3.8 ENERGY AND NATURAL RESOURCES

3.8.1 Existing Conditions

3.8.1.1 Introduction

The Project will consume limited amounts of energy and natural resources primarily during construction. Operation of the Project will consume very limited amounts of natural resources, as the wind turbine generators will use wind, an abundant, naturally occurring renewable resource, to generate electricity. By using wind, rather than non-renewable fossil fuels, to generate electricity, operation of the Project will help reduce overall consumption of non-renewable natural resources.

Numerous independent life cycle analyses of wind power projects have shown that wind farms have a very high "energy payback" (ratio of energy produced compared to energy expended in construction and operation), and that wind's energy payback is higher than that of thermal power plants. Several studies have found that it generally takes less than six months of operation for a wind farm to produce the total amount of energy used to construct the equipment and build the project. (Energy Center of Wisconsin, 1999; Grum-Schwensen, 1990; G. Hagedorn et al, 1991; Gydesen. D et al, 1990.)

The consumption of energy and material quantities of consumables involves:

- The consumption of electricity and natural resources to produce the durable equipment and construction supplies used to build the Project;
- The consumption of electricity during construction and operation;
- The consumption of gasoline and diesel oil for motor vehicles during construction and operations; and
- The consumption of lubricating oil, greases, and hydraulic fluids for operating Project equipment controls and for providing lubrication of moving parts in wind turbine generators.

3.8.2 Impacts of the Proposed Action

3.8.2.1 Consumption of Energy and Natural Resources During Construction

Estimates for materials consumed during construction are summarized in Table 3.8.2-1 below.

Table 3.8.2-1 Materials Consumed During Construction

Resource	Quantity
Electricity	0
Diesel Fuel (gal)	150,000

Gasoline (gal)	30,000
Sand (cu yd)	38,700
Gravel (cu yd)	246,600
Water (gal)	10,700,000
Notes: *Estimated quantities are rounded* *Assumes 10 construction weeks for roads & foundations* *Assumes gas-powered vehicle consumption at 20% of diesel consumption* *Assumes 60/40 gravel/sand concrete mix* *Assumes construction office will be powered by diesel generator*	

3.8.2.2 Sources of Natural Resources Used During Construction

Fuel Sources

Where practical, construction vehicles and trucks will be refueled at existing fuel distributors or gas stations near Kittitas or Ellensburg. For construction vehicles on-site, temporary refueling stations will be established at on site fuel storage tanks dedicated to vehicle refueling. Section 2.2.3, 'Project Facilities' describes the fuel storage tanks in detail.

Water Sources

Water consumed during construction activities will be purchased by the EPC contractor from an off-site vendor with a valid water right and transported to the site in water-tanker trucks as described in Section 3.3.2, 'Water- Impacts of the Proposed Action'. The City of Kittitas has confirmed in writing their interest as one possible water vendor for the Project and would supply potable water from their water tower or standby well for all construction purposes, including dust control (See Exhibit 13, 'Letter of Interest from City of Kittitas').

Gray water from gravel operations is not expected to be re-used during construction. The portable concrete batch plant and portable rock crusher require potable-quality water for machinery and dust-control water spray function. Similarly, water tanker trucks equipped with spray nozzles for dust control will utilize potable quality water to reduce the possibility for clogging valves and nozzles.

Electricity Sources

It is anticipated that electricity for construction use will be generated using portable generators.

Cement, Sand, Aggregate and Gravel Sources

Cement, sand and some aggregate will be purchased from existing suppliers in the area that operate permitted quarries. The on-site gravel pits and their locations are described in Section 2.2.3, 'Project Facilities'.

Consumption of Non-Renewable Natural Resources

Grazing Land:
The permanent footprint of the Project will remove approximately 165 acres from open space and grazing uses for the life of the Project (at least 20 years). The remaining approximately 8,400 acres within the Project boundary will remain undeveloped, and may or may not allow grazing as discussed in Section 3.5, 'Agricultural Crops and Livestock'. At a maximum, the removal of approximately 5,300 acres of land from the approximately 445,000 acres of pasture or unimproved grazing land in Kittitas County (Kittitas County Comprehensive Plan, 2003) would represent a reduction of 1.2%.

