Integrated Resource Plan

Final Environmental Impact Statement

May 2007

Seattle City Light

FACT SHEET

Project Title:	Seattle City Light Integrated Resource Plan
Proposed Action:	Seattle City Light has prepared an Integrated Resource Plan (IRP) to determine strategies for the type, amount, and timing of new resource acquisitions over a time period between 2007 and 2026. Potential resources options include generation options, contract and market purchases, and conservation.
Location:	The Integrated Resource Plan is not site specific, and evaluates resources that could be developed in the Pacific Northwest (Washington, Oregon, Idaho, and western Montana) and wholesale electricity markets in the western region. This is a programmatic Environmental Impact Statement.
Alternatives:	A number of alternative resource portfolios that would satisfy City Light's future energy needs were evaluated. Each portfolio consists of different combinations of individual resources. In the Draft EIS, nine portfolios were evaluated. These nine were narrowed and refined to more closely meet City Light's resource needs, and the Preferred Alternatives that resulted are: A: Renewables/More Wind and B: Renewables/More Geothermal. City Light recommends B: Renewables/More Geothermal because it has lower cost and risk than A, and similar environmental impacts.
Proponent and Lead Agency:	Seattle City Light
Responsible Official:	Jorge Carrasco, Superintendent Seattle City Light PO Box 34023 Seattle, Washington 98124-4023
Required Approvals:	No licenses or permits are required for the City Council to adopt the IRP, if it chooses to do so. Development of new energy resources would require specific permits or approvals. Permitting would be

	considered in any project-specific environmental review.
Authors & Principal Contributors to Draft EIS and Final:	Authors Seattle City Light: Corinne Grande Huckell Consulting Associates, LLC: Duane Huckell, principal author and document preparation; Katie Carroz Contributing Authors Seattle City Light - Lynn Best, David Clement, Steve Lush, Tony Kilduff, Marilynn Semro, Mary Winslow CJB Energy - Charlie Black Exponent - Michael Kelsh Reviewers/Editors Dorothy P. Craig Associates: Dorothy Craig Seattle City Light: Liz Ablow, Beth Blattenberger, Laurie Geissinger, Tom Meyer
Date Final EIS Issued:	**May 2007**
EIS Availability:	Copies of the Draft and Final EIS may be reviewed at Seattle Public Library Downtown Branch, at 1000 Fourth Avenue, Seattle, WA, and at the Seattle City Light Visitor's Center at 700 Fifth Avenue, 32nd Floor, Seattle, WA 98104. The EIS is available at City Light's web site at www.seattle.gov/light/news/issues/irp Individual copies will be provided free of charge, upon request. Call (206) 386-4569.
Nature and Date of Final Action:	Final adoption of the IRP by City Light could occur by May 2007.
Subsequent Environmental Review:	Development of individual energy resources by City Light would require project-specific environmental review.

Appeals:

Appeals of the adequacy of this document are governed by Seattle Municipal Code 25.05.680. Copies of this code provision are available from the Seattle City Clerk.

To be considered, a notice of appeal must be received by the Office of the Hearing Examiner, (**Mailing Address:** City of Seattle Hearing Examiner, PO Box 94729, Seattle WA 98124-4729, **Street Address:** 700 Fifth Avenue, Suite 4000, Seattle, WA 98104), no later than May 29, 2007.

Chapter 1
Summary

This Final Environmental Impact Statement (FEIS) document is designed to be used together with the Draft Environmental Impact Statement (DEIS) document that was issued on September 18, 2006. This FEIS contains revisions to the DEIS, responses to public comments on the DEIS, and descriptions of the Preferred Alternatives and their impacts.

This FEIS document is structured as follows:

Chapter 1:
Contains updates to Chapter 1 of the DEIS, particularly a summary of the Preferred Alternatives and their energy output.

Chapter 2:
Contains revisions, clarifications, and updates to Chapter 2 of the DEIS.

Chapter 3:
Contains revisions and corrections to Chapter 3 of the DEIS.

Chapter 4:
Contains the description of the Preferred Alternatives, their impacts, mitigation measures, and unavoidable adverse impacts.

Chapter 5:
Contains the public comments on the DEIS and City Light's responses.

Sections 1.1 through 1.3

Information in Sections 1.1 through Section 1.3 of "Chapter 1 - Summary", of the Draft Environmental Impact Statement has not changed, with the exception described below for the Final EIS, these will be retained as written in the Draft EIS.

Section 1.4

Section 1.4 of the Draft Environmental Impact Statement (DEIS) described the Alternatives that were analyzed in the first round of the Integrated Resource Plan (IRP). At the time the DEIS was published, a Preferred Alternative had not been identified. Now, based on the results of the Round 1 IRP analysis and comments received on the DEIS, two Preferred Alternatives have been identified. These Alternatives, which will be labeled Alternative A and Alternative B, are actually identical in terms of resource type, amount, and timing, with the exception of the resource mix toward the end of the planning period. Over the 20 year planning

period, Alternative A has almost 300 aMW more wind than B, and Alternative B has 250 aMW more geothermal energy than A. City Light recommends B: Renewables/More Geothermal because it has lower cost and risk than A, and similar environmental impacts.

The resources in Preferred Alternatives "A: More Wind" and "B: More Geothermal" are listed in Tables 4-2 and 4-3 in Chapter 4 of this FEIS. The energy output from each resource in the Preferred Alternatives is shown in Table 4-4.

The energy output of the Preferred Alternatives A and B are shown below.

20 Year Resource Output (aMW)	Portfolios	
	Alternative A	Alternative B
Conservation	1,413	1,413
Geothermal	463	714
Gorge Tunnel	0	0
Wind	674	377
BPA	14,355	14,355
Call Option	0	0
Exchange	-74	-74
Hydro Contract	531	531
Market Sales (COB)	-1,447	-1,447
Market Purchase at Mid C	100	101
Market Sales at Mid C	-8,176	-8,130
Biomass	39	39
Landfill	296	296
CCCT	0	0
SCCT	0	0
CHP	0	0
IGCC	0	0
PV Coal	0	0

Figure 1-1. Preferred Alternative Portfolios Comparison

	Total Cost	**Environmental Impacts**	**Cost Risk**	**Market Risk**	**Revenue Less Cost($5/ton for CO2)**
Performs Best	More Geothermal	Preferred Alternatives are similar - see analysis for details	More Geothermal	More Geothermal	More Geothermal

Section 1.5 Summary of Impacts and Mitigation

There are two changes to this section:

1) The 'Economy' element has been revised, in response to Public Comments (see Chapter 5). These revisions have been made in "Table 1-5. Summary of Resource Impacts," as shown on the next page.

2) Differences between the impacts and mitigation of the Preferred Alternatives, as compared to the Alternatives described in the DEIS, are described below.

The preferred Alternatives, A and B, are composed of renewable resources and contracts. The amounts of these resource types fall within the range of Alternative portfolios evaluated in the DEIS.

The differences are:

- Geothermal - the Preferred Alternatives contain more geothermal energy than considered in the DEIS. While there are potential adverse environmental impacts associated with geothermal energy development, they are lower than those of fossil fuel resources such as coal plants where fuel extraction has significant negative impacts.

- Exchange contracts in the Preferred Alternatives result in more energy being delivered by City Light to the counter party than City Light receives in return. This is due to the value that City Light places on receiving energy at times of the year when it is needed, and in securing a buyer for its excess power during months when it is long.

- Hydropower contracts from an existing resource provided less energy in the Preferred Alternatives. This results in less use of Market energy, which is primarily existing natural gas plants. For this analysis, City Light assumes that the net impact of acquiring additional energy from existing hydropower resources is to increase the use of the "marginal" resource on the market, which is primarily natural gas. So, less energy from a contract with an existing hydro resource lowers the emissions impacts in these portfolios.

- Landfill gas is slightly higher in the Preferred Alternatives compared to Alternatives in the Round 1 portfolios. This is due to the assumption that the Landfill gas resource is built sooner in the Preferred Alternatives and operates at a higher capacity factor. The impact to the environment will be very low, since Landfill plants are built on existing sites and have negligible incremental impacts on elements of the environment.

