3.5 ENERGY AND NATURAL RESOURCES

This section characterizes existing energy and natural resources available at the project site and in the project area, and describes the project's demand for energy and nonrenewable resources. Potential impacts on these resources are discussed, and mitigation measures are identified. The analysis in this section is primarily based on information provided by the Applicant in the ASC (Sagebrush Power Partners LLC 2003a, Section 3.5). Additional information used to evaluate the potential impacts has been referenced.

3.5.1 Affected Environment

Proposed Action

Energy Resources and Infrastructure

The primary existing energy resources in the project vicinity are electrical transmission lines that traverse the project site. Figure 2-1 presents the existing electrical infrastructure in the project vicinity.

Project Area Electricity

PSE and Kittitas County Public Utility District (PUD) No. 1 provide electrical services within the county, except for within the City of Ellensburg, which provides electrical service within its boundaries. The sources of this power are primarily the Columbia River hydroelectric facilities such as Wanapum Dam operated by the Grant County PUD and the Bonneville Power Administration (Kittitas County 2002a).

Several high-voltage transmission lines traverse the project site (see Figure 2-1) Five sets of Bonneville electrical transmission lines run east to west across the project site, divided into one group of four near the middle of the site and one to the north. One set of PSE electrical transmission lines runs east to west just north of the southern set of Bonneville lines.

- The Applicant has submitted requests for transmission interconnection services for the project to both PSE and Bonneville (Bonneville 2003);
- If connected to PSE's system, the project would interconnect directly with PSE's Rocky Reach to White River 230-kV line;
- If connected to Bonneville's system, the project would interconnect directly with either the Grand Coulee to Olympia 287-kV line or the Columbia to Covington 287-kV line.

Northwest Region Electricity

Regional Demand

Based on data published by the NWPCC, electricity demand for its four-state Pacific Northwest planning region (Washington, Oregon, Idaho, and Montana) was 20,080 average megawatts in 2000 (NWPCC 2003).

As shown in Table 3.5-1, the NWPCC's recently revised 20-year demand forecast shows that electricity demand in the region will grow from 20,080 average megawatts in 2000 to 25,423 average megawatts by 2025 (medium forecast), an average annual growth rate of just less than 1% per year. While the NWPCC's forecast indicates that the most likely range of demand growth (between the medium-low and medium-high forecasts) is between 0.4 and 1.50% per year, the low to high forecast range used by the NWPCC recognizes that growth as low as -0.5% per year or as high as 2.4% per year is possible although relatively unlikely (NWPCC 2003).

Table 3.5-1: Projected Pacific Northwest Electricity Demand, 2000-2025

Forecast Scenario	Electricity Demand (Average Megawatts)			Growth Rates (Percentage of Change)	
	2000	2015	2025	2000-2015	2000-2025
Low	20,080	17,489	17,822	-0.92	-0.48
Medium Low	20,080	19,942	21,934	-0.05	0.35
Medium	20,080	22,105	25,423	0.64	0.95
Medium High	20,080	24,200	29,138	1.25	1.50
High	20,080	27,687	35,897	2.16	2.35

Source: NWPCC 2003.

Bonneville Transmission System

Bonneville owns and operates 15,000 miles of power lines that carry power from the dams and other power plants to utility customers throughout the Pacific Northwest. The Bonneville service area includes Oregon, Washington, Idaho, Western Montana, and small portions of Wyoming, Nevada, Utah, California, and Eastern Montana.

Generation resources typically require interconnection with a high-voltage electrical transmission system for delivery to purchasing retail utilities. Bonneville owns and operates the Federal Columbia River Transmission System (FCRTS), which comprises more than three-fourths of the high-voltage transmission grid in the Pacific Northwest, and extra regional transmission facilities. Bonneville operates the FCRTS in part to integrate and transmit "electric power from existing or additional Federal or non-Federal generating units." Interconnection with the FCRTS is essential to deliver power from many generation facilities to loads both within and outside the Pacific Northwest.

Public agencies get preference to power from Bonneville. About half the power Bonneville sells goes to Northwest public utility districts, city light departments, and rural electric cooperatives. An additional 15% of Bonneville's annual sales is to investor-owned utilities. Sales to Northwest aluminum companies and a few other large industries account for about one-fourth of Bonneville's annual revenues. After Northwest customers are served, Bonneville sells any surplus power to utilities outside the region.

