2.2 DESCRIPTION OF PROPOSED PROJECT

2.2.1 Project Summary / Introduction

The Wild Horse Wind Power Project ("Project") is to be constructed in central Washington's Kittitas Valley, which has long been known for its vigorous winds. The Project will be built on high open ridge tops between the towns of Kittitas and Vantage in the eastern end of Kittitas Valley. Maps showing the Project location are presented in Section 2.2.2, 'Project Location' and in Exhibit 1-A, 'Project Area Overview'. The Project site has been selected primarily for its energetic wind resource and its access to existing high voltage transmission lines which have adequate capacity to allow the wind generated power to be integrated into the power grid system.

The Project consists of several prime elements which will be constructed in consecutive phases including roads, foundations, underground and overhead collection system electrical lines, grid interconnection substation(s), step-up substation(s), feeder line(s) running from the on-site step-up substation(s) to the interconnection substation(s), an operations and maintenance (O&M) center and associated supporting infrastructure and facilities. The entire Project area encompasses approximately 8,600 acres. A permanent footprint of approximately 165 acres of land area will be required to accommodate the proposed turbines and related support facilities. A site layout illustrating these key elements is contained in Exhibit 1-B, 'Project Site Layout'. Turbines will be located on open rangeland in areas that are currently zoned as Forest and Range and Commercial Agriculture by Kittitas County.

The Project is designed to provide low cost renewable electric energy to meet the growing needs of the Northwest. The Project has transmission and interconnection requests under review with the Bonneville Power Administration (BPA) and Puget Sound Energy, and is in the process of marketing the electrical energy into the local and regional power market.

The expected service life of the Project is 20 years. Well-maintained wind power plants operating according to industry standard practices are capable of service lives longer than 20 years. However, due to the rapid advancement in wind turbine technology, it is likely that after 20 years, the turbines would be replaced under a re-powering program similar to what has happened to several of the earlier wind power projects in Europe and California.

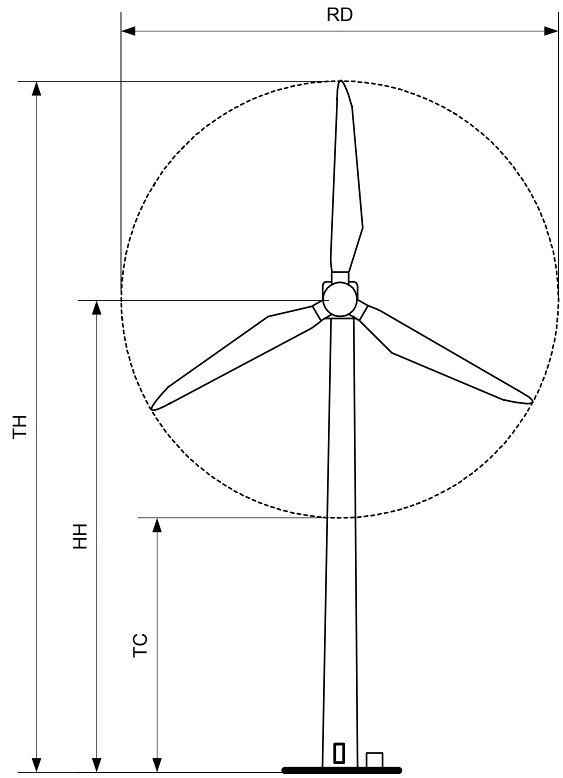
Detailed descriptions of the types of activities required to construct the Project, and the plan for managing the Project during construction and operations, are contained in Sections 2.2.5, 'Construction Methodology', and Section 4.4, 'Construction Management', respectively.

2.2.1.1 Project Feeder Lines

There are two 230 kV transmission feeder lines proposed for the Project, one to allow interconnection with the Bonneville Power Administration (BPA) transmission system and one to allow interconnection with Puget Sound Energy (PSE) transmission system. It is anticipated that only one feeder line would be built, however, Applicant is seeking approval to build and operate up to two feeder lines. Power from the Project will be fed along these transmission feeder lines indicated on the Site Layout in Exhibit 1-B as the BPA Feeder Line and the PSE Feeder Line to the point of interconnection with the respective utility. A more thorough description of the Project transmission system is described below in Section 2.2.3.10, ‘Project Transmission Feeder Lines’.

Power from the Project is fed to step-up substations indicated as the BPA or PSE step-up substation on the Site Layout in Exhibit 1-B. The step-up substations connect to the respective BPA or PSE feeder line which run to the respective utility interconnect. The BPA feeder line runs west from the Project site for approximately 5 miles to a point where it intersects with the existing corridor of Bonneville Power Administration (BPA) high-voltage transmission lines identified as the Schultz to Vantage 500 kV line. The PSE feeder line runs approximately 8 miles south and west from the Project site to the PSE interconnection substation.

Figure 2.2.1-1 Wind Turbine Dimensions



	MAX	MIN	Dimension
HH	80 m/262 ft.	46 m/151 ft.	Hub Height
RD	90 m/295 ft.	60 m/197 ft.	Rotor Diameter
TC	40 m/131 ft.	15 m/49 ft.	Tip Clearance
TH	125 m/410 ft.	76 m/249 ft.	Tip Height

The Project’s BPA feeder line is located on land owned by a single private landowner, and Applicant has negotiated an easement option with the landowner. The route of the BPA feeder line is currently zoned Forest and Range by Kittitas County. The PSE feeder line is also located on privately owned land currently zoned Forest and Range and Agriculture 20 by Kittitas County. The Applicant has negotiated easement options with the private landowners on whose land the PSE feeder line would be located.

