CHAPTER 7. ENERGY AND NATURAL RESOURCES

7.1. HOW WERE ENERGY AND NATURAL RESOURCES IN THE COMBINED STUDY AREA EVALUATED?

This chapter describes at a programmatic level the types of energy resources used by PSE to generate or provide electrical power to its customers. This chapter describes the regulatory context in which PSE operates, including federal, state, and local government policies and regulations. See Chapter 1 for a discussion of the overall process by which electrical energy is generated, transferred, and delivered.

Energy and Natural Resources Key Findings

None of the alternatives would likely have adverse impacts to energy or natural resources.

Alternative 2 would not substantially change the overall mix of resources used by PSE to deliver power to its customers, but would lead to more local (Eastside) use of resources for power generation, some of which would not be renewable.

7.2. WHAT ARE THE ENERGY DELIVERY POLICIES AND REQUIREMENTS THAT APPLY TO PSE?

There are no federal policies or regulations that govern what types of energy resources PSE should consume. The Energy Independence Act of Washington State affects both the types of resources to be used and the level of conservation to be implemented. PSE operates under the regulatory framework described in Chapter 1 to deliver power to the Eastside.

None of the study area communities (Figure 1-4 in Chapter 1) have control over how PSE uses energy to provide power. However, all of the study area communities have comprehensive plan energy goals or policies that lead them to encourage, facilitate, promote, or participate in actions addressing climate change, sustainability, or energy conservation and efficiency, or reduction of greenhouse gases (which would indirectly lead to changes in types of energy resources used). Examples are as follows:

- **Bellevue Policy UT-70:** Facilitate the conversion to cost-effective and environmentally sensitive alternative technologies and energy sources.
- **Newcastle Policy UT-P6:** The City shall promote conservation measures to reduce the need for additional utility distribution facilities in the future.
- **King County Policy F-311**: King County should encourage its energy utilities to provide energy efficiency services and renewable energy options to all their customers. Additionally, the County should encourage the state and energy utilities to mitigate the environmental and greenhouse gas emissions impacts of energy and, as conservation and alternative energy sources demonstrate capacity to address energy

needs, phase out existing fossil fuel based power plants, especially coal based sources.

- **Issaquah LU Policy F2:** Encourage all development and infrastructure in the public and private sectors which: a. Use less energy and have a lower climate impact, and incorporate into developments, where possible.
- **Redmond Policy FW-10:** Additionally, promote efficient energy performance and use of energy sources that move beyond fossil fuels.

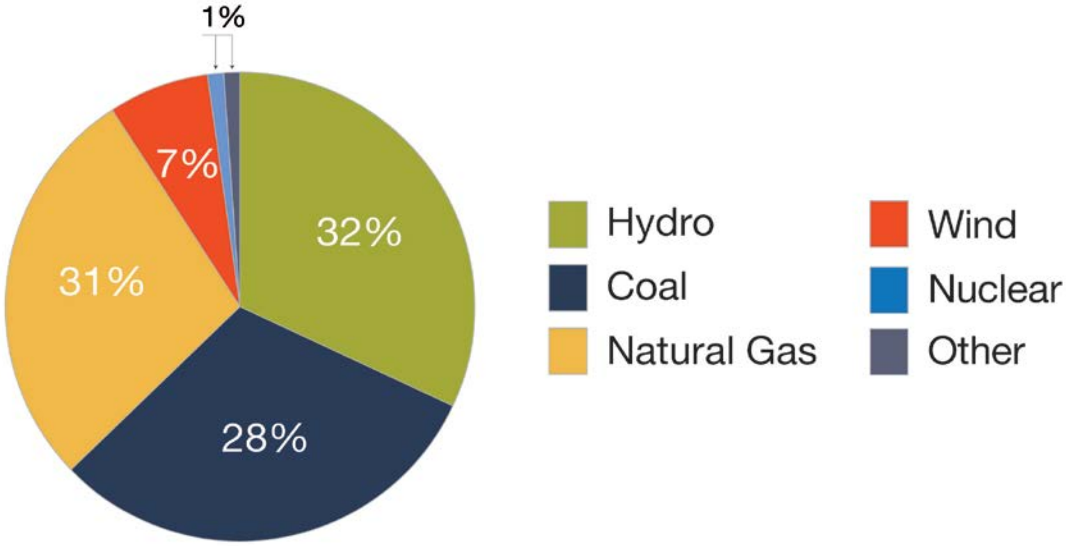
Appendix F lists the currently identified local energy policies.