Bonneville has indicated that portions of the Northwest transmission system are approaching gridlock, resulting in chronic congestion on a number of critical transmission paths, which has curtailed firm power deliveries. One effect of these constraints is that they limit wholesale power

trading, which in turn drives up prices for all consumers in the West. As of 2001, approximately 1,000 MW of generation projects under construction had contracted for transferring power over the Bonneville system. An additional 3,000 MW of new generation was proposed by 2004, and developers for nearly 30,000 MW of generation have requested interconnection. While many of the proposed generation projects would not be built, Bonneville has determined that a transmission capacity shortfall of approximately 3,000 MW would occur by 2004 (Bonneville 2001).

Puget Sound Energy Transmission System

PSE is a private company whose electricity services are regulated by the Washington Utilities and Transportation Commission. PSE operates and maintains an extensive electric system consisting of generating plants, transmission lines, substations, and distribution equipment. PSE operates approximately 303 substations, 2,901 miles of transmission, 10,523 miles of overhead distribution, and 8,224 miles of underground distribution lines to serve 958,000 electric customers within a nine-county, 4,500-square-mile service territory in the Puget Sound region.

There are several congestion points in PSE's electrical transmission system. PSE's transmission system, along with the regional high voltage transmission system, is undergoing fundamental restructuring mandated in large part by three different Federal Energy Regulatory Commission (FERC) initiatives – Order 888 and 889, Order 2000, and the Standard Market Design Notice of Proposed Rulemaking.

Released in May 1996, FERC's first initiative, Orders 888 and 889, required all public utilities, including PSE, to file open access transmission tariffs that would make utilities' electric transmission systems available to wholesale sellers and buyers on a nondiscriminatory basis. PSE complied with Orders 888 and 889, and gained FERC approval of its open access transmission tariff.

On December 20, 1999, FERC issued Order 2000 to encourage transmission-owning utilities, such as PSE, to turn operational control of their high voltage power lines over to independent entities called Regional Transmission Organizations (RTOs), while still maintaining ownership of their power-grid assets and receiving revenues from their use. RTOs are intended to provide centralized, unbiased operation of the power grid to promote economic and engineering efficiencies. This regulation required each FERC jurisdictional public utility that owns, operates, or controls facilities for the transmission of electric energy in interstate commerce to file plans for forming and participating in an RTO to FERC by October 15, 2000. In November 2000, PSE and nine other utilities filed the Stage 1 document for the formation of RTO West and received conditional approval to proceed with the development of an RTO. Since the initial filing, a Stage 2 filing has been made with discussions under way on a Stage 3 filing. The filing utilities anticipate several more months of discussion before a more fully developed proposal for RTO West would be filed for FERC approval. Thereafter, the respective company boards would have to decide to proceed and seek state regulatory approvals. Depending on regional support, RTO West could be operational as early as the beginning of 2006 (PSE 2003a).

Planned Generation Projects

In April 2003, 39 new merchant power generation projects were proposed in the state of Washington, representing more than 10,000 MW of additional generation capacity. Since that time, a number of large thermal projects have either been suspended or terminated. Tables 3.5-2, -3 and -4 summarize energy projects that are respectively proposed, under construction, or in operation in Washington State.

Table 3.5-2: Generation Projects Proposed in Washington 2003-2006

Facility	Developer	Facility Type	Size (MW)
BP Cherry Point Refinery[1]	BP Cherry Point Refinery	Combined Cycle/Cogeneration	Phase I: 520-570
Columbia Wind Ranch	Cielo Wind Power	Wind	80
Desert Claim[2]	Desert Claim Wind Power LLC	Wind	180
Goodnoe Hills East & West	Windtricity Ventures LLC	Wind	125
Kittitas Valley	Sagebrush Power Partners LLC (Horizon Wind)	Wind	195
Morgan Stanley, Frederickson	Morgan Stanley Capital Group, Inc.	Combustion Turbine	324
Plymouth Generating Facility	Plymouth Energy LLC	Combined Cycle	306
Reardan Twin Buttes	Energy Northwest	Wind	50
Stateline Wind Project (Wash) Phase III	FPL Energy, Inc.	Wind	200
Sumner (PG&E)	PG&E Dispersed Generating Co.,	Combustion Turbine	87
Underwood	PacifiCorp Power Marketing, Inc.	Wind	70
Waitsburg	SeaWest Energy Group, Inc.	Wind	100
White Creek Phase I and II (former Roosevelt)	Last Mile Electric Cooperative	Wind	200