<u>Project Turbine Scenarios</u>

The Project will consist of up to 158 wind turbines and have an installed nameplate capacity of up to 312 megawatts (MW). The Project will utilize 3-bladed wind turbines on tubular steel towers each ranging from 1 MW to 3 MW (generator nameplate capacity) and with rotor diameters ranging from 60 to 90 meters (197 to 295 feet) as shown in Figure 2.2.1-1. For the smallest turbine contemplated for the Project, with a rotor diameter of 60 meters and each with a nameplate capacity of 1

MW, up to 158 units would be installed for a Project nameplate capacity of 158 MW. If the largest contemplated turbine, with a rotor diameter of 90 meters and generator nameplate 3 MW is used, up to 104 units would be installed for a Project capacity of 312 MW. The Project Site Layout in Exhibit 1-B shows 136 turbines of 1.5 MW each with a turbine spacing based on a 70.5 meter (231 ft.) rotor diameter. This scenario is in the middle of the range of turbines proposed and represents the anticipated Project configuration.

Regardless of which size of turbine is finally selected for the Project, the turbines will generally be installed along the roadways as indicated on the Site Layout and all construction activities would occur within the same corridors with any final adjustments to specific turbine locations made to maintain adequate spacing between turbines for optimized energy efficiency and to compensate for local conditions. Exhibit 1-D illustrates the Project site layout with the smaller sized turbine scenario (60 meter rotor diameter) and Exhibit 1-E illustrates the Project site layout with larger turbines (90 meter rotor diameter). A summary of the Project Scenarios is tabulated below in Table 2.2.1-1 and a scale diagram comparing the various turbines sizes to one of the nearby BPA transmission towers is contained in Exhibit 1-F.

The size and type of turbine used for the Project will largely depend on the safety, history, quality, price, performance and reliability history, power characteristics, guarantees, financial strength of the supplier, and the availability of a particular type of wind turbine at the time of construction. Requests for proposals (RFPs) for wind energy from utilities are designed to procure delivered energy from a wind power facility to their grid. RFPs are designed to encourage competitive pricing and as such they are not specifically designed to limit proposals to a specific size or type, make or model of wind turbine.

Due to the fact that there may be variances discovered at the time of performing a final site survey of the exact locations of the Project facilities, some flexibility in determining the facility locations is required to allow for in-field practicalities and conditions at the time of construction. Generally, it will not be necessary to relocate roads significantly from their location shown on the Site Layout; however, the exact location of the turbines along the planned roadways may need to be altered slightly from the shown plan in Exhibit 1-B due to a number of factors including:

- The results of the geotechnical investigations at each surveyed turbine location may reveal underground voids, land slide planes, or fault line locations. In this case, the turbine location may need to be altered or eliminated;
- The final on-site field survey with the meteorologists may dictate that turbines be spaced slightly closer together in some areas and further apart in other areas;
- If, at the time of construction, a turbine with a larger rotor diameter (e.g. 90 meters) is to be used, the turbine spacing will be increased and the overall number of turbines would be reduced;

- If, at the time of construction, a turbine with a smaller rotor diameter (e.g. 60 meters) is to be used, the turbine spacing will be decreased and the overall number of turbines would be increased;
- The final field surveys of communication microwave paths may require that some turbine locations be adjusted slightly to avoid line-of-sight interferences.

With the range of turbines that are proposed for use on the Project with rotor diameters ranging from 60 to 90 meters (197 to 295 feet), turbine locations would not vary from their shown locations by more than 105 meters (350 feet). Due to the distant proximity of the turbine sites to any public roads, power lines, property lines of non-participating landowners or residences the adjustments which may need to be made at the time of construction are insignificant.

2.2.1.2 Scope of Proposed Site Certificate

Similar to the environmental analysis performed for gas power projects which examine the full range of potential emissions such as SOx, NOx, CO and CO2 from various sizes and types of gas turbines, Applicant has fully analyzed the entire range of potential impacts and described all environmental effects from the full range of sizes and types of wind turbines. Within each section of Chapter 3 of this ASC, the potential impacts to earth, air, water, wildlife, socioeconomics, public health and safety, and other elements of the environment have been examined for the full range of sizes and numbers of WTGs.

The Applicant requests that the Project be permitted to allow construction and operation within the entire range of turbine size and numbers presented, for which the impacts have been fully analyzed. This will enable the Applicant to choose the best wind turbine for the Project, based on technical and commercial considerations at the time of construction.

While the final selection of the precise model of wind turbine to be used for the Project has not yet been made, the Applicant has evaluated the potential impacts of the full range of turbine sizes and numbers that are proposed for the Project. The differences in terms of environmental impacts of the various scenarios (i.e. the final selection of larger or smaller rotor diameter wind turbines within the range described above) are minimal for some elements of the environment and non-existent for other elements of the environment, as described below. Nevertheless, the impacts of the proposed scenarios are addressed in detail for elements of the environment in relevant sections within Chapter 3. Where applicable, these differences have been summarized in a table within relevant sections of Chapter 3.

Under the different design scenarios, there is no dimensional change to the length or width of the main Project components that constitute its footprint. The footprints of the roadways, substations, O&M facilities, rock quarries, underground and overhead lines, permanent met towers, batch plant, and rock crusher remain the same size and in the same locations under each scenario. 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 the same under all scenarios. Regardless of the number of turbines, roadways have the same beginning and end points for each turbine string road. The footprint at each turbine pad location is slightly different in size for the different sizes of wind turbines. Large turbines require large foundations and larger crane pads to support the larger crane equipment for the erection of the machines. Although the turbine and crane pads are slightly larger for larger turbines, there are fewer turbines for the large turbine scenario and the resulting overall resulting Project footprint is the same regardless of the turbine size as shown in Table 3.1.2-2. 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 as described in Section 3.1.2.6, ‘Comparison of Impacts of the Proposed Scenarios’.