Table 1-5. Summary of Resource Impacts

Elements of the Environment	Resources											
	Landfill Gas	Wind	Gas - SCCT	Gas - CCCT	Coal - Pulver-ized	Coal - IGCC	Trans-mission	Geother-mal	Biomass	Hydro Gorge Tunnel	Conser-vation	Market Trans-actions
Soils and Geology												
Construction	L	M	M	M	H	H	M	H	L	M	N/A	0
Operation	0	L	M	M	H	H	L	H	M	0	0	M
Air Quality												
Construction	L	L	L	L	L	L	L	L	L	L	N/A	0
Operation	L	L	M	M	H	H	L	L	M	L	L	H
Surface and Groundwater												
Construction	L	L	L	L	L	L	M	L	L	L	N/A	0
Operation	L	L	M	M	H	H	M	M	M	0	0	M
Plants and Animals												
Construction	L	M	M	M	H	H	M	H	M	L	N/A	0
Operation	L	M	L	L	H	H	M	M	M	0	0	M
Energy and Natural Resources												
Construction	L	L	L	L	M	M	M	L	L	L	N/A	0
Operation	+	0	H	H	H	H	M	L	L	+	+	H
Environmental Health												
Construction	0	L	L	L	M	M	H	M	M	L	N/A	0
Operation	+	M	M	M	H	H	L	M	M	0	L	M
Land Use												
Construction	L	M	M	M	H	H	H	M	M	L	N/A	0
Operation	L	M	M	M	H	H	H	H	H	L	0	M
Aesthetics and Recreation												
Construction	L	M	M	M	M	M	M	H	M	M	N/A	0
Operation	L	H	M	M	H	H	H	H	H	L	0	M
Cultural Resources												
Construction	0	M	M	M	M	M	L	M	M	L	N/A	0
Operation	0	M	M	M	H	H	M	L	L	0	L	M
Employment ~~Economy~~												
Construction	+L	+M ~~+L~~	+M	+M	+M	+M	+L	+M ~~+L~~	+M ~~+L~~	+L	+H	0
Operation	+M ~~+L~~	+M ~~+L~~	+L	+L	+M	+M	+L	+M ~~+L~~	+M ~~+L~~	+L	+L	+L
	L	Low impact		M	Moderate impact		H	High impact		+, +L, +M	Positive impact	
	0	No impact		N/A	Not applicable							

Chapter 2
Description of the Proposed Action and Alternatives

In Section 2.4.2.2 in the Draft EIS , page 2-18, the title "Washington State Renewable Portfolio Standard Initiative", is changed to "Washington State Initiative 937", and is also revised to state that this initiative was passed by the voters on November 7, 2006.

Washington State ~~Renewable Portfolio Standard~~ Initiative 937

~~In~~ On November 7, voters in Washington State approved an initiative that will ~~be placed on the Washington State ballot that, should it pass, would~~ mandate certain utilities in Washington State, including City Light, to acquire renewable resources for meeting their load. It ~~would~~ will also require that these utilities evaluate the potential for cost-effective conservation in their service territories, and establish and make public an acquisition target for conservation. The renewable resource portfolio requirements in the initiative ~~would~~ will increase over time: at least 3 percent of a utility's load by January 1, 2012; 9 percent by 2016; and 15 percent by 2020. This requirement could also be met by using Renewable Energy Credits, often called green tags. There ~~would~~ will be a financial penalty for failing to meet the requirement. Existing hydropower ~~would~~ will not be counted toward the target. Stateline Wind, at approximately 3 percent of current load, and efficiency upgrades resulting in additional power output at City Light hydropower plants (completed after March 31, 1999), at just under 1 percent of current load, are eligible resources for meeting the target.

Chapter 3

Impacts and Mitigation

Revisions made in sections of the Final EIS, compared to the DEIS, are described below.

Section 3.1
In response to public comment, the label and evaluation of the element of the environment called 'Economy' in the DEIS has been changed, as shown in Table 3-2 of section 3.1. The label has been changed to 'Employment', and the designation of the following resources: Landfill, Wind, Geothermal, and Biomass, have been revised from +L (low positive impacts) to +M (moderate positive impacts). See Chapter 5 - Comments and Responses, for more information about these changes. The revised DEIS Table 3-2 is shown on page 3-6 of this Final EIS.

Section 3.2
In section 3.2, Table 3-3 is revised in two areas, as shown below:

(1) Energy Resources: revise "an RPS initiative is on the November 2006 ballot" to "Initiative 937 was passed by Washington state voters on November 7, 2006, and will require utilities such as City light to meet conservation and renewable energy standards."

(2) Economy/Employment is revised to delete 'Economy' and leave 'Employment'

Table 3-3. Regulations Related to Mitigating Environmental Impacts

Element of the Environment	Regulations	Jurisdiction
Soils and Geology	Zoning and Grading Regulations	Generally set at the local level (county or city)
	Surface Mining Control and Reclamation Act	Federal (Office of Surface Mining)
	The Surface Mining Law created two major programs: a **regulatory program** to establish standards and procedures for approving permits and inspecting *active* coal mining and reclamation operations, both surface and underground; and a **reclamation program** for *abandoned mine lands*, funded by fees that operators pay on each ton of coal mined, to reclaim land and water resources adversely affected by pre-1977 coal mining.	

	Although Surface Mining Control and Reclamation Act is a federal law, Congress structured the program in such a way that states would be the primary authorities responsible for enforcing the law, establishing regulations and performance standards, and issuing surface mining permits.	
	Use of Best Management Practices (BMPs) to reduce soil erosion and control storm water runoff. These standards are employed based on specifics of site and weather conditions, and are often required by local jurisdictions. The required BMPs may include the use of straw, silt fences, and water detention ponds. Clearing and Grading Permits are often required by local jurisdictions for soil and vegetation disturbance and may also contain requirements for BMPs.	
Air Quality	New Source Review (Air Operating Permit, Prevention of Significant Deterioration)	Generally the State and regional air authorities, with authority delegated by the U.S. Environmental Protection Agency
SOx	Clean Air Act, National Ambient Air Quality Standards, Clean Air Interstate Rule	Federal, often delegated to states
NOx	Clean Air Act, National Ambient Air Quality Standards, Clean Air Interstate Rule	Federal, often delegated to states
Mercury	Clean Air Mercury Rule	Federal, often delegated to states
Particulates	Clean Air Act	Federal, often delegated to states
Other	Clean Air Act	Federal, often delegated to states
Greenhouse Gas	Oregon and Washington state energy facility siting standards -- requirement for mitigation	State level currently; federal regulations proposed
	Seattle Greenhouse Gas Mitigation Policy	City of Seattle
Surface and Groundwater	Clean Water Act	Federal; often delegated to states
Cooling Water Intake Structures	In December 2001, EPA published final regulations to establish location, design, construction, and capacity standards for cooling water intake structures at new	

	facilities under section 316(b) of the Clean Water Act. Section 316(b) of the Clean Water Act requires EPA to ensure that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impact.	
Surface Water Discharge	National Pollutant Discharge Elimination System (NPDES) permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Point sources are discrete conveyances such as pipes or man-made ditches. Industrial, municipal, and other facilities must obtain permits if their discharges go directly to surface waters. In most cases, the NPDES permit program is administered by authorized states.	
Plants and Animals	Endangered Species Act, Migratory Bird Treaty Act, Clean Water Act, Coastal Zone Management Act, Tribal treaties	Federal (US Fish and Wildlife, NOAA Fisheries, U.S. Army Corps of Engineers), State and local government, Tribes
	Northwest Power Act	Northwest Power and Conservation Council and NOAA National Marine Fisheries Service
Energy Resources	Limited regulation; some states have Renewable Portfolio Standards (RPS) requiring that electric utilities supply a percentage of energy from renewable sources -- types and amounts vary	State level; proposals have been made for federal legislation; ~~an RPS initiative is on the November 2006 ballot in Washington~~ Initiative 937 was passed by Washington state voters on November 7, 2006, and will require utilities such as City light to meet conservation and renewable energy standards
Environmental Health	Noise Regulations	State and Local
	Mine Safety and Health Administration,	Federal
Land Use	Growth Management Act (GMA): Zoning and land use regulations vary widely by jurisdiction	Generally set at the local level (county or city) subject to the requirements of GMA
Aesthetics and Recreation	Vary widely by jurisdiction;	Generally set at the local

	related to land use and zoning regulations	level (county or city)
Cultural and Historical	National Historic Preservation Act	Federal and State
~~Economy/~~Employment	Minimum wage and safety regulations apply and may have modest impact on number of employees and conditions of employment	Federal and State

Section 3.3 has not been revised, and remains as written in the DEIS for the Alternative Portfolios 1 through 9.

Section 3.4.2.2 contains a correction to **Table 3-9. Air Emissions per Unit of Electricity, by Generation Type.** The table entry for Landfill Gas should be: NOX (lb/MWh) = 0.66, and Particulates (lb/MWh) = 0.1067.

Table 3-9. Air Emissions per Unit of Electricity, by Generation Type

	SOx lbs/MWh	**NOx** lbs/MWh	**Mercury** lbs/MWh	**Particulates** lbs/MWh	**CO_2** lbs/MWh
CCCT	0.00432	0.216	0	0.00504	857
SCCT	0.00581	0.2906	0	0.00678	1153
CHP	0.0028	0.0144	0	0.00336	571
Coal (Pulverized)	1.47	1.43	4.38x10^-5	0.133	1979
Coal (IGCC)	0.68	0.62	2.03x10^-6	0.0882	1979
Wind	0	0	0	0	0
Biomass (wood)	0	0.80	0	0.259	0 (closed loop carbon cycle)
Landfill Gas	0	~~0~~0.66	0	~~0~~0.1067	0 (closed loop carbon cycle)
Geothermal - Binary	0	0	0	0	0
Conservation	0	0	0	0	0
Hydro Efficiency	0	0	0	0	0

Sections 3.5 through 3.11 have not been revised, and remain as written in the DEIS for the Alternative Portfolios 1 through 9.
Section 3.12

In response to public comment, the label of this element of the environment is revised from 'Economy' to 'Employment', and the text is revised to clarify intent. These revisions are shown on the following pages in this chapter. See Chapter 5 - Comments and Responses, for more information.