Sources: PSE 2003a; Makarow, pers. comm., 2003; American Wind Energy Association 2003; Northwest Power Planning Council 2003; Washington State University Cooperative Extension Energy Program 2003; Tri-City Herald 2003; Northwest Energy Coalition 2003; Becker, pers. comm., 2003; Northwest Power and Conservation Council 2006; and Renewable Northwest Project 2006.

Notes: This project list represents an inventory of projects around the state in various stages of development, but is not intended to be all-inclusive.

The following projects have been either suspended or terminated since 2003: Cowlitz Cogeneration (natural gas combined cycle, 405 MW); Starbuck Power Project (natural gas combined cycle, 1300 MW); Sumas Energy 2 (natural gas combined cycle, 660 MW); Wallula Power Project (natural gas combined cycle, 1300 MW); Everett Delta 1 and 2 (natural gas combined cycle, 248 MW each); Frederickson 2 (natural gas combined cycle, 280 MW); Horse Heaven (wind, 150 MW); Longview Power (natural gas combined cycle, 290 MW); Maiden Wind (wind, 150 MW); Longview – Mint Farm (natural gas combined cycle, 286 MW); Goldendale – The Cliffs (natural gas combined cycle, 190 MW); Tahoma Energy (natural gas combined cycle, 270 MW).

1 Project phasing approved October 2006; construction expected to begin early 2007.

2 Application submitted to EFSEC November 2006.

Table 3.5-3: Washington Generation Facilities Constructed 2002-2006

Facility	Developer	Facility Type	Size (MW)	On-Line Date
Big Horn	PacifiCorp Power Marketing, Inc.	Wind	200	Summer 2006
Big Hanaford	TransAlta Energy Corp.	Combined Cycle	248	8/13/2002
Chehalis Power	Tractebel Power, Inc.	Combined Cycle	520	Qtr. 3/2003
Frederickson Power	Frederickson Power (EPCOR)	Combined Cycle	248	8/19/2002
Goldendale	Calpine Corp.	Combined Cycle	237	9/1/2004
Hopkins Ridge	Puget Sound Energy	Wind	150	12/1/2005
Nine Canyon Wind Project I & II	Energy Northwest	Wind	66	9/25/2003
Wild Horse Wind Power	PSE	Wind	165	12/22/2006

Source: Northwest Power and Conservation Council 2006; and Renewable Northwest Project 2006.

Table 3.5-4: Washington Generation Facilities Currently Under Construction

Facility	Developer	Facility Type	Size (MW)	On-Line Date
Coyote Springs 2	Avista	Combined Cycle	260	Qtr. 3/2003
Marengo	Pacificorp	Wind	140	
Nine Canyon Expansion	Energy Northwest	Wind	15	Qtr. 4/2003
Grays Harbor Energy (Satsop CT) Project	Grays Harbor Energy	Combined Cycle	650	Construction Suspended

Sources: PSE 2003a; King County 2003; Northwest Power Planning Council 2003; Northwest Power and Conservation Council 2006; and Renewable Northwest Project 2006.

Petroleum Products

Petroleum products, including vehicle and equipment gasoline and diesel fuels, and machinery lubricants are available and would be purchased from numerous commercial outlets in the project vicinity.

Other Nonrenewable Resources

Nonrenewable resources in the project vicinity are primarily gravel extracted from local sources and used locally. Primary consumption of these resources is related to construction projects (sand, gravel, and other mineral resources as used in steel, aluminum, concrete, and other building products). Washington State is ranked seventh in the nation in annual tonnage of extracted sand and gravel. Several gravel pits and quarries are located near the project site, including one just north of proposed turbine F1 off US 97.