Table 2.2.1-1 Project Scenario Summary

	Most Likely Scenario	**Large WTG Scenario**	**Small WTG Scenario**
Turbine Nameplate	1.5 MW	1 MW	3 MW
Number of WTGs	136	158	104
Project Nameplate	204 MW	158 MW	312 MW
Total Permanent Footprint Approx.	165 acres	165 acres	165 acres
Miles of Road Approx.	32 miles	32 miles	32 miles

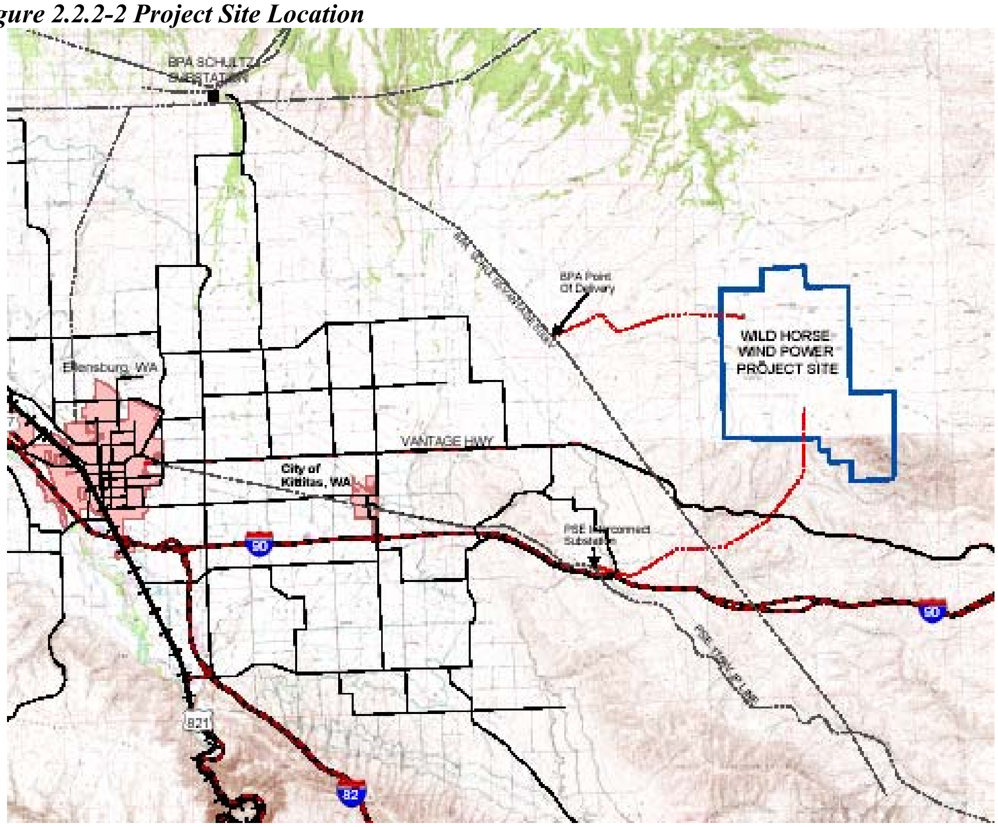
2.2.2 Project Location

Maps showing the locations of Kittitas County and the Project are presented in Figures 2.2.2-1 and 2.2.2.-2, respectively. Exhibit 1-A, ‘Project Area Overview’ also illustrates the Project site location. The Project will be built on open ridge tops between Kittitas and Vantage at a site located approximately 11 miles east of the City of Kittitas. The ridges rise as high as 2,400 feet above the Yakima River Valley to the west and nearly 3,000 feet above the Columbia River to the east. The area’s strong westerly winds are compressed as they pass by Whiskey Dick Mountain at an elevation of 3,873 feet above mean sea level, and are further accelerated as they pass over the site’s ridge tops. The site boundary is located approximately 2 miles north of Vantage Highway, 11 miles east of the City of Kittitas. The most prominent geographic features in the area are Whiskey Dick Mountain itself and the

Figure 2.2.2-1: Location of Kittitas County, Washington

Columbia River located 10 miles to the east.

Figure 2.2.2-2 Project Site Location



2.2.2.1 Land Ownership

The Project will be located primarily on range land to be purchased by Wind Ridge Power Partners, LLC. Parts of the Project are proposed on land the Applicant has secured under a long term lease with the Washington Department of Natural Resources (DNR). One portion of the Project, located in Township 18 North, Range 21 East, Section 35, is owned by the Washington Department of Fish and Wildlife (WDFW). WDFW has expressed interest in leasing this land to the Applicant for wind power development and has granted the Applicant access to this parcel for the purpose of environmental and meteorological studies. WDFW is in the process of reviewing the potential benefits of leasing this land for wind power development and has not yet made a final determination regarding leasing this land to the Applicant. WDFW has authorized the Applicant to include this parcel of WDFW land in this Application, see Exhibit 30-C.

All proposed Project facilities are in areas currently zoned as Forest and Range, or Commercial Agriculture by Kittitas County as shown in Exhibit 17, 'Project Area Zoning Designation', which shows the current zoning for entire surrounding area. The site extends over an area of approximately 8,600 acres, while the overall site footprint is approximately 165 acres.

2.2.2.2 Proximity to Residences and Recreational Areas

Exhibits 1-B and 1-C, ‘Project Site Layout’ illustrate all of the key Project facilities on a topographic map and on an aerial photo map, respectively. Exhibit 15-A, ‘Residences In Project Vicinity’, illustrates the relative location of nearby residences to the Project and feeder lines. The nearest residence to the Project lies approximately 1 ¾ miles to the south near Vantage Highway. The nearest residence to the PSE feeder line is approximately ¼ mile distant, and the nearest residence to the BPA feeder line is approximately ½ mile from the line. Exhibit 22, ‘Recreational Areas Surrounding Project Site’, illustrates the local parks and recreational areas within 25 miles of the Project site.

2.2.2.3 Project Area Land Use

A more thorough description of land uses on and surrounding the Project site and transmission feeder lines is contained in Section 3.10, ‘Land Use’.

