenges of scaling them down to levels that capture the unique nature of each major hydropower watershed, the process of refining the forecasts will take time. Understanding of climate change impact will improve as new data and refined modeling tools become available. City Light will continue working on the climate change issue in the context of the IRP process.

Market Resources

The wholesale electric power market in western North America plays an important role in meeting Seattle's power needs by balancing City Light's energy surpluses and shortages. Surplus power can be sold and power shortages can be made up with purchases both seasonally and over a period of years. Seasonal power can also be obtained from the wholesale market through seasonal capacity contracts (physical call options), although City Light currently has no such contracts. See Chapter 4 for potential use of market resources in the IRP.

With colder winter temperatures driving Seattle's power demand to peak in November through February and the spring snow melt driving hydropower production to peak in April to June, there is a seasonal mismatch between demand and supply of power. Keeping sufficient power generation capability to meet winter demand leads to excess generation capability the rest of the year. In addition to seasonal variation in supply and demand, precipitation may vary substantially from year to year, making it difficult to predict the supply of hydropower.

City Light actively manages its portfolio of power supply resources by purchasing and selling power in the wholesale markets and transacting seasonal exchanges of power with utilities in California. These transactions lower the rates charged to the Utility's retail customers by generating revenues from sales of surplus energy and allowing purchases of lower cost power.

Under its exchange agreement with the Northern California Power Agency (NCPA), City Light delivers 60 MW of capacity and 90,580 MWh of energy to NCPA in the summer. In return, NCPA delivers 46 MW of capacity and 108,696 MWh of energy to City Light in the winter. Deliveries to NCPA started in 1995 and will continue until the agreement is terminated.

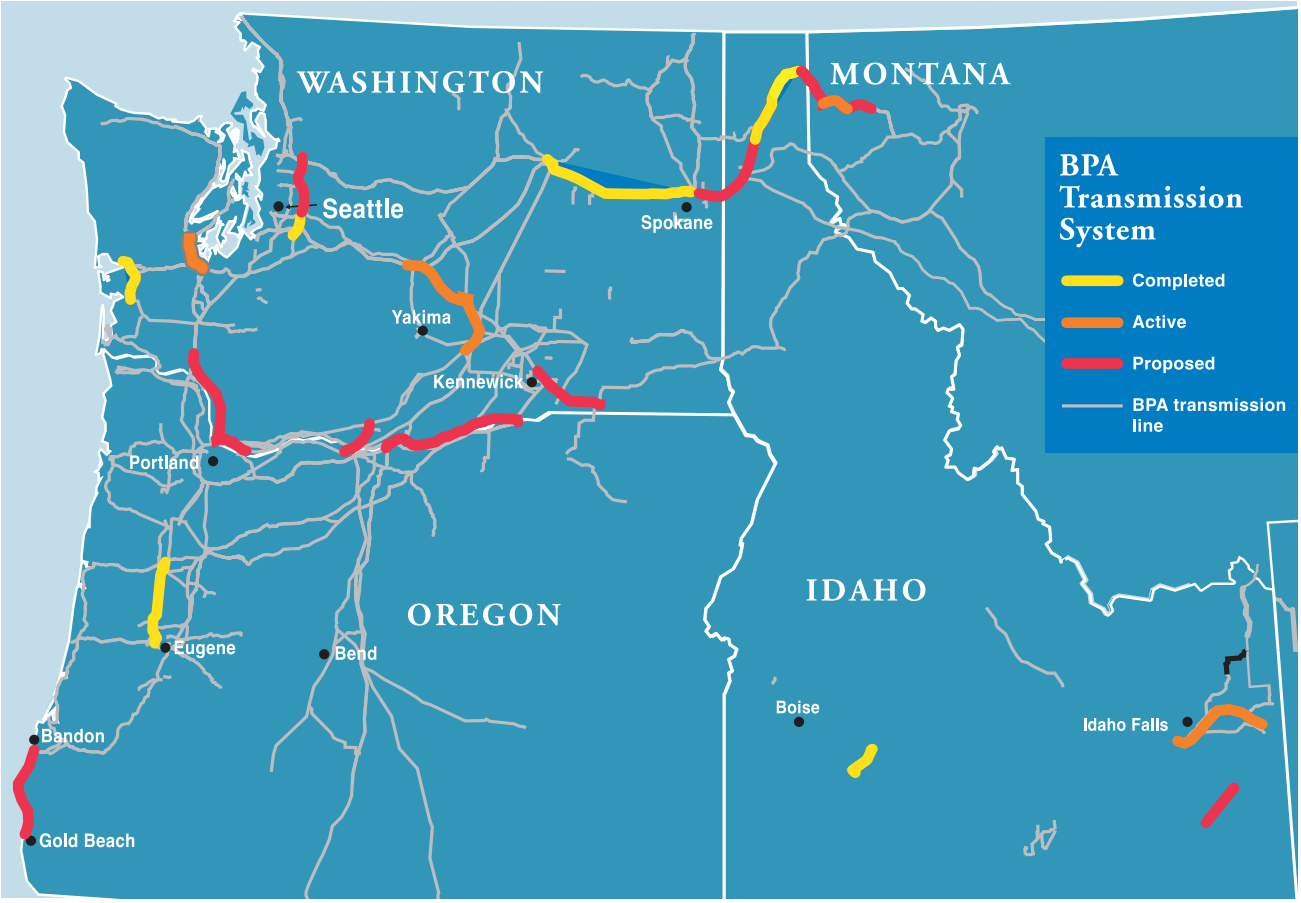
Western States Transmission System

The Western electric transmission system physically defines the wholesale market for electricity in western North America. This market is broadly made up of 11 western states, two Canadian provinces, and northern Baja California, Mexico.