Renewable Resources

Renewable resources are materials that can be regenerated, such as wood, other fibers, wind, and sunlight. The primary renewable resource in the project area is wind. The project site sustains a strong wind energy resource that is primarily thermally driven. Warm air rises over the desert-like area east of Ellensburg, and cooler air in the Cascades west of Cle Elum near Snoqualmie Pass is drawn through the Kittitas Valley over the project site in a chimney effect. The rapidly moving cooler air mass is accelerated by the project's ridgelines. The expected 100-year peak wind gust in the Ellensburg area is 73 mph (Wantz and Sinclair 1981). In the 3.5 years that wind data have been collected at the project site, no extreme wind gusts in excess of 73 mph have been recorded.

All markets for wind turbines require an estimate of how much wind energy is available at potential development sites. To provide this information, National Renewable Energy Laboratory (NREL) researchers for the U.S. Department of Energy have been assembling data sets and refining modeling techniques for three decades. In 1981, the program published the *Wind Energy Resource Atlas of the United States*, which was updated in 1987. This wind atlas estimates wind energy resources for the U.S. and its territories, and indicates general areas where a high wind resource may exist.

Areas potentially suitable for wind energy applications are dispersed throughout much of the U.S. Estimates of the wind resource in this atlas are expressed in wind power classes ranging from Class 1 to class 7, with each class representing a range of mean wind power density or equivalent mean speed at specified heights above the ground. Areas designated Class 4 or greater are suitable with advanced wind turbine technology under development today. Exposed areas with a moderate to high wind resource are dispersed throughout much of the contiguous United States. Most of the southeast U.S. and portions of the southwest are not suitable for wind power development.

The Pacific Northwest National Laboratory (formerly known as the Pacific Northwest Laboratory) of the Department of Energy has published estimates of the wind power resource available in the U.S. The laboratory estimates that 9% of the lower 48 states has "good" (Class 4) or "excellent" (greater than Class 4) wind resources. This is reduced to 6% of U.S. land once protected areas, urban areas, wetlands, and other unavailable areas are excluded. While this area does not represent a large percentage of U.S. land, it has the potential to meet more than 1.5 times the present (2003) U.S. power consumption (World Resource Institute 2003).

Compared with other states, Washington is ranked in the bottom tier in terms of wind energy potential (Pacific Northwest Laboratory 1991a). However, the state still has wind potential, as documented in the following studies:

- In the early 1990s, the Pacific Northwest Laboratory estimated that the state could generate 3,700 average megawatts (aMW) of electricity from wind—more than one-third the total amount of electricity the state generated in 1998 (Pacific Northwest Laboratory 1991b).
- NREL made more conservative estimates, measuring wind potential only in areas of the state that met stricter wind classifications and that were located within 10 miles of existing

transmission lines. Under these criteria, NREL estimated Washington could generate 3,400 aMW of electricity from wind (NREL 1994).

- In 2002, four research organizations published a survey of renewable resources in 11 Western states called the *Renewable Energy Atlas of the West*. This study found 7,000 aMW of wind potential in Washington. The study used higher resolution data and considered taller and more advanced turbines than those used for the earlier analyses (Land and Water Fund of the Rockies et al. 2002).
- In a 2002 report contracted by the Northwest Energy Coalition, the Tellus Institute identified 1,900 aMW of wind energy potential in Washington looking only at the windiest and most developable locations (Tellus Institute 2002).

An area of good wind energy potential in the state that currently supports wind power projects is the Columbia River corridor along the Oregon-Washington border. The Columbia River gorge provides a low-elevation connection between continental air masses in the interior of the Columbia Basin east of the Cascade Range and the maritime air of the Pacific Coast. Especially strong pressure gradients develop along the Cascades and force the air to flow rapidly eastward or westward through the gorge. Existing wind developments in this area include the 48-MW Nine Canyon Wind Farm in Benton County and the 300-MW Stateline Wind Project in Walla Walla County.

As described above, the Ellensburg corridor in central Washington, where the KVWPP and other wind power projects are proposed (see Section 3.14, Cumulative Impacts), also sustains a strong wind energy resource. Data from several sites throughout the central Washington corridor indicate that exposed areas have a Class 4 to 5 annual average wind resource with a Class 6 resource during the spring and summer seasons (Pacific Northwest Laboratory 1987).