7.3. WHAT NATURAL RESOURCES ARE USED TO GENERATE THE ELECTRICAL ENERGY PROVIDED BY PSE?

As discussed in Chapter 1, PSE expects peak winter electrical power demand on the Eastside to grow from 619 MW in 2014 to 783 MW in 2024. The power supply to serve this growth in demand derives from a variety of sources.

In 2013, the overall mix of fuels used by PSE to provide all electricity to all of its customers was led by hydropower, followed closely by coal, natural gas, and wind energy. Nuclear and other sources (biomass, landfill gas, petroleum, and waste) each contributed 1 percent or less (Figure 7-1) (PSE, 2015a). Hydropower and wind are considered to be renewable types of resources, as opposed to the finite or nonrenewable resources of coal, nuclear, and natural gas.

Figure 7-1. Energy Sources for PSE Power



Source: PSE, 2015a

The resources used for energy production change over time and PSE updates its projected mix of energy sources in its *Integrated Resource Plan* (IRP) (PSE, 2013) every two years.

PSE's Integrated Resource Plan, which is updated every 2 years, is a plan for meeting forecasted annual peak and energy demand, plus some established reserve margin, through a combination of supply-side and demand-side resources, into the future. The IRP process considers a full range of power sector investments to meet new demand for electricity, not only in new generation sources, but also in transmission, distribution, and demand-side measures such as energy efficiency on an equal basis.

The Energy Independence Act of Washington State requires that PSE must obtain 15 percent of its electricity from new renewable resources by 2020, as well as undertaking cost-effective energy conservation. The Act also requires PSE to report on its progress toward achieving renewable energy goals. PSE stated that it was meeting and exceeding its incremental target for renewable resource use by the end of 2015, using PSE's wind power facilities plus power purchased from independent producers (PSE, 2015b). Although water is considered to be a renewable resource, its uses in meeting the targets of the Act are somewhat restricted. In fact, most new water-driven electric generation may not be used to meet the targets.

7.4. HOW WERE POTENTIAL IMPACTS TO ENERGY AND NATURAL RESOURCES ASSESSED?

The energy analysis considered how construction of the alternatives would likely use energy (in the form of fuel), as well as the natural resources needed for energy production once the project became operational. The analysis also assessed how operation of each alternative would use or conserve energy. Because the Phase 1 Draft EIS is programmatic, and not a project-level analysis, it is not possible to quantify differences among alternatives with regard to energy usage. However, this chapter provides a qualitative comparison to indicate the likely range of impacts among the alternatives. Chapter 4, Greenhouse Gas, evaluates potential greenhouse gas emissions associated with the alternatives, and the range of potential impacts associated with loss of carbon sequestration associated with vegetation removal.

In evaluating construction impacts, the relative amounts of energy likely to be used for each alternative (in the form of fuel used by equipment) was considered, based on information about likely equipment types and construction durations provided by PSE[1]. Information on equipment usage is contained in Appendix B, and information on duration is found in Chapter 2. Combining these pieces of information provided a sense of the relative extent of energy usage that would be likely for construction of each alternative and option.

On the operational side, the analysis considered the types of energy the alternatives would use to operate and how efficient the alternatives would be in providing energy to customers. The specific energy conservation features included with each alternative are described in Chapter 2.

[1] These durations are high-level estimates that would need to be refined for project-specific analysis.

The alternatives were evaluated to determine whether they would be consistent with energy policies of local jurisdictions regarding energy and natural resource conservation.

The magnitude of potential energy impacts during construction is classified as minor, moderate, or significant, which have been defined for this analysis as follows:

Minor – Construction of the project would not likely strain natural resource supplies, but energy used for operation would contribute to a cumulative shortage of supplies of non-renewable natural resources providing energy; however, that shortage would not affect the project over its lifetime or contribute to shortages for other sectors in the foreseeable future.