Note that the impacts to elements of the environment for the Preferred Alternatives: More Wind and More Geothermal, are described in Chapter 4 of this FEIS.

3.12 Employment ~~Economy~~

3.12.1 Affected Environment

Although not required by SEPA, a general analysis of ~~economic impacts, focusing on~~ construction and operation employment, was conducted to identify potential differences among the portfolios. While the <u>following evaluation is not meant to be a detailed economic evaluation of employment impacts,</u> ~~impacts are positive~~, the information may be helpful in discerning the differences among portfolios and the trade-offs between adverse and beneficial characteristics of the portfolios. <u>The approach of this analysis is to show increases in direct employment at the power plants, both during construction or operation, and in fuel extraction, not secondary employment impacts. Increases in employment are designated as being positive. Information about general economic conditions, below, is meant to provide context, not a thorough analysis of the regional and local economic conditions.</u>

The pace and composition of economic growth in SCL's service area and the region are major determinants of future demands for electricity and the amount of new energy that is needed to satisfy the demand. The Seattle economy is more diverse than it was several decades ago, although it is still strongly influenced by the aerospace industry. The other, newer, dominant industry is software. A major factor in the recession of 2001-2003 was the dot.com bust. The recession hit the Pacific Northwest economy hard. The proportion of jobs lost in the Seattle area (Seattle-Bellevue-Everett) was greater than for the state. The state, in turn, was harder hit than the nation. For the years 2000-2004, Washington's unemployment rate exceeded the nation's rate. Oregon was also slower to recover from the recession than the rest of the country. Growth in the Seattle area has been strong over the past year. The regional economy continues to improve although it has yet to regain the employment level that preceded the 2001-2003 recession. As of March 2006, the number of payroll jobs in the

Seattle was still 5,800 less than in December 2000, when the number peaked at 1,430,600.

Boeing had announced job cuts shortly before the attack on the World Trade Center on September 11, 2001. The subsequent blow to the commercial airline industry resulted in even more job cuts. Boeing employment has since rebounded, as has software industry employment. Even though most of the Boeing manufacturing jobs are not in the City Light service area and Microsoft is in Redmond, the multiplier effect of these two industries boosts employment and population growth in the service area. Washington State economic forecasters project continued job growth in the software industry, with a leveling off of aerospace job growth through 2009.

Much of the recent job growth has been in the construction industry. Statewide, the number of construction jobs has increased by more that 11 percent over the past year. Low mortgage rates and high housing prices have spurred residential construction in Seattle, as well as the rest of the country. Density is being encouraged in many parts of Seattle, driving the construction of high-rise apartments and condominiums. This trend is expected to continue because of recent lifting of height limits in downtown, Capitol Hill, and the Denny Triangle areas.

Commercial office vacancy rates have fallen somewhat, but they are still over 11 percent for downtown Seattle. Even so, office space is being built downtown, most notably the new Washington Mutual building. Some existing downtown space will fill as Safeco moves its operation from the University District. Office and laboratory space is being built in both the South Lake Union area and the Denny Triangle. Some developers have signed tenants, but others are building on speculation.

Sectors other than the construction industry that have been growing are aerospace manufacturing, machinery manufacturing, software publishing, computer-systems design, the health sector, the leisure and hospitality industries, the real estate sector of financial services, and professional and business services. The number of construction jobs will eventually decline as the construction cycle follows its usual boom-and-bust course.

Economic conditions in the vicinity of energy resources is likely to be quite variable, ranging from highly developed in the Seattle area to much less developed in rural areas. The structure of the local economies will influence their ability to provide the labor, goods, and services that are needed to build and operate energy facilities and, therefore, to benefit from the economic stimulus that such facilities provide.

3.12.2 Impacts of the Alternatives

Employment generally increases during all aspects of the life cycle of electricity generating plants; usually larger but shorter-term employment during construction and smaller but permanent employment during operation. This assumes that the generating plant is in addition to, and not replacing, existing generating plants. Different types of energy facilities have different levels of employment impacts. The most labor-intensive generating technology is coal-fired generation. The facilities are generally larger and have a longer construction period. The greater complexities of operations, as well as decommissioning a plant, also require a relatively larger work force compared to other energy resources. In addition, extracting, cleaning, and processing coal fuel requires a significant work force. Reclaiming and monitoring the mined land once the mine is closed, according to regulations, provides many long-term, all-season, relatively high-paying jobs. A similar amount of labor could be expected in an Integrated Gasification Combined Cycle (IGCC) plant, although the employment levels could be lower if a non-coal fuel source, such as petroleum coke that is a waste product of another refining process, is used instead. Wind generation generally requires less labor for operations, and clearly none for fuel extraction, but does provide moderate positive employment. Other renewable resources, such as geothermal and biomass, have the potential for moderately positive employment impacts during construction and operation, and landfill gas energy projects have moderately positive employment impacts during operation.

Along with employment, local economies accrue gains in personal income due to the wages and salaries paid to workers, spending for facility construction and operation, and the multiplier effects of these economic stimuli. Further, fiscal gains typically accrue to local governmental jurisdictions except in the cases where large-scale development occurs in rural areas without adequate infrastructure (e.g., the "boom-town" phenomenon associated with some past mining activities).

Table 3-28 summarizes the impacts of the alternative resource portfolios relative to employment ~~the economy~~. Impacts would be positive during both construction and operation. Employment ~~and other economic gains~~ during construction would be zero to moderate, with portfolios that include coal-fired and gas turbine energy generation (Portfolios 3 through 9) posting the largest gains due to the larger scale of the facilities. On a per unit of energy production basis, however, renewable energy projects also have moderately high positive benefits, and some studies suggest they have higher employment impacts than natural gas plants.[1] The importance of these gains would vary with the size of the local

[1] Kammen, D., K. Kapadia and M. Fripp. April 2004. Putting renewables to work: How many jobs can the clean energy industry generate? U.C. Berkeley. (http://www.berkeley.edu/news/media/releases/2004/04/13_kamm.shtml for press release) and Final Environmental Impact Statement for Sumas Energy 2 natural gas power plant. Available at http://www.efsec.wa.gov/Sumas2/eis/feis/vol1/3-8socio.pdf. See Section 3-8.

economy in which the facilities are constructed. Relatively small work forces and personal income gains would occur during operation. The portfolios with coal-fired generation (Portfolios 8 and 9) would accrue moderate economic gains, which is partly due to economic activity associated with coal mining.

Table 3-27. Impacts on Employment ~~the Economy~~

	Portfolios								
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Element of the Environment	Rely On Market - No Action	Renewables	Gas 100% Block	Gas, Wind, 50% Block	Gas, Wind, Hydro	Gas, Biomass Wind	Gas	Gas, Coal	Wind, IGCC
Employment ~~Economy~~									
Construction	0	+M ~~+L~~	+M	+M	+M	+M	+M	+M	+M
Operation	+L	+M ~~+L~~	+L	+L	+L	+L	+L	+M	+M

L = Low Impact M = Moderate Impact H = High Impact
+L, +M = Positive Impacts 0 = No Impact

3.12.3 Mitigation

No mitigation would be needed, because the impacts to employment are all zero or positive.

Table 3-2. Resource Impact Matrix

Elements of the Environment	Resources											
	Landfill Gas	Wind	Gas - SCCT	Gas - CCCT	Coal - Pulver-ized	Coal - IGCC	Trans-mission	Geother-mal	Biomass	Hydro Gorge Tunnel	Conser-vation	Market Trans-actions
Soils and Geology												
Construction	L	M	M	M	H	H	M	H	L	M	N/A	0
Operation	0	L	M	M	H	H	L	H	M	0	0	M
Air Quality												
Construction	L	L	L	L	L	L	L	L	L	L	N/A	0
Operation	L	L	M	M	H	H	L	L	M	L	L	H
Surface and Groundwater												
Construction	L	L	L	L	L	L	M	L	L	L	N/A	0
Operation	L	L	M	M	H	H	M	M	M	0	0	M
Plants and Animals												
Construction	L	M	M	M	H	H	M	H	M	L	N/A	0
Operation	L	M	L	L	H	H	M	M	M	0	0	M
Energy and Natural Resources												
Construction	L	L	L	L	M	M	M	L	L	L	N/A	0
Operation	+	0	H	H	H	H	M	L	L	+	+	H
Environmental Health												
Construction	0	L	L	L	M	M	H	M	M	L	N/A	0
Operation	+	M	M	M	H	H	L	M	M	0	L	M
Land Use												
Construction	L	M	M	M	H	H	H	M	M	L	N/A	0
Operation	L	M	M	M	H	H	H	H	H	L	0	M
Aesthetics and Recreation												
Construction	L	M	M	M	M	M	M	H	M	M	N/A	0
Operation	L	H	M	M	H	H	H	H	H	L	0	M
Cultural Resources												
Construction	0	M	M	M	M	M	L	M	M	L	N/A	0
Operation	0	M	M	M	H	H	M	L	L	0	L	M
Employment ~~Economy~~												
Construction	+L	+M ~~+L~~	+M	+M	+M	+M	+L	+M ~~+L~~	+M ~~+L~~	+L	+H	0
Operation	+M ~~+L~~	+M ~~+L~~	+L	+L	+M	+M	+L	+M ~~+L~~	+M ~~+L~~	+L	+L	+L
	L	Low impact		M	Moderate impact		H	High impact		+, +L, +M	Positive impact	
	0	No impact		N/A	Not applicable							

Chapter 4

Description of Preferred Alternatives, Impacts of the Alternatives, Mitigating Measures, and Significant Unavoidable Adverse Impacts

4.1 Introduction

Chapter 4 describes the Preferred Alternatives and analysis of their environmental impacts and mitigating measures.