Pacific Northwest Markets for Renewable Energy Resources

Markets for renewable or "green" energy are growing in the Pacific Northwest. RCW 19.29A, Implementation of Retail Option to Purchase Qualified Alternative Power, signed into law in 2001, directed 16 of Washington's electric utilities to offer a voluntary "qualified alternative energy product" (essentially an electricity product powered by green resources) starting January 2002. The law defined a qualified alternative energy resource as electricity fueled by wind, solar energy, geothermal energy, landfill gas, wave or tidal action, gas produced during the treatment of wastewater, qualified hydropower, or biomass. The statute calls for the utilities to report annually on the progress of these voluntary green power programs to the Washington Department of Community, Trade, and Economic Development (CTED) and the Washington Utilities and Transportation Commission (WUTC). In lieu of reports, agency staff surveyed the utilities in October 2002. The survey produced the following key findings (CTED and WUTC 2002):

- Each of the 16 utilities has a green power electricity product to offer its customers, and 14 of the 16 utilities have implemented voluntary green power programs. The two remaining utilities have secured wind power from a new facility and were initiating their programs after agency staff completed this survey.
- Utilities regularly advertised the green power programs to their customers.

- A total of 1.4 aMW (12.4 million kilowatt-hours) of green power was sold during the first nine months of 2002 to participants in these voluntary programs.
- Wind power represented the vast majority of the green power sales in this year's program (approximately 90%). The remaining resources were landfill gas, hydropower, and solar.
- The resources in the green power programs either have zero carbon dioxide emissions or, in the case of landfill-gas-fueled power, release only 5% of the carbon dioxide that would have been released if the landfill methane gases were emitted directly into the atmosphere.
- Nearly all of the public utilities participating in the survey, as well as seven smaller public utilities that do not offer green power programs to their customers, have added renewable resources to their utility system mix above and beyond that required by the green power option.
- A total of 118 aMWs (1 billion kilowatt-hours) of electricity fueled by wind, landfill gases, and biomass were included in the system fuel mix reports by electric utilities in Washington in 2001.

The results of this survey demonstrate that local and regional markets for green power have been increasing. In particular, there has been a proliferation of requests from Pacific Northwest electric utilities to purchase wind power. Several electric utilities have recently issued RFPs to acquire wind power, including those summarized below:

Puget Sound Energy

In November 2003, PSE issued a RFP to acquire approximately 150 MW of capacity from wind power for its electric resource portfolio. The RFP is the first step toward achieving the utility's goal of establishing renewable energy as a 10% share of its electric supply mix by 2013 (PSE 2003b). In October 2005 PSE purchased the Wild Horse Wind Power Project in Kittitas County. PSE also estimated that by 2008 it would need power sources that could generate 350 MW more power to serve its growing numbers of users (Duryee 2004).

Avista Corporation

Avista Corporation's 2003 Integrated Resource Plan (IRP) includes wind within its acquisition strategy beginning in the 2008-2010 time frame. The IRP includes an action item for Avista to investigate wind integration issues. In support of an integration issues study, Avista is interested in purchasing between 25 MW and 50 MW of installed nameplate wind-generating capability over a term of between two and five years, and in August 2003 Avista issued an RFP soliciting proposals for wind energy (Avista Utilities 2003).

Portland General Electric

On June 18, 2003, Portland General Electric (PGE) released an RFP to prospective bidders who could meet the company's future power supply needs. The RFP process is part of the company's 2002 IRP, which forecasts PGE's future energy needs and identifies low-cost supply strategies that enable the company to fulfill them (Portland General Electric 2003). In response to the RFP, PGE received more than 90 offers to supply energy. Of the proposals, it was estimated that 20% of the projects are for renewable energy, and by far the greatest numbers of those are wind generation (The Business Journal Portland 2003). According to PGE's Proposed Action Plan for

its Integrated Resources Plan, one of the new mid- to long-term resource actions is to acquire up to 65 aMW (195 MW) of wind generation (Portland General Electric 2004).

PacifiCorp

In December 2003, PacifiCorp (doing business as Pacific Power in Washington) issued a request for proposals from third parties to fulfill a portion of the supply-side resource need identified its January 2003 IRP. The IRP concluded that adding 1,400 MW of renewables over the next 10 years was cost-effective for PacifiCorp's system. The RFP solicited proposals from companies to provide up to 1,100 MW of renewable resources, including wind (PacifiCorp 2003).