2.2.3 Project Facilities

2.2.3.1 Roads and Civil Construction Work

Access to the Project site will be achieved via an existing private graveled access road which branches from Vantage Highway at a location approximately 11 miles east of the City of Kittitas. Project site roads are designed to allow for heavy equipment to be transported to the Project and will be used throughout the life of the Project to allow access to and from the wind turbines, substations and meteorological monitoring towers. Flat areas, approximately 30 ft. by 60 feet, will be cleared, compacted and graveled as necessary adjacent to each turbine location as a crane pad to facilitate the erection of the wind turbines and towers. Other graveled areas are parking areas near the Project operations and maintenance facility and at a visitor’s kiosk near the site entrance to Vantage Highway, as well as 3 equipment lay-down areas adjacent to the site roads. Three on-site rock quarries are planned to provide gravel for the Project. An on-site concrete batch plant is also planned to be located near the northwest end of the Project site. Exhibit 1-A, ‘Project Site Layout’ illustrates the location of the Project facilities. No Project facilities are to be built in or near any wetlands. All facilities will be set back sufficiently from any streams and wetlands to avoid impacts. Construction will not require the use of any heavy equipment in stream beds or riparian areas.

Project Site Roads

The road design has been prepared to minimize the overall disturbance footprint and avoid erosion risks. The Project site is currently crisscrossed with an extensive network of existing roads and, wherever practical, existing roads have been utilized to minimize new ground disturbance. As such, approximately 17 miles of new gravel roads will be constructed and approximately 15 miles of existing roads will be improved for the turbines.

Road Design

The road design will be finalized by an experienced and state licensed civil engineer based on the results of a detailed geotechnical investigation of the surface and subsurface conditions at the Project site. Specific portions of Washington Department of Transportation (WSDOT) standards for road construction and road rock specifications will be used as appropriate to provide a final road design that is adequate for safe and reliable Project construction and on-going operations. The access road and roads between turbine strings will generally consist of a 20 foot wide compacted graveled surface and a 2 foot wide shoulder on either side to blend with the surrounding contours and allow for proper drainage. The roads between contiguous turbines in a string will be 34 feet wide to accommodate for larger crane equipment to move between the individual turbine sites safely. In areas of steeper grades, a cut and fill design will be implemented to keep grades below 15% to facilitate access and help prevent erosion. Detailed topographic contour maps will be prepared as part of final detailed design prior to construction. The detailed contour maps will be used to clarify special cut and fill areas and to prepare a detailed storm water pollution plan (SWPP) and set of Best Management Practices (BMP) which will be implemented to prevent erosion both during construction and operations.

Figure 2.2.3.1-1 Typical Wind Power Project Gravel Road

On Site Rock Quarries

The amount of cut and fill and the amount of gravel required for road construction is approximately 230,000 cubic yards and is explained more thoroughly in Section 3.1, 'Earth'. Due to the site's remote location more than 20 miles from the nearest existing commercial rock quarry and the amount of gravel required for road construction the Project will have 3 on-site rock quarries dedicated to providing gravel for construction as indicated on the Project Site Layout in Exhibit 1-A. During construction, rock will be blasted from the quarries and crushed at a temporary on-site rock crushing facility. Each rock pit will have a footprint of approximately 5 acres and be 10-20 feet in depth. The rock pits will be rehabilitated in accordance with a formal plan approved by EFSEC in consultation with Washington DNR. More details regarding the on site rock pits and rock crushing facilities are contained in Sections 2.2.3.8 and 2.2.3.9, below.

Feeder Line Construction Trails

The Project transmission feeder line(s) will require the installation of a temporary construction trail. The construction trail will be a 12 foot wide swath which is cleared of large boulders to allow high clearance vehicles to pass. The trail will be installed to allow access to support the construction of the feeder lines. Once construction is complete, the trail will be used approximately every 6 months for inspection and maintenance. Native vegetation will be allowed to re-establish over the trails to the extent that 4-wheel-drive vehicle travel remains practical. The PSE feeder line will require approximately 8 miles and the BPA feeder line will require approximately 5 miles of new construction trails. Grading, and erosion control measures such as ditching and rock addition are not anticipated, but may be required at specific locations. No construction is planned in any wetlands. Construction techniques for the transmission feeder line(s) will not require the use of any heavy equipment in stream beds or riparian areas and all transmission poles and/or towers will be set back sufficiently from any streams to avoid impacts.

Figure 2.2.3.2-1 Spread Footing Type Foundation

2.2.3.2 Turbine Tower Foundations

The Project site provides solid subsurface conditions for the turbine foundations. A formal geotechnical investigation will be performed at each tower location prior to construction with a drill rig and ground-penetrating radar to analyze soil conditions and test for voids and homogeneous ground conditions. Depending on the results of the geotechnical investigation, either spread footing type foundation, or a vertical mono-pier foundation, as shown in Figures 2.2.3.2-1 and 2.2.3.2-2 respectively will be used.

Figure 2.2.3.2-2 Mono-Pier Type Foundation

The foundation design will be tailored to suit the soil and subsurface conditions at the various turbine sites. The foundation design will be certified by an experienced and qualified, state-registered structural engineer who has designed several generations of wind turbine towers and foundation systems that have proven themselves well in some of the most aggressive wind regions of the world.

Post tension (PT) rock anchors may be

implemented for the final design of the foundations. PT rock anchors are used frequently in dam, retaining wall, and bridge construction. The determination of whether or not PT anchors are suitable will depend largely on the results of the detailed geotechnical analysis and the design engineer's foundation analysis. The use of rock anchors could reduce the overall excavation size required for the foundations.