Moderate –Adequate natural resources would be available to serve the project need, but building and operating the project would use a critical supply of any given resource, possibly leading to energy shortages for other sectors or needs.

Significant –Natural resources and energy would not be available to build, or to operate the project once constructed.

7.5. HOW WOULD CONSTRUCTION OF THE PROJECT AFFECT ENERGY AND NATURAL RESOURCES?

7.5.1 Construction Impacts Considered

Constructing any of the action alternatives would entail use of fuel. Most of the alternatives and options would involve use of fossil fuels to power construction equipment, along with some electrical power. Fuel would likely be used by vehicles in transporting materials or workers to project sites for any of the alternatives.

7.5.2 No Action Alternative

There would be no construction activities; thus, no related energy or natural resource usage associated with construction would occur.

7.5.3 Alternative 1: New Substation and 230 kV Transmission Lines

In general, the construction process may use some electrical power for lighting or other miscellaneous activities, but it would rely primarily on diesel and gasoline fuel, both of which are expected to remain in good supply in the near future. Therefore, negligible impacts to energy and associated natural resources are expected from construction of any of the alternatives.

7.5.3.1. Option A: New Overhead Transmission Lines

Construction of this option would likely use equipment such as auger trucks, dump trucks, cranes, concrete trucks, backhoes, and bulldozers, as described in Appendix B. Most of this equipment would operate on diesel fuel. Construction of this option would take approximately 12 to 18 months. Although Alternative 1, Option A would involve a more varied type of construction equipment as indicated in Appendix B, its relatively short duration would likely result in lower fuel usage than Options B or C. Overall, the likely adverse energy impacts for construction of this option would be negligible considering the current and likely continuing availability of fuel resources.

7.5.3.2. Option B: Existing Seattle City Light 230 kV Transmission Corridor

Alternative 1, Option B would require a complete rebuild of the SCL 230 kV lines, including replacing most of the existing structures (although some structures may be adequate and not require replacement, reducing the amount of construction equipment and materials needed). Construction duration would be slightly longer than Option A, approximately 24 months for overhead lines, with concurrent substation construction, although it could be somewhat less if major structural rebuild is not required. In any event, adverse energy impacts in the form of fuel used for construction would be negligible.

7.5.3.3. Option C: Underground Transmission Lines

As with Alternative 1, Options A and B, the equipment involved for construction under Option C would operate on diesel fuel. Of all the options under Alterative 1, underground transmission line construction would have the longest construction period (approximately 28 months). Construction for the transformer installations under Option C would likely be performed concurrently with the transmission line. Additionally, excavation and removal of soils throughout the construction route would require many more truck trips than the other options. Therefore, energy usage for construction of Option C would likely be the greatest of the Alternative 1 options, but would still result in a negligible to minor adverse impact.

7.5.3.4. Option D: Underwater Transmission Lines

As with the other options, the types of construction equipment likely to be needed for this option would mostly operate on diesel fuel. Eight months would be needed for construction, with underwater work likely occurring simultaneously with work on land. Negligible adverse energy impacts are anticipated.

7.5.4 Alternative 2: Integrated Resource Approach

7.5.4.1. Energy Efficiency Component

Negligible energy would be used for this component, which would not involve substantial infrastructure improvements, changes to maintenance activities, or construction of new or relocated maintenance yards. Vehicles (gasoline or diesel) would be used to reach job sites for home improvements, with hand tools (electric or battery powered) used to change out windows or install appliances, new weatherproofing, etc.

7.5.4.2. Demand Response Component

Energy usage would be the same (or less) as for the energy efficiency component for the same reason: limited physical site improvements. Vehicles would be used to reach job sites and hand tools used to install meters.

7.5.4.3. Distributed Generation Component

Some of the same types of equipment would likely be used to construct this component as would be used for Alternative 1, Option A (backhoes and dump trucks for site grading, delivery trucks, cranes to lift equipment into place). Sites for some of the components could be similar in size to the substations of Option A. Overall, less energy would likely be needed for this component than for Option A due to smaller scale of the work. It is not known exactly how many locations would be involved or the specific sizes of sites. However even assuming a similar construction duration and size of work areas as for Alternative 1, Option A, negligible adverse energy impacts would be expected.