Offsite Alternatives

Alternative 1: Swauk Valley Ranch

Electrical services in the project vicinity are provided by PSE, Kittitas County PUD No. 1, and the City of Ellensburg. Sources of this power are primarily Columbia River hydroelectric facilities operated by the Grant County PUD and Bonneville. Five sets of Bonneville and one set of PSE electrical transmission lines run east-west across this project site.

Petroleum products, including vehicle and equipment gasoline and diesel fuels, and machinery lubricants are available for purchase from numerous commercial outlets in the project vicinity. Other nonrenewable resources in the project vicinity are primarily gravel extracted from local sources and used locally. The primary renewable resource in the project area is wind.

Alternative 2: Springwood Ranch

As noted above, several systems for transmission of electrical power are available in Kittitas County. However, the closest location for interconnection for the Springwood ranch is the BP transmission line, located 5 miles away. Interconnection of a project at Springwood Ranch would therefore require construction of a 5 mile feeder line.

Petroleum products, including vehicle and equipment gasoline and diesel fuels, and machinery lubricants are available for purchase from numerous commercial outlets in the project vicinity. Other nonrenewable resources in the project vicinity are primarily gravel extracted from local sources and used locally. The primary renewable resource in the project area is wind.

3.5.2 Impacts

Proposed Action

This section describes impacts on energy and natural resources under the proposed action. Direct impacts would result from use of energy and natural resources such as fuel, water, and electricity to construct, operate and maintain, and decommission the project. Direct impacts associated with or attributable to specific project elements such as the proposed turbine towers, O&M facility, and substations are discussed, where applicable. Indirect impacts on energy and natural resources are not anticipated because the project is not expected to substantially induce regional growth to

the extent that would result in significant changes to offsite energy and fuel consumption. Table 3.5-5 summarizes potential energy and natural resource requirements under the two proposed action scenarios. Potential water resource impacts are evaluated in more detail in Section 3.3, Water Resources.

Table 3.5-5: Summary of Potential Energy and Natural Resources Requirements of the Proposed Action

	330-foot Turbine Scenario	410-foot Turbine Scenario
Construction Impacts		
Increased demand for electricity	Electricity provided by portable generators	Electricity provided by portable generators
Increased demand for petroleum products	25,000 gallons (diesel and gasoline) for mobile construction equipment	25,000 gallons (diesel and gasoline) for mobile construction equipment
Increased demand for water	5 million gallons for dust control, compaction, wetting concrete	6.4 million gallons for dust control, compaction, wetting concrete[1]
	2 million gallons with dust palliative	2.6 million gallons with dust palliative[1]
Increased demand for steel	7,540 tons for turbine towers	7,540 tons for turbine towers
	1,105 tons for tower foundation reinforcement	1,105 tons for tower foundation reinforcement
Increased demand for gravel (aggregate)	94,805 cubic yards for roads[1]	94,805 cubic yards for roads
	7,222 cubic yards for turbines and crane pads	7,222 cubic yards for turbines and crane pads
	27,415 cubic yards for substation and O&M facilities	27,415 cubic yards for substation and O&M facilities
Increased demand for concrete	25,000 cubic yards for turbine foundations	25,000 cubic yards for turbine foundations
Operations and Maintenance Impacts		
Increased demand for electricity	800 MWh/year	800 MWh/year
Increased demand for petroleum products	8,500 gallons annually for O&M facility vehicles	Same as the 330-foot Turbine
Increased demand for water	<1,000 gallons daily at O&M facility	Same as the 330-foot Turbine
Increased demand for lubricating oils, hydraulic fluids, and mineral oil	50 gallons/turbine of glycol-water mix	Slightly more than the 330-foot Turbine
	85 gallons/turbine of hydraulic oil	
	105 gallons/turbine of lubricating oil	
	500 gallons/pad-mounted transformer of mineral oil	
	12,000 gallons/substation transformer of mineral oil	
Decommissioning Impacts		
	Similar to those described above for construction	Similar to those described above for construction

Sources: Sagebrush Power Partners LLC 2003a, 2003f; Brown 2006.

1 For turbines larger than 1.5 MW, roads may be wider (approx. 34 feet wide) to accommodate larger cranes and would require more water for compaction and dust control.