2.2.3.3 Wind Turbine Generators and Central Control System

Several wind turbine generators (WTGs) are under evaluation for the Project. Based on these evaluations, a number of wind turbine vendors have been pre-qualified to supply equipment for the Project. All turbines under consideration are well proven, commercially viable utility-scale units with a minimum design life of 20 years under extreme high wind and high turbulence conditions. Over the past two decades, wind turbine manufacturers have rapidly advanced the development of new technology, resulting in the release of newer, larger wind turbines roughly every 2 years. Typically, new turbines are released as variations of earlier models with small increments in size. The current generations of modern wind turbines are in the size range that has been studied for this Application, with a nameplate capacity of 1 to 3 MW and with rotor diameters ranging from 60 to 90 meters. Before a new turbine is released for serial production, prototype units are tested for approximately 2 years. As such, the Project would only use well proven WTGs which have been through at least a 2 year testing period. The typical lead time for procurement of WTGs ranges from 5 to 8 months, and all WTGs under consideration for the Project are now commercially available. Specific model availability will depend on conditions at the manufacturer's production facility at the time a WTG order is placed.

Equipment Selection
A very rigorous approach has been taken in an effort to pre-qualify all key equipment suppliers for the Project, especially the wind turbines. Only equipment that has been proven as utility grade with the an emphasis on safety, reliability and competitive pricing will be utilized. This results in a Project that delivers energy safely and reliably at the most competitive cost possible over the long haul.

Wind Turbine Type Certification
European manufacturers have been required, for many years, to meet rigid standards verifying their design criteria, operational characteristics, supervision of construction, transportation, erection, commissioning, testing and servicing. In Europe, Germanischer Lloyd (GL), Det Norske Veritas (DNV), Wind Test GmbH, and Risø (Denmark) are independent testing laboratories, which administer regulations for the design, approval, and certification of wind energy conversion systems. There are no well-established testing agencies in the US that offer the amount of experience, scrutiny and know-how as the European agencies. For this reason, the Project will implement turbine technology that, as a minimum, complies with the European standards.

The testing processes involved in the approval of design documentation include safety and control system concepts, static and dynamic load assumptions, and associated load case definitions. Once approved, specific components, such as blades, drive trains (hubs, gearing, bearings and generators etc.) safety systems, towers, yaw systems, foundations, electrical installations, will be reviewed and approved according to minimum standards established by these testing agencies. In addition to operating characteristics and design features, the testing agencies review construction supervision procedures, including materials testing, QA reports and procedures, corrosion protection, and others. They also review and set standards for supervision during the transportation, erection and commissioning of the turbines.

Operational testing performed by the agencies includes measurement of power curves, noise emissions, as well as loads and stresses including wind loads imposed on the tower, foundation, drive train, blades, nacelle frame, power quality, etc. Test data are evaluated for plausibility, and compared with the original calculations and mathematical models used for the design.

Neither Germanischer Lloyd, WindTest, Risø, nor DNV will issue its certification unless the turbine design has met minimum design standards and performance levels, both calculated and measured. The approval process also applies to the manufacturers' processes and procedures through ISO 9001.

Due to this arduous approval process, wind turbines designed to European standards have proven to be the most reliable wind energy systems over the past two decades. In Europe, certification pursuant to these standards is mandatory for both permitting and financing. Partly due to these verification programs, lenders in Europe view wind energy equipment in the same way lenders in the United States might view the purchase of heavy construction equipment.

The Project will implement only turbines that have achieved type certification by a reputable and experienced third party verification institute such as DNV, GL, Risø, or WindTest and demonstrate a design life of at least 20 years.

Wind Turbine Basic Configuration

Wind Turbines consist of 3 main physical components that are assembled and erected during construction: the tower, the nacelle (machine house) and the rotor (3-blades).

Tower

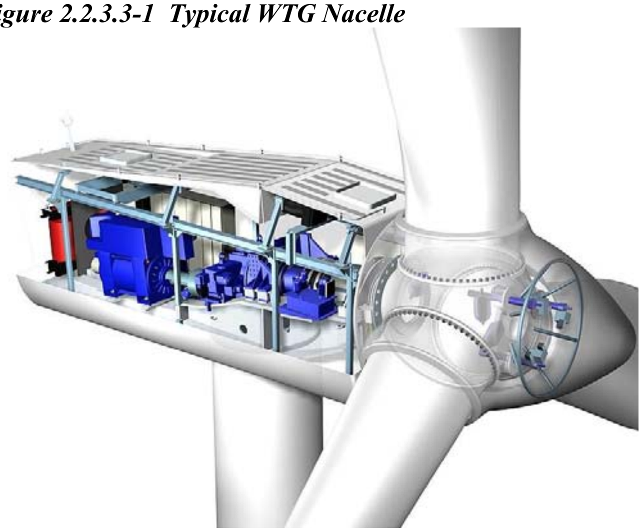
The WTG tower is a tubular conical steel structure that is manufactured in multiple sections depending on the tower height. Towers for the Project will be fabricated, delivered and erected in 2 or 3 sections each. A service platform at the top of each section allows for access to the tower connecting bolts for routine inspection. An internal ladder runs to the top platform of the tower just below the nacelle. A nacelle ladder extends from the machine bed to the tower top platform allowing nacelle access independent of its orientation. The tower is equipped with interior lighting and a safety glide cable alongside the ladder.

The tower design is certified by experienced and qualified structural engineers who have designed several generations of turbine towers that have proven themselves well in some of the most aggressive wind regions of the world. The towers and foundations are designed for a survival gust wind speed of 90+ mph with the blades pitched in their most vulnerable position. For the cold-weather winter conditions on the Project site, special material specifications are set to ensure that materials do not go below the brittle transition temperature.

Nacelle

Figure 2.2.3.3-1 shows the general arrangement of a typical nacelle that houses the main mechanical components of the WTG. The nacelle consists of a robust machine platform mounted on a roller bearing sliding yaw ring that allows it to rotate (yaw) to keep the turbine pointed into the wind to maximize energy capture. A wind vane and anemometer are mounted at the rear of the nacelle to signal the controller with wind speed and direction information.

Figure 2.2.3.3-1 Typical WTG Nacelle



The main components inside the nacelle are the drive train, a gearbox and the generator. On some turbines, the step-up transformer is situated at the rear of the nacelle that eliminates the need for a pad-mounted transformer at the base of the tower.