7.5.4.4. Energy Storage Component

The site needed to accommodate this component would be essentially a 6-acre paved lot. Some of the same types of equipment would likely be used to construct this component as would be used for Alternative 1, Option A (backhoes and dump trucks for site grading, delivery trucks, cranes to lift equipment into place). The component would take approximately 6 months to construct. The fuel needed for construction (and potential energy impacts) would likely be less than for Alternative 1, Option A and would constitute a negligible adverse impact.

7.5.4.5. Peak Generation Plant Component

This component would involve installing three 20 MW gas-fired simple-cycle generators, called peak generation plants, at existing substations within the Eastside. Construction of these peak generation plants would be similar to a substation, including trenching to access upgraded natural gas, water, and wastewater utility lines. Construction would occur within or adjacent to existing PSE substations over 12 months with a negligible adverse energy impact, the same as Alternative 1.

7.5.5 Alternative 3: New 115 kV Transmission Lines and Transformers

In building 60 miles of new transmission line, along with substation improvements, Alternative 3 would be the most fuel-intensive of the alternatives. The alternative would be most similar in duration to Alternative 1, Option C, likely taking between 24 and 28 months to construct. The same types of equipment would be used to build this alternative as for Alternative 1 and as with that alternative, the adverse energy impacts would likely be negligible due to easy availability of fuel resources.

7.6. WHAT ARE THE LIKELY IMPACTS TO ENERGY AND NATURAL RESOURCES FROM OPERATION OF THE PROJECT?

7.6.1 Operation Impacts Considered

An increase in the amount of energy needed to operate the project could be considered an adverse impact, if availability of natural resources needed to generate that energy were to become more limited. All alternatives require energy (provided by natural resources) to operate. Depending on the alternative, this could include hydropower, coal, natural gas, wind[2], nuclear, gasoline or diesel fuel, and waste. None of these resources are anticipated to be in short supply in the foreseeable future.

All alternatives would involve consumption of small amounts of energy for operational controls and maintenance. For example, some PSE facilities are lighted (using electrical energy), and PSE vehicles operating on diesel, gas, electricity, or compressed natural gas would visit sites for maintenance or repairs as needed. Heating and cooling equipment is also needed for some facilities. None of these facilities use significant amounts of energy for these purposes.

Relatively greater inefficiencies in operating an alternative might make it less favorable than others, but would not necessarily lead to an adverse energy impact given availability of the resources as discussed above. None of the alternatives include any inherent inefficiencies in providing power, other than minor losses of electricity that occur over distance along high-voltage power lines. Some electricity transported over transmission lines is lost due to resistive heating of the conducting materials and in the transformers. These losses vary based on the amount of electricity transmitted over the line at any given time relative to the size of the line. This loss is likely minimal and would not affect the overall efficiency of energy transmission or the amount of energy that needs to be generated to meet the demand.

An inconsistency with applicable energy policies would likely constitute an adverse impact. All alternatives would likely be consistent (or at least not inconsistent) with the energy conservation policies of study area communities described in Section 7.2. This would be true for Alternatives 1 and 3 due to their inclusion of PSE's ongoing conservation measures, and for Alternative 2 due to its increased reliance on such measures.

7.6.2 No Action Alternative

Negligible adverse energy impacts would occur with this alternative. Under this alternative, with no new infrastructure added, PSE would continue to manage its energy portfolio as described in its *2013 Integrated Resource Plan* (PSE, 2013). Natural resources used to provide energy for the region could shift as described in Section 7.3, but would be expected to continue in good supply for the foreseeable future. Because this alternative would not expand transmission capacity (as PSE indicates is needed), the amount of energy that could be used on the Eastside during peak periods would be somewhat limited. Therefore, the alternative could result in slightly lower overall consumption of electricity than the demand PSE has projected; however, on a broad scale, power generation and use of resources to generate energy would not likely change. Power generated by existing facilities would likely be sold to other utilities if available. This alternative would not change PSE's current conservation program.