Construction Impacts

Energy Resources

The proposed wind turbines and associated facilities, including access roads and underground and overhead collection infrastructure, would be constructed using materials that require energy for their production. Energy would also be required to transport these materials to the project site and to operate construction equipment such as cranes, trucks, tools, and vehicles. Energy consumption is predominantly in the form of gasoline, diesel fuel, and electricity.

Electricity. Substantial amounts of electricity are not required during project construction. Portable generators would produce the electricity required for construction activities. The level of electrical energy consumption required during project construction would not significantly affect locally available energy resources.

Petroleum Products. Fuel consumption during construction would be approximately 25,000 gallons (diesel and gasoline) for mobile construction equipment, construction vehicles, and generators for the three proposed action scenarios. Petroleum fuel for construction equipment would be supplied by existing licensed fuel distributors or local gas stations in nearby communities (Ellensburg or Cle Elum). The EPC contractor would use fuel trucks to refuel construction vehicles and equipment onsite; no fuel tanks would be used or stored at the project site. The level of petroleum products consumed during project construction would not significantly affect locally available resources.

Other Nonrenewable Resources

As identified in Table 3.5-5, nonrenewable resources used to construct the KVWPP would include fuel (diesel and gasoline, discussed above), water, steel, concrete, and gravel (aggregate). Approximately five million gallons of water would be consumed for dust suppression and other construction purposes under the 330-foot turbine scenario, while an estimated 6.4 millions gallons of water would be required under the 410-foot turbine scenario because of the larger roadway footprint. However, if lignin (a non-toxic, non-hazardous compound derived from trees) or another dust palliative is used, it is anticipated that between 2 and 2.6 million gallons of water would be required. Water would be delivered to the project site by water trucks and obtained from a local source with a valid water right.

Approximately 8650 tons of steel would be required to construct the turbines and towers. Approximately 25,000 cubic yards of concrete would be required to build roads, crane pads, and turbine foundations. Concrete would be purchased from existing suppliers near the project site. Approximately 129,442 cubic yards of gravel (aggregate) would be required to construct roads, turbine and crane pads, and other project facilities such as the O&M facility, substations, turn-around areas, and meteorological towers. Aggregate would be obtained from existing, permitted local quarries. Several gravel pits and quarries are located near the project site in Kittitas County. For example, there is an existing permitted quarry north of proposed turbine F1. The EPC contractor would make the final decision regarding the source of these materials.

The impacts on nonrenewable resources under the proposed action scenarios would not vary significantly depending on the size of turbine constructed. Larger access roads (likely required for turbines greater than 1.5 MW) would require more water for dust control and gravel for road construction. The project's nonrenewable resource requirements during construction would not significantly affect local supply.

Operations and Maintenance Impacts

Energy Resources

Electricity. The project would generate energy using the kinetic energy in wind. That energy would be transformed by the wind turbine generators into electricity. Depending on the make and model of wind turbine generator selected, the KVWPP would be rated for 97 to 195 MW. MW hours (MWh) are derived by multiplying the project's capacity factor (0.3333) by its nameplate capacity (97.5 to 195 MW) and the number of hours in one year (4,760 hours). Therefore, the project would generate between 154,685 and 309,369 MWh of electricity annually and would increase the availability of renewable energy in the Pacific Northwest, a beneficial effect.

On an annual basis, the project (regardless of the size of turbine selected) is expected to consume less than 1% of the electricity it generates to support auxiliary systems at the wind turbines such as hydraulic systems, pumps, heaters, fans, controller electronics, and lighting. The projected increased demand for electricity would be approximately 800 MWh per year (see Table 3.5-5).

The project would not consume a large amount of power for startup. Each wind turbine would be activated randomly depending on the local wind speed at each turbine location. Power consumption would generally result from auxiliary systems at each turbine. The transformers and auxiliary systems at the substation would also consume a small amount of power to stay energized. Electricity for project operations would mostly be generated by the project itself. During periods when the wind turbines are not generating electricity, power would be purchased from the regional utility.

Petroleum Products. Expected fuel consumption under all three proposed action scenarios is estimated to be 8,500 gallons per year to operate O&M facility vehicles. Fuel would be purchased from local gas stations. The level of energy consumption required during project operation would not significantly affect locally available energy resources and would be beneficial to the region by generating an additional source of energy.