4.2 Development of the Preferred Alternatives

The Draft Environmental Impact Statement (DEIS) described the impacts of nine initial alternative resource portfolios. These alternative portfolios were combinations of resources, to be added to City Light's existing owned generation and long term contracts, needed to meet electricity demand and reliability requirements over a 20 year period, including the type, amount, and timing. One of the Alternatives/Portfolios was No Action, under which City Light would buy electricity from the wholesale power market to meet demand over the 20 year planning period, and would not add any new owned or contracted resources beyond those existing in 2006.

Based upon analysis of the Alternatives described in the Draft EIS, the following decisions were made about which resources and strategies to consider for the Preferred Alternatives:

- Eliminate the two coal-fired generation technologies. The offset costs for carbon dioxide under City policy, expected transmission costs, risks under two carbon emission constrained scenarios (Green World and Nuclear Resurgence – see Section 2.5.2.2 of the DEIS for descriptions), and the estimated societal costs and environmental impacts of their emissions combined to remove them from further consideration.
- Combined Heat and Power (CHP) and hydro efficiency upgrades both have desirable attributes, but were not included in Round 2 portfolios. The site-specific nature of these resources (see Appendix C of the DEIS for descriptions) makes good information especially important. The potential amounts, costs, and timing of these resources are presently subject to considerable uncertainty. A study of hydro efficiency upgrade potential for City Light is currently underway, but the results are not yet available. The cost and availability of both these resources should be further investigated.
- For the first eight years of the study (2007-2015), increases in energy requirements sufficient to meet the resource adequacy targets can be met with a combination of

seasonal exchanges, conservation, short term call options, and purchased power agreements. This “front-end” to the portfolios was the minimum cost, risk, and environmental impact combination of available resources. It was determined that this selection of arrangements would provide the base of all portfolio alternatives to be evaluated. This provided a reduced set of resource alternatives to evaluate for the later years (post 2016).

- Details regarding the Washington State Initiative 937 (Renewable Portfolio Standard) were published after Round 1 analysis was begun and it was determined that it was vitally important to integrate the requirements for renewable energy purchases under Initiative 937 into the construction of some Round 2 portfolios.

Description of the Preferred Alternatives

Seven refined portfolios were evaluated in Round 2, based upon the results in Round 1. Of these, two did not meet the requirements of the recently passed Initiative 937. Four portfolios contained the level of conservation identified through the Conservation Potential Assessment and the IRP process and three contained an accelerated level of conservation. Seattle City Light is encouraged by the possibility that an accelerated acquisition of possible cost-effective conservation may eventually prove to be a good resource choice. Until this possibility can be carefully verified with further study, the Utility is recommending that the two Preferred Alternatives satisfy the prescribed level of resource adequacy and hold to the most cost-effective constant rate of programmatic conservation spending. These portfolios were called 7 and 8 in Round 2 of the IRP. For the Final EIS, the Preferred Alternatives are called A: Renewables/More Wind, and B: Renewables/More Geothermal, containing resources shown in the table below.

Table 4-1. Preferred Alternatives

Portfolio	Resource Additions
A: Renewables - More Wind	Conservation, Call Option, Exchanges, Landfill Gas, Hydro Contract, Biomass, Market Purchase and Sales, Geothermal, Wind
B: Renewables - More Geothermal	

The aggregate resources that would be used under each alternative over the 20-year planning period are shown on Tables 4-2 and 4-3. During the years 2007-2018, the portfolios are the same. Different amounts of wind and geothermal are added during the remaining years of the planning period. Alternative A would add more wind and Alternative B would add more geothermal resources.

Table 4-2. Alternative A: Resource Capacity (MW) By Year

	Conser-vation	Call Option	Exchange 1	Exchange 2	Landfill Gas	Hydro Contract	Biomass	Geothermal	Wind	Total
2007	7			50						57
2008	14		50	50						115
2009	21	30	50	50						154
2010	28		50	50	25					151
2011	35		50	50	25					152
2012	42		50	50	25	23				185
2013	49	5	50	50	25	23				205
2014	55		50	50	25	23				204
2015	62		50	50	25	23		30		239
2016	68		50	50	25	23	15	30		249
2017	74		50	50	25	23	15	30		258
2018	81		50	50	25	23	15	30		268
2019	87		50	50	25	23	15	30	55	307
2020	94		50	50	25	23	15	50	55	304
2021	100		50	50	25	23	15	50	55	355
2022	107		50	50	25	23	15	50	105	412
2023	113		50	50	25	23	15	50	105	414
2024	119		50	50	25	23	15	50	105	416
2025	126		50	50	25	23	15	50	105	417
2026	132		50	50	25	23	15	50	105	454

Table 4-3. Alternative B: Resource Capacity (MW) By Year

	Conser-vation	Call Option	Exchange 1	Exchange 2	Landfill Gas	Hydro Contract	Biomass	Geothermal	Wind	Total
2007	7			50						57
2008	14		50	50						115
2009	21	30	50	50						154
2010	28		50	50	25					151
2011	35		50	50	25					152
2012	42		50	50	25	23				185
2013	49	5	50	50	25	23				205
2014	55		50	50	25	23				204
2015	62		50	50	25	23		30		239
2016	68		50	50	25	23	15	30		249
2017	74		50	50	25	23	15	30		258
2018	81		50	50	25	23	15	30		268
2019	87		50	50	25	23	15	50		307
2020	94		50	50	25	23	15	50	55	304
2021	100		50	50	25	23	15	50	55	300
2022	107		50	50	25	23	15	100	55	412
2023	113		50	50	25	23	15	100	55	414
2024	119		50	50	25	23	15	100	55	416
2025	126		50	50	25	23	15	100	55	417
2026	132		50	50	25	23	15	100	55	454

Key:	Resources Common to Both Alternatives
	Differences Between Portfolios After 2018

Energy Output In Alternative Portfolios

The energy output of individual resources under Alternatives A and B are shown Table 4-4. The Renewables Portfolio 2 from the DEIS analysis is shown for comparison. By comparison to Portfolio 2, Alternatives A and B contain fewer average megawatts of conservation, hydro contracts and efficiency improvements, call options, biomass and wind. Conversely, the amount of geothermal, exchanges, and landfill gas are increased. (SCL's BPA purchase essentially remains the same. The change in BPA purchase numbers between Round 1 and 2 result from adjustments made in modeling the hydro system).

Resource amounts reflected in Preferred Alternatives A and B are based on what was learned in Round 1, refinements to modeling and other factors including:

- Corrections in assessment of conservation potential,
- Adjustment of the wind capacity factor to 32 percent,
- Slight change in modeling of hydro system reflected in BPA purchase,
- Need to validate cost estimates for Gorge Tunnel Hydro efficiency improvements,
- Earlier purchase of landfill gas project to avoid potential lost opportunity, and
- Refinements in the model resulting in optimization of energy exchanges.

The most significant difference is the amount of wind and geothermal included. Compared to the Round 1 Renewables Portfolio, the amount of wind resource is reduced by 1390 aMW in Alternative A and 1690 aMW in Alternative B. The amount of geothermal is higher by 410 aMW in Portfolio A and 560 aMW in Alternative B.

Table 4-4. Preferred Alternatives Energy Portfolios and Their Composition - Reference Case (aMW of Energy, 2007-2026)

Resource	Portfolios	
	Alternative A	Alternative B
Conservation	1,413	1,413
Geothermal	463	714
Gorge Tunnel	0	0
Wind	674	377
BPA	14,355	14,355
Call Option	0	0
Exchange	-74	-74
Hydro Contract	531	531
COB Sales	-1,447	-1,447
MID C Purchase	100	101
MID C Sales	-8,176	-8,130
Biomass	39	39
Landfill	296	296
CCCT	0	0
SCCT	0	0
CHP	0	0
IGCC	0	0
PV Coal	0	0

Summary of Environmental Impacts

The analysis in Chapter 4 follows the format used in Chapter 3 to describe environmental impacts. As in Chapter 3, the impact evaluations in this chapter draw upon generic descriptions of individual resources found in Appendix C of the DEIS and are similarly limited by the lack of site specific information. Table 4-5 below summarizes Chapter 4 findings with respect to the impacts of the Round 2 portfolios. The Table includes the "No Action" and Round 1 Renewable Portfolio for comparison.