The energy used for operation and maintenance of facilities and equipment under this alternative would be primarily fuel for vehicles, lighting, and heating and cooling equipment, the same as currently occurs. Typical vehicles include light- and medium-duty trucks running

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[2]According to the American Wind Energy Association, PSE is the second-largest utility producer of wind power in the United States (PSE, 2015a).

on either diesel fuel or gasoline. PSE's vehicle fleet also includes some hybrid vehicles, as well as some vehicles using compressed natural gas (PSE, 2015c).

7.6.3 Alternative 1: New Substation and 230 kV Transmission Lines

Operation of this alternative would not be expected to lead to additional need for power generation or additional use of resources in power generation. The resources used to generate power would be the same as those discussed in Section 7.3. As noted in that discussion, types and percentage of energy resources used can change over time. Conservation and use of alternative energy would likely be at the same levels as under the No Action Alternative as described in Chapter 2. Alternative 1 would not change PSE's current conservation program and is expected to be consistent with PSE's legally mandated energy delivery requirements.

7.6.3.1. Option A: New Overhead Transmission Lines

This option would involve the same types of energy usage as the No Action Alternative, primarily in the form of fuel for vehicles, lighting, and heating and cooling equipment. Adverse energy impacts from this option would be negligible.

7.6.3.2. Option B: Existing Seattle City Light 230 kV Transmission Corridor

This option would have the same operational characteristics as the No Action Alternative and Alternative 1, Option A. Negligible adverse energy impacts would occur.

7.6.3.3. Option C: Underground Transmission Lines

This option would have the same operational characteristics as the No Action Alternative and Alternative 1, Options A and B, with negligible adverse energy impacts.

7.6.3.4. Option D: Underwater Transmission Lines

This option would have the same operational characteristics as the No Action Alternative and the other options, with negligible adverse energy impacts.

7.6.4 Alternative 2: Integrated Resource Approach

With its energy efficiency and demand response components, Alternative 2 would increase use of conservation on the Eastside. The alternative would also lead to slightly less use of regional energy than the No Action Alternative, or Alternatives 1 or 3. As described in Chapter 2, Alternative 2 could result in a reduction in demand of power provided via PSE's proposed energy sources of approximately 74 MW, assuming the conservation targets described in Chapter 2 were met.

Although Alternative 2 could lead to less demand for regional power on the Eastside during peak periods due to increased conservation measures and local power production, that change in demand is negligible in the overall context of power generation and distribution since the power needed on the Eastside is a small part of the overall system of power that PSE provides. In implementing distributed generation and peak power generation locally, the alternative would lead to a slightly different energy mix than is used for regional power supply.

7.6.4.1. Energy Efficiency Component

Operation of the energy efficiency component would not use energy over and above No Action Alternative levels and should lead to less energy usage overall, with more efficient appliances, better weather proofing, etc. Little fuel would be regularly used by service vehicles to maintain new features (such as new windows or appliances). The measures installed with this component would likely incrementally reduce the usage of regionally produced energy by individual customers, and would have a negligible adverse energy impact.

7.6.4.2. Demand Response Component

This component would have the same operational characteristics with regard to energy usage as the energy efficiency component, contributing to some reduction in regional energy usage by the Eastside, with negligible adverse energy impacts.

7.6.4.3. Distributed Generation Component

As defined for this EIS, the small-scale energy generation facilities that would be constructed around the Eastside could use waste (a renewable energy resources) in anaerobic digesters or would rely on non-renewable resources (fossil fuels in the form of diesel or natural gas), to generate electrical power. Because natural gas and diesel-fueled generators are more readily controlled[3], these were considered the most likely types of new generation facilities for this analysis, possibly increasing overall use of petroleum products in the region incrementally. Natural gas that could be needed for this alternative is expected to remain in good supply for at least the next 100 years, with a strong supply available in the United States (AGA, 2015) and diesel fuel would also be expected to remain available. Ability to use waste products to operate generation facilities would depend in part on location of source material and logistics of transport, but could be considered a practically inexhaustible resource.