Constructed primarily in the 1950s and 1960s, the high-voltage transmission system is owned by a number of both private and public utilities. In the Pacific Northwest, the Bonneville Power Administration (BPA) operates about 75 percent of the transmission system, shown in Figure 3-6. Other large transmission owner/operators, including PacifiCorp, Puget Sound Energy, Idaho Power, British Columbia Transmission Company, and Portland General Electric, operate the rest. The high voltage transmission system is near capacity in many parts of the West, including the Pacific Northwest.

Market transactions are facilitated by City Light's ownership share of the Third AC Intertie. This ownership share was acquired in 1994, when City Light signed an agreement with BPA for rights to 160 MW of transmission capability over Bonneville's share of the Third AC Intertie. The Third AC Intertie is an alternating current line that connects the Northwest region with California and the Southwest.

Figure 3-6. BPA Transmission System



Resource Adequacy

Resource adequacy is a utility industry term used in long-range planning. Utility planners want to avoid acquiring resources that may not be needed; on the other hand, they seek a high level of probability that load will be served under varying conditions. The measure of resource adequacy used by resource planners reflects the level of risk that decision-makers are willing to accept that load may not be served. Past experience around the country suggests that most customers are willing to pay very high prices for power on a short-term basis rather than have power interrupted. This indicates that a high degree of resource adequacy is desired.

The degree of reliability City Light plans for is ultimately a policy decision. Planning for higher reliability can lead to a higher cost of service. However, having insufficient power can also be very costly, as witnessed during the 2001 power crisis in the West. Pacific Northwest utilities did not interrupt service to their customers; yet extremely high power costs were incurred in order to maintain reliable service. Resource adequacy targets can have both reliability and economic consequences. Recent direction from Seattle policy-makers and advice from customers has been to plan to serve load with a high degree of reliability.

Resource Adequacy in the IRP

For this IRP, City Light developed a resource adequacy target of 95 percent probability that the Utility will have sufficient power supply to meet demand without customers being unserved. In other words, 95 times out of a hundred, there will be sufficient power to meet load in a month, given the combined probabilities for high demand and insufficient resources. In developing this target, City Light planners assumed that only 100 MW of power is available for purchase from the wholesale power market under extreme conditions – where the market is under stress due to high demand, limited supply or both.

For comparison, City Light asked Global Energy Decisions (GED) to conduct a separate resource adequacy study using a measure of loss of load probability of one day in 10 years, which is a regional standard endorsed by the North American Electric Reliability Council. The result was slightly below, but very comparable to City Light's 95 percent resource adequacy measure.

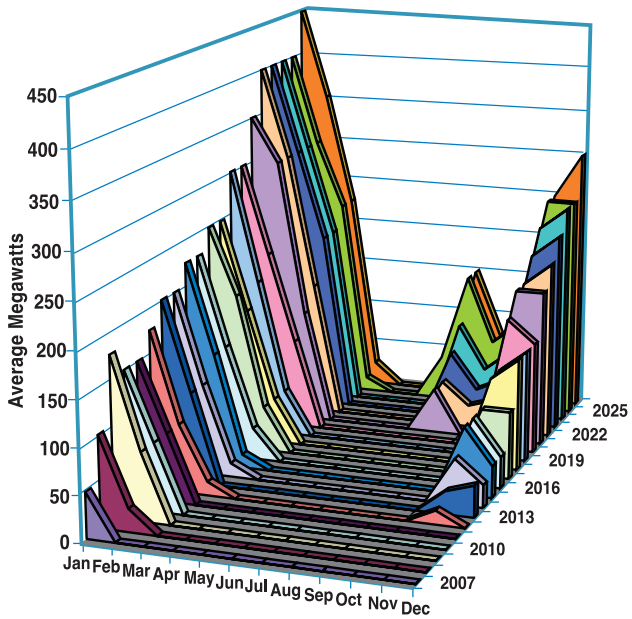
City Light's resource adequacy study showed that by 2007, the existing portfolio will not meet the 95 percent target in the winter, when system load is greatest; in other words there is more than a 5 percent risk of not being able to meet load in the winter. Unserved load could result from the combined circumstances of very low temperatures, very low water, and a limited amount of power available to City Light from the market.

New Resources Needed to Reduce Risk

Over the 20-year planning period, load is expected to continue to grow, and some of the power purchase contracts will expire. As shown in Figure 3-7, the amount of unserved load at the 95 percent level increases as the difference between load and present-day resources grows.

By 2021, when the Stateline wind contract expires, load may be unserved in late summer and early fall, as well as in winter. In order to reduce the risk of unserved energy below the 5 percent level, approximately 50 aMW of additional energy must be available in 2007. As load increases through the 20-year planning period, the amount of additional resources required grows to 450 aMW by the year 2026.

Figure 3-7. 95% Resource Adequacy – Projected Gap between Load and Resources



The resource adequacy requirement is calculated to account for the risk of variation in hydro generation and loads, and to replace the resources for which contracts have expired.

The resource adequacy study was the starting point for developing a portfolio of additional resources for the 20 years from 2007 - 2026. As described in Chapter 6, new resources, including conservation, were added to the existing portfolio, in amounts and at points in time when the resource adequacy study indicated they would be needed. This methodology produced candidate portfolios, all with the same level of resource adequacy.