In general, greater reliance on geothermal would tend to result in greater ongoing impacts on soils, geology and groundwater. Wind turbines are large (typically 300 ft and taller) and often located on ridges, so there could be high aesthetic impacts and significant noise associated with even a minimally sized facility. Both Alternatives A and B include enough wind resources to potentially generate high aesthetic and noise (environmental health) impacts. Land use impacts would also be potentially high for both alternatives given their impact on recreational or agricultural lands.

Table 4-5.

Summary of Environmental Impacts of IRP Preferred Alternatives				
	Two Round 1 Portfolios - for Comparison		Preferred Alternatives	
	1	2	A	B
Elements of the Environment	**No Action - Rely on the Market**	**Round 1- Renewables**	**More Wind**	**More Geothermal**
Soils and Geology				
Construction	0	H	M	H
Operation	M	H	M	H
Air Quality				
Construction	0	L	L	L
Operation	H	M	L	L
Surface and Groundwater				
Construction	0	L	L	L
Operation	M	M	M	H
Plants and Animals				
Construction	0	H	M	H
Operation	M	M	M	M
Energy and Natural Resources				
Construction	0	L	L	L
Operation	H	L	L	L
Environmental Health				
Construction	0	M	M	M
Operation	M	M	M	M
Land Use				
Construction	0	M	M	M
Operation	M	H	H	H
Aesthetics and Recreation				
Construction	0	M	M	M
Operation	M	H	H	H
Cultural Resources				
Construction	0	M	M	M
Operation	M	M	M	M
Employment				
Construction	0	+M (revised from DEIS)	+M	+M
Operation	+L	+M (revised from DEIS)	+M	+M
	L	= Low impact		M
	+, +L, +M	= Positive impact		0

4.3 Soils and Geology

4.3.1 Impacts of the Alternatives

Construction impacts and operation impacts are moderate for Alternative A: More Wind and high for Alternative B: More Geothermal reflecting the ground-disturbing activities that would occur and, in the case of B the risk of greater geologic impacts such as landslides or subsidence. It is important to note that the construction footprint for wind developments can be very large in relation to the final footprint - with the installation occupying 5-10% of the disturbed area.

Due to the inclusion of some geothermal resources in Alternative A, it would be expected to have some operational impacts related to soils and geology but much less so than Alternative B.

4.3.2 Mitigation

Potential mitigating measures for Soils and Geology include:

- Minimize the extent of ground disturbance required, such as by using existing roads to the extent possible. Locate new access roads to follow the local topography, and minimize sidehill cuts.
- Cover and stabilize exposed areas consistent with applicable standards, salvage removed topsoils and reclaim disturbed areas as soon as possible.
- Identify and avoid unstable slopes and other geologic hazards, and avoid creating excessive slopes during construction; use special construction techniques where applicable.
- Develop and implement a temporary storm water management system to control runoff, erosion, and sedimentation during construction.
- Implement a Spill Prevention Control and Countermeasure (SPCC) Plan.
- Employ Best Management Practices (BMPs) such as using straw, silt fences, and water detention ponds to reduce soil erosion and control storm water runoff.
- Implement a permanent storm water pollution prevention plan (SWPPP).

4.4 Air Quality

4.4.1 Impacts of the Alternatives

The air quality impacts are based on emissions from three general categories: (1) direct emissions from the Generation resources in the Preferred Alternatives, (2) indirect emissions that result from City Light's use of Contracts for Existing Resources (existing generation from Market Transactions: Call Options, Exchanges, and the Hydro Contract), and (3) the indirect emissions of Market (net purchases and sales). Another category was included in Round 1: changes in the amount of the BPA Contract. That category does not apply to the Preferred Alternatives, because in this analysis the

amount of BPA is assumed to be the same for all portfolios: the existing contract amount.

As in the Draft EIS analysis, it is important to consider the actual amount of energy produced for load, used by, or sold by City Light in each resource category. Table 4-6 shows the energy output, broken down into the categories listed in the paragraph above. Also as in the Draft EIS, the evaluation of the Net Market Purchases/Sales will be based on the difference between the No Action portfolio and the Preferred Alternatives, in order to show the impacts from the choices made in the Preferred Alternatives.

The air emissions from the Preferred Alternatives are lower than the range in the Round 1 Alternatives described in the Draft EIS.

Table 4-6. 20 Year Total Energy in Each preferred Alternative (aMW)

	Alternative A	Alternative B
Conservation	1413	1413
Generation		
Biomass	39	39
CCCT	0	0
CHP	0	0
Geothermal	463	714
Gorge Tunnel	0	0
IGCC	0	00
Landfill	296	296
PV Coal	0	0
SCCT	0	0
Wind	674	377
Contracts for Existing Resources		
Call Option	0	0
Exchange	-74	-74
Hydro Contract	531	531
BPA	14355	14355
Market		
COB Sales	-1447	-1447
MidC Purchase	100	101
MidC Sales	-8176	-8130

The NOx and Particulate emissions from New Generation Resources are due to the biomass and landfill gas resources. Biomass emits 0.80 lbs NOx/MWh and 0.259 lb Particulates/MWh, and landfill gas emits 0.66 lb NOx/MWh and 0.1067 lbs

Particulates/MWh. Since both portfolios contain almost exactly the same amount of capacity and energy output for these resources, the emission amounts are almost identical in both of the Preferred Alternatives. See Table 4-7 for overall emissions from Generation resources in the Preferred Alternatives.

Table 4-7. 20-Year Air Emissions for Preferred Portfolios - New Generation Resources ONLY

	CO2 (tons)	NOx (tons)	SOx (tons)	HG (tons)	PM (tons)
Alternative A	0	992	0	0	183
Alternative B	0	991	0	0	182

Emissions from the Contracts for Existing Resources, shown in Table 4-8, are also lower than the Round 1 Alternatives, including the Round 1 Renewables (Portfolio 2) alternative. This is a result of the decrease in the amount of energy from Market Transactions, primarily the Hydropower Contract. There are emissions of SOx, due to the natural gas and small amounts of coal in the Market resource. Note that some of the values are negative. This is the result, also seen in the DEIS Air Quality evaluation, of the differences in the emission rates in different months of the planning period. As it turned out, City Light was delivering energy to other utilities during times of higher emission rates, thereby displacing more emissions than resulted from the energy City Light received at other times of the year. In addition, given City Light's surplus, the Exchange contracts were designed to deliver more energy to the counter party than City Light received in return.

Table 4-8. 20-Year Air Emissions for Preferred Alternatives - Contracts for Existing Resources ONLY (Call Options, Exchanges, Hydro Contract)

	CO2 (tons)	NOx (tons)	SOx (tons)	HG (tons)	PM (tons)
Alternative A	1,753,830	-3	-62	0	-228
Alternative B	1,753,830	-3	-62	0	-228

In the IRP analysis evaluated in the Draft EIS, the amount of BPA was varied in the Alternative portfolios. However, in the second set of analysis included in the Final EIS, the amount of BPA energy is the same across all portfolios and the same as the existing contract. Therefore, there is no change in air emissions associated with the BPA contract in the Preferred Alternatives, as shown in Table 4-9.

Table 4-9. 20-Year Air Emissions for Preferred Alternatives - Change in Energy Received from BPA ONLY

	CO2 (tons)	NOx (tons)	SOx (tons)	HG (tons)	PM (tons)
Alternative A	0	0	0	0	0
Alternative B	0	0	0	0	0

Emissions from Net Market Sales and Purchases, shown in Table 4-10, are large and negative, due to City Light having a large surplus of energy, on an annual basis, to sell into the wholesale market, thus displacing a mix of resources with higher emissions. This result was also seen in the Draft EIS, but the magnitude of the reduction in emissions was much higher. This is because the Preferred Alternatives were designed to reduce the large net surplus, by better matching resources to load throughout seasons in the planning period.

Table 4-10. 20-Year Air Emissions for Preferred Alternatives - Net Market Sales/Purchases ONLY (Difference from 'No Action')

	CO2 (tons)	NOx (tons)	SOx (tons)	HG (tons)	PM (tons)
Alternative A	-15,151,797	-5,229	-517	0	-924
Alternative B	-14,911,998	-5,083	-495	0	-906

Overall, the sum of the air emission categories results in a net reduction of air emissions. This is the result of adding energy from zero/low emission sources, and selling the surplus from those resources into the wholesale market.

Table 4-11. 20-Year Air Emissions for Preferred Alternatives - Sum of Generation, Contracts, Market Net Sales/Purchases

	CO2 (tons)	NOx (tons)	SOx (tons)	HG (tons)	PM (tons)
Alternative A	-13,397,967	-4,240	-579	0	-969
Alternative B	-13,158,168	-4,095	-557	0	-952

Air quality impacts of both of the Preferred Alternatives, A - Renewables/More Wind and B - Renewables/ More Geothermal, are Low for Construction and Operational phases. This is due to the use of renewable resources that have no net greenhouse gas emissions, and low emissions of other pollutants.