Other Nonrenewable Resources

As shown in Table 3.5-5, the project would consume nonrenewable natural resources including fuel and electricity (described above), water, and lubricating oils, greases, and hydraulic fluids. As described in Section 3.3, Water Resources, a new water well would be installed to provide a nominal water supply to the O&M facility. This well, which would provide water for bathroom and kitchen use and for general maintenance purposes, is expected to consume less than 1,000 gallon per day.

The estimated amounts of lubricating oils, hydraulic fluids, and mineral oils required for project operation are presented in Table 3.5-5; the amounts would be the same because of the number of turbines is limited to 65, regardless of the size of turbine chosen. Lubricating oils and hydraulic fluids used to operate project equipment and to maintain the wind turbine generators would be purchased from distributors of such materials. The final selection of these distributors would depend on the specific turbine model chosen for the project. The estimated quantities of fuel and other nonrenewable resources required for project operation and maintenance activities would not affect the availability of these resources locally or regionally.

Decommissioning Impacts

Impacts attributable to energy consumption during project decommissioning would be similar to those described for the construction phase of the project. Energy consumption, predominantly in the form of gasoline, diesel fuel, and electricity, would be required to operate equipment such as cranes, trucks, tools, and vehicles used to dismantle and remove most project facilities and reclaim disturbed areas. Demolition or removal of equipment and facilities would occur, to the extent necessary, to salvage economically recoverable materials such as steel towers.

Offsite Alternatives

Alternative 1: Swauk Valley Ranch

Specific data for energy and natural resource use are not available for this alternative, however the types of resources used would be similar to those used in the Kittitas Valley alternative, since it is also a wind power plant construction project. Based on estimated construction of 42 turbines under this alternative, use of natural resources for construction, operations, and maintenance is expected to be less than the Kittitas Valley proposal and similar to the Springwood Ranch alternative. The project would generate 21 aMW of electricity annually and would increase the availability of renewable energy in the Pacific Northwest.

Alternative 2: Springwood Ranch

Specific data for energy and natural resource use are not available for this alternative, however the types of resources used would be similar to those used in the Kittitas Valley alternative, since it is also a wind power plant construction project. Based on construction of 40 to 45 turbines under this alternative, use of natural resources for construction, operations, and maintenance is expected to be less than the Kittitas Valley proposal. The project would generate 20 to 25 aMW of electricity annually and would increase the availability of renewable energy in the Pacific Northwest.

No Action Alternative

Under the No Action Alternative, the project would not be constructed or operated. However, development by others and of a different nature, including residential development, could occur at the project site in accordance with the County's existing Comprehensive Plan and zoning regulations. Depending on the location, type, and magnitude of future development at the project

site, impacts on energy and natural resources could be similar to or even greater than the proposed action.

If the proposed action were not constructed, it is likely that the region's power needs would be addressed by user-end energy efficiency and conservation measures, by existing power generation sources, or by the development of new renewable and nonrenewable generation sources. Base load demand would likely be filled through expansion of existing, or development of new, thermal generation such as gas-fired combustion turbine technology. A base load natural gas-fired turbine facility would have to generate approximately 60 aMW of power to replace an equivalent amount of power generated by the project. Such development could occur at conducive locations throughout the state of Washington. Impacts on energy and natural resources would depend on the type, location, and magnitude of facility proposed. The significance of such impacts would depend on the site-specific location and project design.

3.5.3 Mitigation Measures

Proposed Action

The Applicant proposes to implement resource conservation measures during project construction and operation including, but not limited to, the following:

- Use lignin (a non-toxic wood byproduct) as a dust palliative to reduce water consumption for dust suppression during construction;
- Encourage carpooling of onsite construction crews;
- Use high-efficiency electrical fixtures and appliances in the O&M facility and substation
- control house; and
- Use low-water-use flush toilets in the O&M facilities.

Offsite Alternatives

Alternative 1: Swauk Valley Ranch

Mitigation measures related to energy conservation for Swauk Valley Ranch would be the same as those described for the proposed action.

Alternative 2: Springwood Ranch

Mitigation measures related to energy conservation for Springwood Ranch would be the same as those described for the proposed action.

No Action Alternative

No mitigation measures related to energy conservation are proposed for the No Action Alternative.

3.5.4 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts on energy or natural resources would occur from project construction, operation, maintenance, or decommissioning.