Petrified Forest Deposits:
There appears to be no relationship between this site and the Gingko petrified forest resources. No petrified wood deposits similar to the gingko deposits located in the Gingko Petrified Forest (approximately 5 miles from the Project site) have been discovered at the Project site and no petrified gingko was observed during the geotechnical reconnaissance work at the Project site. The likelihood that any such resources would be affected by the Project is low given the relatively small disturbed area within the Project site.

The Gingko Petrified Forest State Park is described in Section 3.11.2.1, 'Visual Resources Light and Glare – Existing Conditions - Regional and Local Landscape Settings'. Because the Project will not be visible from the portions of the park in which there are developed facilities (see Section 3.11.2.), the Project will have little impact on the aesthetic experience of park users.

3.8.2.3 Consumption of Energy and Natural Resources During Operation

Operation of the Project will consume very limited amounts of energy and non-renewable natural resources. Energy will be generated using the kinetic energy in wind, transformed by the wind turbine generators into useful electricity. Types and quantities of energy and natural resources consumed during operations will primarily consist of the following:

- Fuel for O&M vehicles: Annual consumption is expected to be about 11,500 gallons.
- Lubricating oils, greases and hydraulic fluids for the wind turbine generators: Annual consumption is expected to be about 18,000 gallons of lube and hydraulic oils and approximately 5,500 gallons of cooling fluid.
- Water for domestic use at the O&M facility and incidental maintenance uses: Expected to be substantially less than 1,000 gallons/day
- Electricity for Project operations: The Project will generate power output approximately 80% of the time and will consume a small amount of electricity from the grid during periods of low wind as station stand-by power. The Project is estimated to consume less than 1% of Project energy generation.
- Wind Integration: In order to be interconnected to either the BPA or PSE grids, the Project will require an interconnection and transmission agreement which

complies with FERC (Federal Energy Regulatory Commission) and NERC (National Electric Reliability Council) standards. This ensures the safe and reliable delivery of power from the Project to the grid. Power from the Project will be integrated into the overall grid system which is handled by BPA and/or PSE system operations groups who are responsible for scheduling and managing their respective grid control areas. By definition, the injection of power to the grid from any power project does not consume power. In order to maintain system balance, during periods of high wind power output from the Project, system operators will be able to reduce the amount of other power being injected into the grid from other sources. Hourly power output fluctuations from the Project are typically less than 30% of nameplate capacity which is significantly smaller than load swings on either the BPA or PSE systems.

3.8.2.4 Sources of Natural Resources Used During Operation

Fuel used for O&M vehicles will be purchased from local gas stations. Lubricating oils and hydraulic fluids used for wind turbine generator maintenance will be purchased from distributors of such materials. The final selection of these distributors will depend on the specific turbine model chosen for the Project.

Electricity for Project operations will mostly be generated by the Project itself. During periods when the wind turbines are not generating power; it will be purchased from the regional utility.

Water consumed during operations would be purchased from a local vendor with a valid water right and transported by a water tanker truck. The supply requirement is estimated at a maximum of 1,000 gallons per day for domestic usage and light maintenance duties.

3.8.2.5 Comparison of Impacts of Proposed Scenarios

Construction

As described in Section 3.1.2 'Earth – Impacts of the Proposed Action', there is no change to the length or width of Project components, including roads, substations, O&M facilities, rock quarries, underground or overhead lines, permanent met towers, batch plant, or rock crusher under the different turbine size scenarios. These components comprise the vast majority of acreage impacted by the Project, and because they remain unchanged under all scenarios, the total acreage and construction quantities are very similar under all scenarios. This is because the scenarios utilize a similar layout, with greater or fewer WTGs along each string, but with the same beginning and end points for each string. For a specific comparison of the relative areas impacted under each scenario, refer to Table 3.1.2-2: Comparison of Area Impacts of the Proposed Scenarios.