Table 4-12. Impacts on Air Quality - Summary

Elements of the Environment	Preferred Alternative A	Preferred Alternative B
Air Quality		
Construction	L	L
Operation	L	L

L = Low impact

M = Moderate impact

H = High impact

+, +L, +M = Positive impact

0 = No impact

4.4.2 Mitigation

Air quality impacts are low for both Preferred Alternatives, so mitigation requirements would be small. City Light will mitigate for any greenhouse gas emissions associated with purchased from Contracts for Existing Resources, as part of its goal of net zero greenhouse gas emissions.

4.5 Surface and Groundwater

4.5.1 Impacts of the Alternatives

Although considerable potential exists for impacts during construction, the requirements for mitigation are likely to minimize impacts on surface and groundwater. As a result, construction impacts are anticipated to be low for both alternatives.

Operational impacts vary greatly depending on the resource. Water use per MWh for various energy resources is depicted in Table 4-13.

Table 4-13. Water Use for Energy Resources (Gallons/MWh)

Energy Resource	NWPCC 5th Plan (Withdrawal)	California Energy Commission (2005) (Consumption)
Wind	~1	0
Geothermal	107,000 - 130,000	250
Biomass Steam (once-through	23,000 - 55,000	500
Biomass Steam (re-circulate)	350 - 900	
Biomass Steam (dry)	50	
Biogas (Landfill)		250

Alternatives A and B include minimal amounts of biomass, but there would be a large difference in use of geothermal, with Alternative A having moderate and Alternative B having potentially high operational impacts on water resources.

4.5.2 Mitigation

Potential mitigating measures for Surface and Groundwater include the following:

- Characterize the surface and groundwater hydrology prior to construction, develop an understanding of discharge and recharge relationships, and avoid creating new hydrologic connections through grading and related activities.
- Monitor water quantity and quality conditions if construction activity is to occur near aquifer recharge areas.
- Implement BMPs for use, handling, and storage of fuels, pesticides and other hazardous materials during both construction and operation.

4.6 Plants and Animals

4.6.1 Impacts of the Alternatives

Construction of wind and geothermal facilities requires significant land area that could at least temporarily degrade habitat. Because geothermal facilities are more likely to be located in sensitive areas, they are more likely to have higher impacts.

Operation of wind turbines can impact bird and bat migration if not sited carefully, and impacts could be moderate for Alternative A. Disturbance of habitat that results from geothermal processes could be moderate if water resources and aquatic species are adversely affected.

4.6.2 Mitigation

Potential mitigating measures for Plants and Animals include the following:

- Conduct adequate surveys of plant and animal resources.
- Avoid siting facilities in areas that support unique or sensitive plants or important wildlife habitat.
- Where possible, use existing roads and disturbed areas for project development, and minimize the area disturbed for project construction.
- Design necessary stream crossings to minimize disturbance and maintain aquatic habitat conditions.
- Develop and implement a restoration plan to restore disturbed plant and animal habitat.
- Purchase or preserve areas to replace habitat values lost through project development.
- Implement measures to minimize establishment of invasive species.
- Landscape site buffer areas with native plant species.
- Establish a monitoring program to assess impacts on the area's plant and animal species.

4.7 Energy and Natural Resources

4.7.1 Impacts of the Alternatives

Renewable resources do not consume significant amounts of fossil fuels. Some biomass fuels are considered renewable if they come from sources that are easily and quickly replaced (such as wood waste or fast-growing crops). However, biomass might not be considered renewable if the source is not readily replaceable. The amount of biomass in Alternatives A and B is slightly less than in the DEIS renewables portfolio and the impact of both portfolios is low.

4.7.2 Mitigation

Mitigation would not be required.

4.8 Environmental Health

4.8.1 Impacts of the Alternatives

It is not expected that significant impacts would occur during construction for either alternative. Construction and operation of wind, geothermal, and landfill gas facilities would likely be able to comply with permissible noise levels. During operation, noise impacts from wind turbines may be moderate for both alternatives.

The scientific agencies that have considered electromagnetic magnetic fields (EMF) have concluded that the extensive body of research that currently exists does not suggest that EMF from electrical sources causes any long-term adverse health effects. Recent research does not provide any evidence to alter this conclusion. The only studies that can be said to confirm a relationship between EMF and an adverse effect are those in which very high levels of exposure to these fields produce short-term, shock-like effects. The levels at which these short-term effects occur are very high and are rarely encountered by the general public. In summary, there is no scientific basis to indicate any adverse health effects to the public as a result of the electric and magnetic fields from transmission lines.

Adherence to occupational safety plans put in place during construction and operation should mitigate any risks to workers.

3.8.2 Mitigation

Potential mitigating measures for Environmental Health include the following:

- Restrict construction activities to daylight hours.

- Lay out plant facilities so that noise standards are not exceeded at the site boundary.
- Ensure adherence to all applicable occupational safety regulations and standards and project health and safety plans in construction and operation.
- Establish safety zones and setbacks to prevent public exposure to potential safety hazards during both construction and operation.
- Plan and design projects to comply with FAA requirements for notification and marking of tall structures to ensure aviation safety.
- Analyze and evaluate operating noise conditions during project planning and design to ensure compliance with applicable community noise standards.
- Consider implementing a noise complaint and investigation program for the project operation period.

4.9 Land Use

4.9.1 Impacts of the Alternatives

Land use impacts are highly site specific and difficult to assess in a Programmatic EIS. Generally there is little flexibility in siting geothermal and wind facilities which makes land use impacts likely. Also these kinds of resources are typically located in rural or outlying areas that are either used for agriculture or are mostly undeveloped.

Land use impacts during construction include the possible displacement of existing uses (a long-term impact) and proximity impacts on nearby land uses as a result of noise, dust, traffic, and similar triggers (temporary impacts). The magnitude of these impacts would be greater for large facilities and if development were to occur in rural areas or affect lands designated as sensitive areas such as wetlands. Construction impacts are judged to be moderate for both Alternatives A and B.

High operational impacts could occur for Alternatives A and B. This is due to the potentially long-term land-disturbing activities that accompany harvest/removal of biomass (although there is less of this resource than in DEIS renewables portfolio), the possibility of land use conflicts where geothermal facilities are developed in pristine areas, and any permanent loss of agricultural land.

Construction and operation of new transmission lines, if required, can also require large areas and any change in land use would have both short and long term impacts.

4.9.2 Mitigation

Potential mitigating measures for Land Use include the following:

- Locate the plant site to minimize land use impacts.

- Evaluate the project site before construction to make sure it conforms to local planning and zoning requirements and avoids compatibility issues with nearby uses.
- Locate new transmission facilities within or parallel to existing rights-of-way and avoid bisecting existing land uses such as farmland.
- Develop construction management plans that avoid or minimize disruptions to adjacent existing uses.

4.10 Aesthetics and Recreation

4.10.1 Impacts of the Alternatives

Most energy resources included in portfolios A and B and transmission lines would create visual contrasts with the surrounding areas in which they are located. Wind generating facilities can be seen from long distances and stand out on the landscape. Fuel extraction sites for biomass are considered unattractive due to the disturbance to soils, heavy machinery, and potential for noise and dust. With the exception of landfill gas, there would be substantial changes in visual quality of the setting during construction that would carry on over the long term during operation. The level of impact would depend upon the nature of the site, visibility of the facility, and the number of potential viewers.

Similar impacts would occur for recreation. Energy facilities in more remote, pristine areas could affect recreation directly because of use conflicts and loss of habitat and wildlife and indirectly through compromising the recreation experience. There is little flexibility in choice of plant sites in order to avoid recreational impacts for geothermal and wind.

Alternatives A and B would potentially have moderate construction impacts, and both would potentially have high impacts on aesthetics during operation.

4.10.2 Mitigation

Potential mitigating measures for Aesthetics and Recreation include the following:

- If possible, locate facilities in areas with less viewer exposure and away from popular recreation areas.
- Integrate facility design and configuration of structures into the surrounding landscape or otherwise incorporate aesthetic objectives into design.
- Minimize surface disturbance for roads and other project features, particularly on steep slopes, and control erosion.
- If possible, provide vegetative screening to obstruct views of project facilities from surrounding sensitive areas.
- Keep project facilities clean and well maintained throughout project operation.
- Compensate for impacts by aesthetic improvements in other areas such as reclamation of unneeded roads.

4.11 Cultural Resources

4.11.1 Impacts of the Alternatives

Due to the site specific nature of locating geothermal and wind resources, it is possible some cultural resource impacts could occur, and possible but less likely, that historic resources would be disturbed. Improved access to remote locations where cultural resources are present could possibly lead to greater human intrusion of the area and possible disturbance. This impact could extend into the period of operation. During construction and operation impacts would be moderate for both Alternatives A and B.

4.11.2 Mitigation

Potential mitigating measures for Cultural Resources include the following:

- Consult with the State Historic Preservation Officer (SHPO) in the state where the resource is to be located and Native American tribes with interests in the project area to determine the likelihood of any cultural resources within or near the project area, including the proposed route for transmission facilities.
- Conduct records searches and field surveys, if necessary, to identify and assess resources that may be present.
- Modify the project configuration, to the extent possible, to avoid cultural resources identified through the inventory process.
- If cultural resources are present in development areas and impacts cannot be avoided, develop and implement a cultural resources mitigation and management plan in consultation with appropriate authorities to accomplish data recovery from the affected sites.
- If unanticipated resources are discovered during construction, halt work, notify SHPO and any affected tribes, develop an appropriate mitigation program, and negotiate next steps.