The nacelle is housed by a fully enclosed steel reinforced fiberglass or all steel shell that protects internal machinery from the environment and dampens noise emissions. The shell is designed to allow for adequate ventilation to cool internal machinery such as the gearbox and generator.

Drive Train

The rotor blades are all bolted to a central hub. The hub is bolted to the main shaft on a large flange at the front of the nacelle. The main shaft is independently supported by the main bearing at the front of the nacelle. The rotor transmits torque to the main shaft that is coupled to the gearbox. The gearbox increases the rotational speed of the high speed shaft that drives the generator at 1200-1800 RPM to provide electrical power at 60 Hertz (Hz).

Figure 2.2.3.3-2 Rotor Assembly

Rotor Blades

The modern WTGs under consideration for the Project have 3-bladed rotors that range in span from 60 to 90 meters (197 to 295 feet) in diameter. Figure 2.2.3.3-2 illustrates the rotor hub, spinner nose cone and rotor blade assembly on the ground prior to erection. The rotor blades turn quite slowly; typically less than 20 RPM, resulting in a graceful appearance during operation. The rotor blades are typically made from a glass-reinforced polyester composite similar to that used in the marine industry for sophisticated racing hulls. Much of the design and materials experience comes from both the marine and aerospace industries and has been developed and tuned for wind turbines over the past 25 years. The blades are non-metallic, but are equipped with a sophisticated lightning suppression system that is defined in detail below in Section 2.2.3.6, 'Project Grounding System'.

Turbine Control Systems

Wind turbines are equipped with sophisticated computer control systems which are constantly monitoring variables such as wind speed and direction, air and machine temperatures, electrical voltages, currents, vibrations, blade pitch and yaw angles, etc. The main functions of the control system include nacelle operations as well as power operations. Generally, nacelle functions include yawing the nacelle into the wind, pitching the blades, and applying the brakes if necessary. Power operations controlled at the bus cabinet inside the base of the tower include operations of the main breakers to engage the generator with the grid as well as control of ancillary breakers and systems. The control system is always running and ensures that the machines are operating efficiently and safely.

Heat Dissipation

Cooling to the operating machinery inside the wind turbines, such as the generator and gearbox, is achieved with air cooling. Heat dissipation is very minimal and does not generate adverse impacts. The proposed facility uses wind as its source of energy production and not thermal energy, therefore water sources are not used in the process of heat dissipation. In light of these facts, pursuant to WAC 463-42-115, the Applicant requests a waiver of the information required by WAC 463-42-175, which calls for a description of the heat dissipation systems.

Central SCADA System

Each turbine is connected to a central Supervisory Control and Data Acquisition (SCADA) System as shown schematically in Figure 2.2.3.3-3 through a network of underground fiber optic cable or copper signal wire. In order to prevent stray surges, if copper signal wire is used, the interfaces to the wind turbine and other signal processors are all optically isolated. The SCADA system allows for remote control and monitoring of individual turbines and the wind plant as a whole from both the central host computer or from a remote computer. In the event of faults, the SCADA system can also send signals to a fax, pager or cell phone to alert operations staff.