The construction impacts are also substantially similar under the different design scenarios. There is no significant change to peak and total earthmoving quantities, or to peak and total production volumes at the batch plant or rock crusher. This is because the

Large WTG Scenario utilizes larger foundations for a smaller number of WTGs while the Small WTG Scenario utilizes smaller foundations for a larger number of WTGs.

Table 3.8.2-2 illustrates the variance in quantities consumed under the different scenarios, as compared with the 72m WTG (Most Likely) quantity presented in Table 3.8.2-1. The maximum variance (either increase or decrease) from the Most Likely scenario is a change of 3.9%.

Table 3.8.2-2 Materials Consumed During Construction

	Most Likely WTG Quantity	**Large WTG**	**Small WTG**
Electricity	0	0	0
Diesel Fuel (gal)	150,000	150,000	150,000
Gasoline (gal)	30,000	30,000	30,000
Sand (cu yd)	38,700	37,200	39,000
Gravel (cu yd)	246,600	244,300	246,900
Water (gal)	10,700,000	10,500,000	10,800,000

Operation

The consumption of energy and natural resources during operations will be the same for any of the proposed scenarios, with the exception of annual quantities of maintenance fluids (lube oil and cooling fluid), which are presented below in Table 3.8.2-3. The amount of power generated would be greater with the Large WTG scenario (312 MW of nameplate capacity) as compared to the other scenarios.

Table 3.8.2-3: Annual WTG Maintenance Fluid Quantities Under Different Scenarios

Turbine Component	**Fluid Type**	**Replacement Interval (months)**	**Large WTG Scenario (gal/yr)**	**Most Likely Scenario (gal/yr)**	**Small WTG Scenario (gal/yr)**
Gearbox lubrication	Lubricating oil	12	11,440	12,240	11,060
Generator cooling	Glycol-water mix	12	5,720	5,440	4,740
Hydraulic systems	Hydraulic oil	18	5,893	5,893	4,740

Note: Estimates are extrapolated from Table 3.16.2-2 data.

3.8.3 Impacts of the No Action Alternative

Under the No Action Alternative, the Project would not be constructed or operated, and the environmental impacts described in this section would not occur. The No Action Alternative assumes that future development would comply with existing zoning requirements for the Project area, which is zoned Commercial Agriculture and Forest and Range. According to the County's zoning code, the Commercial Agriculture zone is dominated by farming, ranching, and rural lifestyles, and permitted uses include residential, green houses and agricultural practices. Permitted uses in the Forest and Range zone include logging, mining, quarrying, and agricultural practices, as well as residential uses (Kittitas County 1991). However, if the proposed Project is not constructed, it is likely that the region's need for power would be addressed by user-end energy efficiency and conservation measures, by existing power generation sources, or by the development of new renewable and non-renewable generation sources. Baseload demand would likely be filled through expansion of existing, or development of new, thermal generation such as gas-fired combustion turbine technology. Such development could occur at conducive locations throughout the state of Washington.

A baseload natural gas-fired combustion turbine would have to generate 67 average MW of energy to replace an equivalent amount of power generated by the project (204 MW at 33% net capacity). (An average MW or "aMW" is the average amount of energy supplied over a specified period of time, in contrast to "MW," which indicates the maximum or peak output [capacity] that can be supplied for a short period.) See Section 2.3, 'Alternatives'.

3.8.4 Mitigation Measures

As the Project would have a positive impact overall on the use of non-renewable resources, no mitigation is necessary or proposed.

3.8.4.1 Conservation and Renewable Resources Measures

During construction, conservation measures will include recycling of construction wastes where possible and encouragement of carpooling among construction workers to reduce emissions and traffic.

Several conservation measures will be undertaken during operations:

- The O&M facility will utilize station power for electricity needs.
- Water usage at the site will be closely monitored during operations due to the limited capacity of the on-site water storage tank.
- Carpooling and among operations workers will be encouraged.
- Recycling of waste office paper and aluminum will be encouraged.

3.8.5 Significant Unavoidable Adverse Impacts

No significant unavoidable adverse impacts are expected as a result of the Project.