4.12 Employment

4.12.1 Impacts of the Alternatives

Impact to employment for Alternatives A and B would be moderately positive in both construction and operational phases.

4.12.3 Mitigation

No mitigation would be needed.

Chapter 5

Public Comment on the Draft EIS and Responses

This chapter includes all comments received on the DEIS. Each specific comment is identified, and a response is given.

Comments received:

1. Northwest Energy Coalition
2. Jim Harding
3. Patrick Binns
4. Andy Silber

Seattle City Light held a public hearing, as required by SMC 25.05.535(B), on October 11, 2006 in the Seattle Municipal Tower, Floor 40 conference rooms, in downtown Seattle.

COMMENTS

Northwest Energy Coalition (received via email)
Thank you for the opportunity to submit comments regarding Seattle City Light's Draft Environmental Impact Statement for its 2006 Integrated Resource Plan. The DEIS is thorough in its description of the IRP process and analysis to date. We have separately submitted comments in the IRP process regarding Round Two assumptions and draft portfolios. We offer the following brief set of suggestions and questions while recognizing that the roots of some of these comments may be more appropriately addressed within the context of the final IRP.

NWEC #1) Table 3-2 on page 3-4 estimates the economic impact of each of the resources considered in Round One, focusing primarily on job creation. We disagree with the assessment of wind resources as having low economic benefits during construction and during operation. We strongly suggest revisiting the assumptions used here and at a minimum assigning wind a medium ranking in each of these categories. The assumptions regarding the economic benefits of other renewable resources also should be reexamined – the DEIS assessed those as low during both construction and operation.

Table 3-2 estimates CCCT and SCT plants as having medium positive economic impacts during construction, and pulverized coal and IGCC as having medium positive economic impacts during both construction and operation. Yet according to the Union of Concerned Scientists, both solar and wind power create 40% more jobs per dollar invested than coal.[2] A U.C. Berkeley review of 13

[2] Union of Concerned Scientists. "SB 532 – A renewable portfolio standard. Stable prices, clean energy, new jobs." Fact sheet. Contact = Julia Levin.

independent reports and studies found that across a broad range of scenarios, the renewable energy sector (solar, wind, biomass) generates more jobs than fossil fuels per unit of energy delivered.[3] The authors concluded that investment in new renewable energy sources leads to roughly 10 times more jobs than a comparable investment in the fossil-fuel sector. The National Renewable Energy Laboratory compared economic impacts of wind, gas and coal in three states, examining materials and labor for construction, operations, maintenance, fuel extraction, and fuel transport, as well as project financing, property tax, and landowner revenues.[4] Results indicated that adding new wind power can be more economically effective than adding new gas or coal power.

In Washington, the 150 MW Hopkins Ridge wind facility created 22 full-time jobs and averaged 150 jobs over its 10-month construction period.[5] The 64 MW Nine Canyon wind facility south of Kennewick created 5 full-time jobs and 150 jobs during its seven-month construction period.[6] The 229 MW Wild Horse Wind Project, which commenced construction in Kittitas County at the end of 2006, already has created more than 250 construction jobs with more expected before the facility comes on line.[7] In comparison, the 660 MW Sumas Energy 2 gas plant would have yielded 300-400 jobs during construction and 23 long-term jobs during operation.[8] The 1300 MW Wallula gas plant assumed average jobs ranging from 16-489 per 3-month period during its 24 months of construction. Operations would require 32 permanent employees.[9]

Page C-28 refers to operational benefits of wind power including increased tax base and land lease payments, yet the conclusion that wind has a low positive economic impact during operations does not reflect this. The owners of Hopkins Ridge contribute more than $1 million in annual tax payments to the local community.[10] Nine Canyon is contributing nearly $250,000 annually in rent payments to local landowners, and approximately $170,000 annually for local maintenance materials and service contracts for road maintenance and power forecasting.[11] The developer of Wild Horse Wind already has contributed more

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[3] Kammen, D., K. Kapadia and M. Fripp. April 2004. Putting renewables to work: How many jobs can the clean energy industry generate? U.C. Berkeley. (http://www.berkeley.edu/news/media/releases/2004/04/13_kamm.shtml for press release)

[4] Tegen, S. August 2005. Comparing statewide economic impacts of new generation from wind, coal and natural gas in Arizona, Colorado and Michigan. NREL/CP-500-38154. (http://www.nrel.gov/docs/fy05osti/38154.pdf)

[5] Puget Sound Energy (PSE). 2006. Hopkins Ridge wind project facts at a glance. Online at *http://www.psehopkinsridge.com/posted/979/Factsheet.130070.pdf*, accessed on September 5, 2006.

[6] Kobus, D. 2004. Energy Matters: NW Energy Coalition Campaign Launch. Presentation delivered to the NW Energy Coalition, May 11. Dave Kobus is Nine Canyon Project Development Manager.

[7] Taylor, C. at Horizon Energy. Sept. 2006. Personal communication.

[8] Final Environmental Impact Statement for Sumas Energy 2 natural gas power plant. Available at http://www.efsec.wa.gov/Sumas2/eis/feis/vol1/3-8socio.pdf. See Section 3-8.

[9] Draft Environmental Impact Statement for Wallula natural gas power plant. Available at http://www.efsec.wa.gov/wallula/eis/DEIS/Chap2PropAct.pdf. See ps. 2-29 to 2-30.

[10] PSE. 2006.

[11] Kobus. 2004.

than $7 million to the local economy.[12] Land lease payments currently are upwards of $5000 per turbine per year. These economic benefits of wind power should be recognized in a ranking of at least medium positive impact.

In addition to wind, other renewable resources also can bring significant economic benefits. For example, the National Geothermal Collaborative estimates that building a 50 MW geothermal plant may create several hundred temporary (2-3 years) construction and related development jobs and from 30-50 permanent full-time jobs.[13] They are often located in rural areas, which typically have chronic high unemployment rates.

City Light response: Thank you for your recommendation, and for the references you have provided. After reviewing the information, we agree that the revisions to the ranking of the individual resources is appropriate. See updates in this Final EIS to chapters 1and 3 of the Draft EIS.

While re-evaluating this part of the environmental analysis, City Light decided that the intent of this section had not been made as clear as it could have been. The inclusion of economic impacts of the Alternatives was not meant to represent a thorough economic analysis. The purpose of including information on employment and economic impacts was to provide a very general estimate of direct impacts, primarily to employment, of the different resource options. This information is often of interest to the public and decision makers, but it is not in any way intended to substitute for the economic analysis of the Alternatives that is done in the Integrated Resource Plan, nor is it intended to provide a detailed analysis of indirect impacts. In order to help clarify the intent of this aspect of the environmental analysis, the label assigned to this element of the environment has been changed from "Economic Impact" to "Employment Impact" throughout the DEIS, as described in this Final EIS.

NWEC #2) Table 3-2 shows no construction impacts due to the market transactions portfolio. Page C-116 refers to all market transactions being based on existing resources. Does the reference to “existing resources” mean resources in operation today? While the region may currently be experiencing a surplus of energy resources, it seems unlikely that no new resources will be developed in the region and sold on the wholesale market during SCL’s 20-year planning horizon.

City Light response: The 'Existing Resource' does mean operation of plants that are in operation today. This is based on the data provided by Global Energy Decisions about the resources that would be operated to meet load on the margin of the market. While new generation resources will certainly be built, they will primarily meet baseload demand, while peak loads, such as those City Light would be meeting with market purchases, will be met with the existing, less

[12] Taylor. 2006.
[13] http://www.geocollaborative.org/publications/default.htm

efficient, and consequentially more expensive and higher emission resources. These forecasts of the marginal market resources are best estimates, and will be updated in future IRPs, as more information becomes available.

NWEC #3) The DEIS should explain why the portfolio comparison appearing on p. 2-44 differs from the portfolio comparison provided at the July IRP public meeting. The total cost of the renewable portfolio originally ranked in the top third and now ranks in the middle third, while the total cost of the gas/wind/hydro portfolio moved in the opposite direction. What changed in the analysis to shift the cost of these 2 portfolios?

City Light response: At the time the initial table was prepared, a wind shape was inadvertently not applied in the modeling. This resulted in the wind shape being flat. The flat wind shape incorrectly gave the wind more output than it should have had at times of peak need. Upon applying the wind shape correctly, the renewable portfolio dropped in the ranking by one position. It only needed to move one place relative to other portfolios to be categorized in the middle third.

NWEC #4) An explanation regarding why non-hydro renewable energy accounts for less than 1% of the mix in the 4 Global Energy Decisions scenarios would be helpful (p. 2-30). It seems contrary to common sense that a Green World approach or Nuclear Resurgence scenario would not result in a larger percentage of the nation's resource mix coming from new renewable resources.