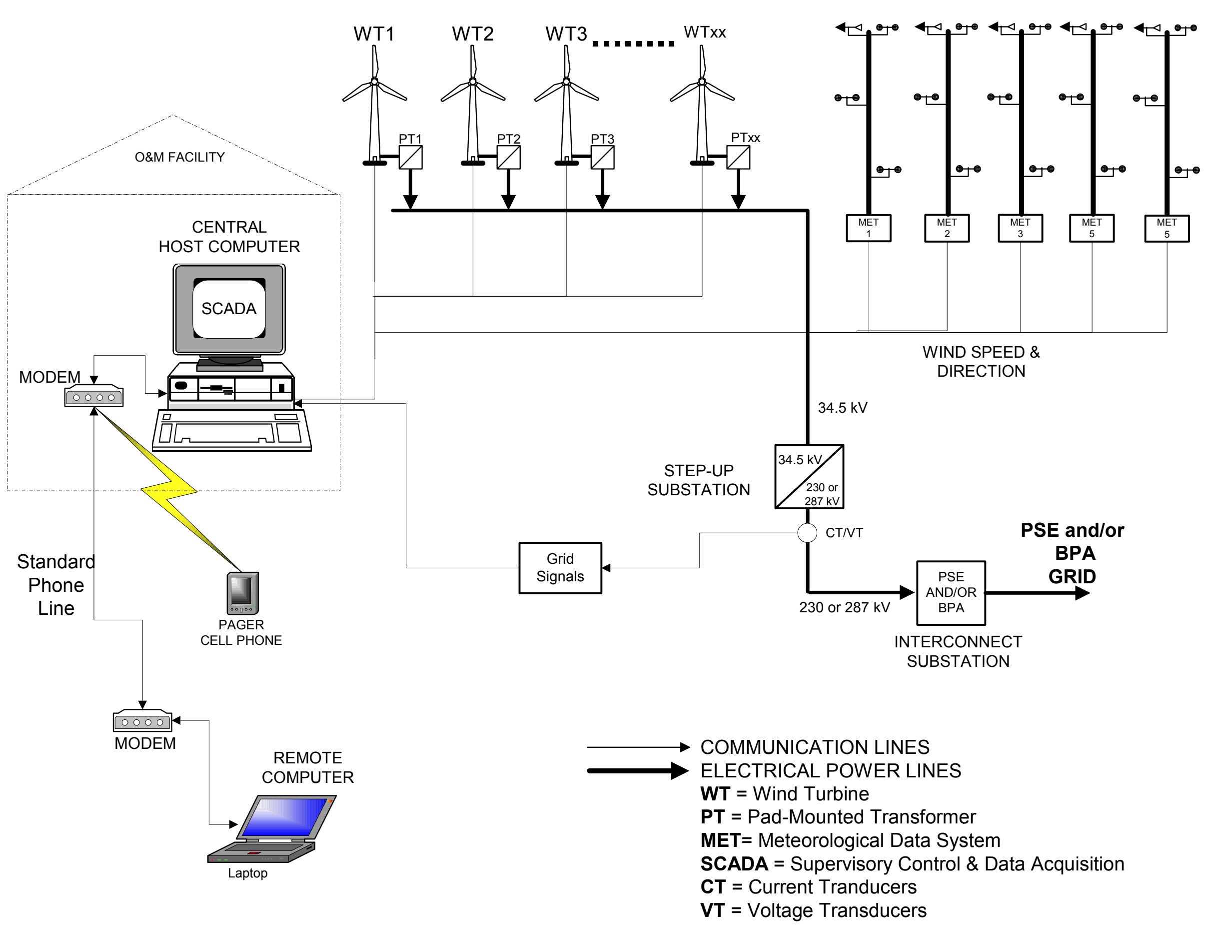
Safety Systems

All turbines are designed with several levels of built-in safety and comply with the codes set forth by European standards as well as those of OSHA and ANSI.

Braking Systems

The turbines are equipped with two fully independent braking systems that can stop the rotor either acting together or independently. The braking system is designed to be fail-safe, allowing the rotor to be brought to a halt under all foreseeable conditions. The system consists of aerodynamic braking by the rotor blades and by a separate hydraulic disc brake system. Both braking systems operate independently such that if there is a fault with one, the other can still bring the turbine to a halt. Brake pads on the disc brake system are spring loaded against the disc and power is required keep the pads away from the disc. If power is lost, the brakes will be mechanically activated immediately. The aerodynamic braking system is also configured such that if power is lost, it will be activated immediately using back-up battery power or the nitrogen accumulators on the hydraulic system, depending on the turbine's design.

Figure 2.2.3.3-3 Electrical and Central Control System



After an emergency stop is executed, remote restarting is not possible. The turbine must be inspected in-person and the stop-fault must be reset manually before automatic operation will be re-activated.

The turbines are also equipped with a parking brake that is generally used to "park" the rotor while maintenance routines or inspections that require a stationary rotor are performed.

Climbing Safety

Normal access to the nacelle is accomplished with a ladder inside the tower. Standard tower hardware includes equipment for safe ladder climbing including lanyards and safety belts for service personnel. All internal ladders and maintenance areas inside the tower and nacelle are equipped with safety provisions for securing lifelines and safety belts and conform to or exceed ANSI 14.3-1974 (Safety Requirements for Ladders). During operations of the Project, maintenance staff always work in pairs inside the wind turbines as part of standard safety practice.

Turbine Design Life

The Project will utilize proven utility grade equipment with a minimum design life of 20 years. The most vulnerable equipment are the wear and tear components of the wind turbines. The Project will utilize only well-proven designs that have been approved by reputable third party testing agencies. Modern wind turbines of the type being proposed for the Project have been developed over the past 25 years and have been proven over several generations of equipment. The basic configuration of the 3-bladed up-wind turbine is the best proven and understood turbine configuration available in the industry and the vast majority of all new wind power generation facilities planned, or under construction, in the world utilizes this technology. The wind turbine technology used for the design of the Project has proven to be very reliable, efficient, and lower in electrical energy production cost than other commercially available wind power technologies.

Over the past 25-30 years, more than 56,000 wind turbines have been installed around the world for an installed nameplate capacity of about 34,000 MW. More than 18,000 wind turbines (about 5,000 MW) are installed in the USA and there are more than 380 units (283 MW) of wind turbines currently operating in the state of Washington, near Walla Walla and Kennewick.

Figure 2.2.3.4-1 Typical Pad Mount Transformer (shown during construction before terminations landed)

2.2.3.4 Electrical Collection System Infrastructure

Electrical Collection System Overview

Electrical power generated by the

wind turbines is transformed and collected through a network of underground and overhead cables which all terminate at the Project step-up substation. It is most likely that only one substation will be constructed for the Project, however, it is possible that two substations will be installed allowing access to both the BPA and Puget Sound Energy (PSE) systems. The Project Site Layout in Exhibit 1-B shows the general routing paths of the underground and overhead electrical lines as well as the proposed step-up substation locations. Figure 2.2.3.3-3 illustrates the overall electrical collection system schematically.

Turbine Drop Cables

Power from the wind turbines will be generated at 575 Volts to 690 Volts (V) depending on the type of wind turbine utilized for the Project. A set of heavy gauge, armored, flexible drop cables connect to the generator terminals in the nacelle and pass from the nacelle into the tower where they drop down to a cable support saddle located about 20-40 feet below the top tower platform. From the support saddle, the cables are trained along the side of the tower or along the internal ladder in cable trays or they are hung straight down to the base bus cabinet and breaker panel inside the base of the tower. As the cables are of a special design, and are flexible, the length of cable from the nacelle to the cable support saddle allows the nacelle to freely rotate without damaging the cables. There is sufficient slack on the cable to allow the nacelle to rotate several times. There are also independent over-twist prevention systems and sensors in the wind turbine generator to prevent cable-over-twist.

Figure 2.2.3.4-2 Typical Underground Cable Trench

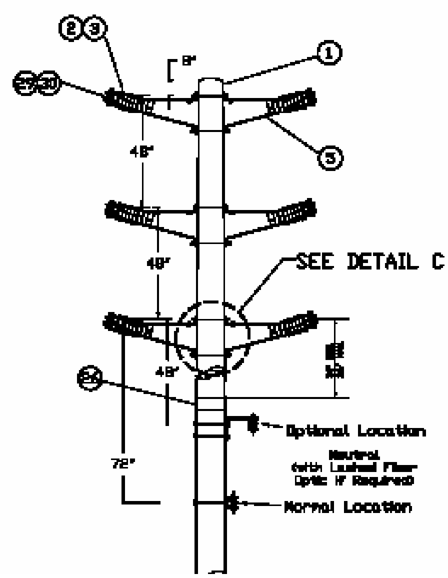
The drop cables are terminated inside the bus cabinet. Another set of cables run from the bus cabinet through conduits in the foundation to the pad transformer which steps the voltage up to 34.5 kilovolts (kV). Some wind turbine generators, such as the Vestas V-80 and V90, have the step-up transformer in the machine house at the top of the tower called the nacelle. For the V80 and V90, the drop cables would be at 34.5kV, the base bus cabinet would be a switchgear breaker panel and no outdoor pad transformer at the tower base would be required.