The IRP notes that expanded use of natural gas across the region could strain its gas infrastructure, and that ensuring sufficient gas supply regionally could require expansion of the Northwest's gas transmission pipeline system and more underground gas storage capacity. The IRP also notes that another option for natural gas distribution could involve PSE development of a liquefied natural gas facility to help meet customer peak demands and serve marine and road transportation powered with natural gas.

Although the component would not substantially affect large-scale use of energy resources for power production, this local generation activity would incrementally reduce the usage of regionally produced energy by individual customers. This component of Alternative 2 could also lead to an incrementally greater use of non-renewable energy sources, with fossil fuels as an energy source relied upon for some of the facilities; however, since those energy sources are in good supply, the component would have a negligible adverse energy impact.

7.6.4.4. Energy Storage Component

Operation of a battery storage facility would be similar to that of a small office building, with worker vehicle trips and vendor trips to perform periodic replacement of degraded cells. Such

[3] See Chapter 2 for a discussion of the reliability of the Alternative 2 components for energy production.

trips would be infrequent and not use appreciable amounts of fuel. Operation of this component would have negligible adverse impacts.

7.6.4.5. Peak Generation Plant Component

This component would involve operation of three peak generation plants at existing substations within the Eastside, likely simple-cycle gas-fired generators fueled by natural gas. The plants would be operated to provide power at peak demand times to reduce the demands on the transmission system, but could be used more regularly to provide power once installed. These plants would also need to be operated for maintenance purposes at least monthly (typically permitted for weekly operation of an hour, or 50 hours per year).

As described for the distributed generation component, natural gas is expected to remain in good supply for the foreseeable future, although distribution infrastructure may need to be upgraded to deliver fuel supplies. Some worker vehicle trips (using gasoline or diesel fuel) would also be needed to perform periodic maintenance.

The component could incrementally reduce the usage of regionally produced energy. Operating this type of facility would lead to incrementally greater use of non-renewable energy sources, with fossil fuels as the energy source. Even so, the component would be anticipated to have a negligible adverse energy impact since fossil fuel supplies (natural gas in this case) are expected to be adequate.

7.6.5 Alternative 3: New 115 kV Transmission Lines and Transformers

Potential operational impacts of this alternative would be the same as those identified for Alternative 1, with some maintenance-related vehicle trips needed to service the 115 kV powerlines and substations over time. Such trips would be infrequent and not result in appreciable energy usage. Operation of the substation components would also have similar characteristics as Alternative 1 and would not be expected to lead to additional need for power generation or additional use of resources in power generation, and the resources used to generate power would be the same as those discussed in Section 7.3. Conservation and use of alternative energy would be at the same levels as under the No Action Alternative and Alternative 1 and this alternative would not change PSE's current conservation program. Negligible adverse energy impacts would result from operating Alternative 3.

7.7. WHAT MITIGATION MEASURES ARE AVAILABLE FOR POTENTIAL IMPACTS TO ENERGY AND NATURAL RESOURCES?

With no negative impacts to energy and natural resources expected with any alternative, no mitigation measures would be warranted.

7.8. ARE THERE ANY CUMULATIVE IMPACTS TO ENERGY AND NATURAL RESOURCES AND CAN THEY BE MITIGATED?

No cumulative adverse impacts to energy and natural resources are anticipated from any of the alternatives, including the No Action Alternative. None of the alternatives are expected to substantially change the regional use or mix of natural resources that would be used to generate electrical power or affect availability of energy resources for usage by others. PSE is required to comply with state mandates regarding use of renewable resources and conservation. Implementing this project would not postpone any of those conservation measures. Alternative 2 would accelerate and expand energy efficiency and demand response measures, which would reduce peak demand and also potentially reduce demand throughout the year. However, it is unclear whether Alternative 2 would establish a long-term trend toward more localized and independent power generation that might have implications for reliable power supply to the community in the future.

7.9. ARE THERE ANY SIGNIFICANT UNAVOIDABLE ADVERSE IMPACTS TO ENERGY AND NATURAL RESOURCES?

No significant adverse impacts to energy or natural resources are expected from any of the alternatives.