City Light response: There was an error in the document. The same description appears in the table for several scenarios. In actuality, the Green World scenario contains 17% renewable capacity. This has been corrected in the draft IRP and the EIS.

NWEC #5) We understand that the DEIS reflects the IRP process through the Round One development of portfolios. In Round Two, several underlying assumptions have been modified based on updated information. The final EIS should reflect those changes as well. For example, p. 2-31 refers to northwest wind having a 27% capacity factor, but the final IRP analysis will assume a 32% capacity factor. The tables showing capacity and energy from wind resources also should be modified to reflect this change.

City Light response: We have already incorporated these changes as discussed in Stakeholder meetings in the description of the Round 2 analysis for the Draft IRP.

NWEC #6) On p. 2-24, it would be helpful for the DEIS to explain the basis for the assumption that SCL would be able to acquire 100 aMW from the wholesale power market under adverse hydro conditions, or approximately 10% of its current average load.

City Light response: Analyzing historical weather events suggests that during the worst cold weather event during a low water year, Seattle City Light was able to acquire over 200 aMW from the market. This amount was scaled back to 100 aMW because of expected growth in utilization of existing transmission capacity. Also, the Northwest Power and Conservation Council now estimates that during adverse weather events, the Pacific Northwest would be able to count on about 1,500 MW from a combination of imports from outside the region and drafting the hydro system beyond normal minimums. 100 MW for Seattle would be roughly consistent with a pro rata share.

NWEC #7) Table 3-1 on page 3-3 provides the aMW of energy expected from each of the portfolios. We note that 8 of the 9 portfolios sum to 8227-8231 aMW, but Portfolio #3 (gas/100% block) totals 8406 aMW. Explaining this difference here (and for Table 3-10) would be helpful.

City Light Response: The portfolios were not sized identically because they used different combinations of resources where each resource has different minimum sizes. Some resources are lumpy, requiring the utility to be surplus when they are first added and grow into them. Also, some resources dispatch more often and have higher capacity factors, leading to greater output.

NWEC #8) A discussion regarding how SCL plans to assess the impacts of climate change on its hydropower system and how that might impact resource needs and selection of new resources in the IRP process would be helpful.

City Light Response: addressing the potential impacts of climate change on hydropower output and demand for electricity are definitely important to City Light as part of the Integrated Resource Planning process. The challenge is representing these potential changes in the IRP model. In October 2005, local experts in climate change evaluation, the University of Washington Climate Impacts Group, issued a report that stated that "projected climate and hydrologic changes will likely alter the annual patterns of electricity demand and streamflow". In addition, demand for electricity is expected to change: "projected warming due to climate change will likely lower electricity demand during the winter and increase demand during the summer in Washington."[14]

While these general observations can help planners evaluate their assumptions and identify areas for additional analysis in future IRPs, forecasts that are more specific in terms of the affects on precipitation patterns and flows in river and stream systems are needed for the high level of analysis done in the IRP model. These forecasts are being developed by the University of Washington, on a regional level. The work is being refined, and City Light and other local, state, and federal agencies are working to support this effort. 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 of the major hydropower watersheds, the process of refining the forecasts will likely take a year or more, and will be an ongoing process after that, as new data and refined modeling tools become available. 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 UW on modeling for the Skagit, and BPA and the NW Power and Conservation Council may pursue studies for the Columbia River system.

Even though the climate change data is not yet available for all the hydropower systems that City Light receives power from, the hydrostastics for the output of the Skagit system that were used in the IRP model did include a range of extreme flow conditions that have been predicted by climate change models. The input data was based on historic data, but not limited strictly to the extremes seen in recorded data. This approach does allow planners to see how these extremes would effect the various resource portfolio options in terms of cost, risk, and reliability.

[14] "Climate Impacts on Washington's Hydropower, Water Supply, Forests, Fish, and Agriculture", Casola, Kay, Snover, Norheim, Whitley Binder, University of Washington Climate Impacts Group, October 2005

NWEC #9) We would appreciate the reference on p. 2-18 to “Renewable Portfolio Standard Initiative” to be replaced with the name “Clean Energy Initiative” or “Initiative 937.” As discussed in the explanatory paragraph, the Initiative includes a critical energy efficiency component in addition to the renewable energy provision.

City Light response: Thank you for your comment. This reference will be changed to "Initiative 937".

Jim Harding
JH #1) Second, your EIS assumptions for new resources ascribe general economic benefits for investments in new resources that are essentially proportional to capital cost. Thus, coal benefits are greater than gas, wind, or conservation. This is not economics; it is a narrowing counting of direct jobs. As any economist knows, jobs are a cost, not a benefit; you can build the most expensive new resource with lots of job additions and they will be offset by uncounted job losses caused by more expensive electricity. I have no problem in characterizing resources by job intensiveness per kilowatt-hour, or through other more reasonable metrics.

City Light Response: Thank you for your comments. The element of the environment that was labeled 'Economy' in the DEIS will be relabeled 'Employment' in order to clarify intent. Please see response to comment (NWEC#1), above.

Patrick Binns (from and email message following the Public Hearing)

PB #1) Time-of-Day Pricing and Metering:
Foremost in significance is the missed opportunity to directly confront the fundamental problem SCL has with the way it currently prices and measures electricity usage by all of its customers (large and small). The thrust behind the IRP is how to best assure that SCL will reliably support the base and peak load demands over the coming 20 years. However, the plan is silent about how a time-of-day and seasonal power pricing model could create market-based incentives for users to practice energy efficient usage behaviors and to invest in energy conserving appliances, equipment, buildings and commercial processes. Seattle’s residential, commercial, industrial and institutional power customers must be given proper price signals to guide them to conserve electricity use; to time-shift their usage; and to implement other actions that could significantly reduce the growth of power demand and the severity of seasonal peaking capacity requirements. There are utilities in the U.S. and in Canada that are actively using, introducing or trialing such time-of-day pricing and metering programs. SCL’s IRP should make such a strategy a fundamental condition for assessing all of the next twenty years’ incremental and replacement energy resource scenarios.

City Light response: Thank you for this suggestion. City Light intends to continue to evaluate demand side management options, including time of day pricing, for meeting electricity demand in the next IRP process.

PB #2) Co-generation of power and useful heat:
Another major limitation of the current draft Plan is the minimal valuation assessment given to the potential for co-generation systems to supply significant amounts of power and heat – especially to mid-to-large scale commercial and institutional users. Co-gen options are not included as a component of every Resource Scenario – but they should be. Although many co-gen systems are likely to use natural gas; the fact that nearly 80% of the energy potential would be put to 'useful work' should improve the economics of smaller scale systems and reduce the adverse environmental impacts of increased use of that fossil fuel.

City Light response: Thank you for this comment. City light plans to evaluate cogeneration opportunities in more detail for the next IRP process.

PB #3) Geothermal Energy:
The draft IRP only considers a single scenario that would include geothermal power production. Geothermal power systems represent a significant source of base load power that could be supplied by new systems installed in many locations throughout the Pacific Northwest. From reports that I have seen published by the National Renewable Energy Lab (NREL), advances in Rankin cycle and other innovative turbine systems make many geothermal sites price competitive with new fossil fueled power plants. SCL should more aggressively encourage and support new Geothermal Power Producers to meet our future power needs.

City Light response: Thank you for this suggestion. Both of the Preferred Alternatives contain significant amounts of geothermal resources and City Light intends to evaluate opportunities for geothermal energy and other resources as part of the IRP Action Plan.

PB #4) The scope of analysis required for preparing a twenty year energy resource plan is substantial. I recognize that SCL has time and resource constraints that shape the degree of assessment involved in preparing this IRP. I strongly recommend that the current draft plan be enhanced with higher priority attention given to the three main scenarios that I've described above. I would also advise that the IRP's baseline planning and energy cost assumptions be refined and updated on a Quarterly basis to incorporate the evolving conditions of energy resource and technology costs and impending Green House Gas mitigation policies.

From the Public Hearing, written on easel pads:

(PB comments above repeat these comments)
PB #5) Factor time of day pricing for power to commercial, industrial, and large institutions; smart metering and cost of power pricing should provide economic justification for private investment inefficiency upgrades and load management systems.

See response above

PB #6) Such new pricing should also stimulate consideration of on-premises co-generation systems (fueled by natural gas, bio-mass pellets, etc.).

See response above

PB #7) Smaller scale co-gen achieves useful energy efficiencies of power and space or process heat (probably 70+% efficiency vs. 35-40% of nat gas ____ turbines in larger utility sites).

See response above

PB #8) Geothermal power options are probably greater than the 25 MW capacity element included in one scenario (why would not geothermal capacities be part of every scenario?).

See response above

Andy Silber (andyds11@mac.com)
AS #1) Natural Gas assumption overly optimistic

City Light response: Thank you for this comment. City Light will continue to track updates in natural gas price forecasts for use in evaluating contract options and for use in the next IRP process.

AS #2) Front load conservation

City Light response: Thank you for this suggestion. City Light will continue to evaluate its conservation options, and plans to create an updated conservation program that includes information from this IRP and the requirements of Initiative 937.