Pad Transformers and UG Cable

The pad transformers are interconnected on the high voltage side to underground cables that connect all of the turbines together electrically. The underground (UG) cables are installed in trenches that are typically 3-4 feet deep and run beside the Project's roadways as shown in Figure 2.2.3.4-2. Alongside the electrical cables will be buried a fiber optic or copper communication line which will tie all of the turbines back to the central control computer as illustrated in Figure 2.2.3.3-3. Due to the rocky conditions at the site, a clean fill material such as sand or fine gravel will be used to cover the cable before the native soil and rock are backfilled over the top.

Figure 2.2.3.4-1 shows a typical pad-mount transformer used at each wind turbine. The pad transformers are generally a loop feed, dead front configuration with bayonet and current limiting fuse systems for protection and safety. Each transformer will be sized to carry its respective load without exceeding a 55 °C temperature rise. The step-up transformer impedance will be optimized based on the facility power output requirements, and feeder circuit breaker interrupting ratings and internal fuses. Protection to the transformer and turbine generator is provided by a switchable breaker at the turbine bus cabinet electrical panel inside the turbine tower.

Figure 2.2.3.4-3 Collection System Overhead Line - Pole Structure



The underground collection cables feed to larger feeder lines that run to the step-up substation(s) as shown schematically in Figure 2.2.3.3-3. At the substation(s), the electrical power from the entire wind plant is stepped up to transmission level at 230 kV or 287 kV (for BPA) and delivered to the point(s) of interconnection.

<u>Collection System Overhead Line</u>

For the short run of overhead collection 34.5 kV power line on the north side of Whiskey Dick Mountain, a dual circuit single pole structure system will is anticipated to be used approximately 60 feet tall as shown in Figure 2.2.3.4-3, a fused, switch-riser pole will be used to run the cables from the underground trench to the overhead conductors.

<u>Junction Boxes and Switch Panels</u>

In locations where two or more sets of underground lines converge, pad mounted junction boxes and/or pad mounted switch panels will be utilized to tie the lines together into one or more sets of larger feeder conductors and to allow for the isolation of particular strings of turbines. In total, it is anticipated that about 12 junction boxes and switch panels will be required for the electrical collection system. Both the junction boxes and switch panels look very similar to the pad transformer shown in Figure 2.2.3.4-1 and the anticipated locations of the pad-switches and/or junction boxes are indicated on the Project Site Layout in Exhibit 1-B.

The junction boxes are either steel clad or fiberglass panels with dimensions of roughly 4 feet wide by 6 feet long by 6 feet high, mounted on pad foundations. The pad foundation also has an underground vault about 3 feet deep where the underground cables come in. The junction boxes will also have a buried grounding ring with grounding rods tied to the collection system and a common neutral.

The switch panels are steel clad enclosures, mounted on pad foundations with dimensions of roughly 7 feet wide by 7 feet long by 5 feet high. The switches allow for the de-energization or isolation of particular collector lines and strings of turbines. This isolation allows for maintenance and repair of the collection system as needed without de-energizing the entire Project. The switch panels also have an underground vault about 3 feet deep where the underground cables come in. The switch panels will also have a buried grounding ring with grounding rods tied to the collection system and a common neutral.

The Project will require approximately 27 miles of underground and 2 miles of overhead 34.5 kV electrical power lines to collect all of the power from the turbines to terminate at the step-up transformer substation(s).

Operations and Maintenance (O&M) Facility

An O&M facility is planned near the center of the Project site out of sight from Vantage Highway as indicated on the Project Site Layout in Exhibit 1-B. The O&M facility will include a main building with offices, spare parts storage, restrooms, a shop area, outdoor parking facilities, a turn-around area for larger vehicles, outdoor lighting and a gated access with partial or full perimeter fencing. The O&M building will have a foundation footprint of approximately 50 ft. by 100 ft. The O&M facility area will be leveled and graded and will serve as a central base. The overall O&M facility area will have a footprint of approximately 2 acres. The final design and architecture of the O&M facility will comply with all required building standards and codes and be determined prior to its construction.

Water Storage Tanks and Septic System

The O&M Facility will include 1 to 2 on-site storage tanks approximately 5,000 gallons in size suitable for potable water to supply the building for domestic use. The O&M building will also have a septic tank.

Figure 2.2.3.5-1 Aerial View of Existing BPA Schultz Substation

2.2.3.5 Interconnection Facilities and Substations

Proximity to Transmission Access

The Applicant has reviewed and evaluated multiple prospective wind energy sites in various areas of the Pacific Northwest. The site for the Wild Horse Wind Power Project was chosen for several reasons including its strong wind resource, compatible land uses and access to suitable transmission lines.

There are several sets of large sized high voltage power lines within 8 miles of the Project site including 2 sets of Bonneville Power Administration (BPA) transmission lines and 1 set of Puget Sound Energy (PSE) transmission lines.

The Project offers excellent interconnection possibilities with both Bonneville Power Administration (BPA) and Puget Sound Energy (PSE) lines. If connected to BPA's system, the Project will interconnect with the Columbia to Covington 230 kV or with the Grand Coulee to Olympia 287 kV lines. If connected to PSE's system, the Project will interconnect with PSE's Inter-Mountain Power line (IP line) at 230 kV.

The Project substation and transmission facilities will consist of 1 or 2 step-up substations (indicated as the BPA and PSE step-up substations on the Site Layout in Exhibit 1-B), the PSE and BPA interconnection substations, and 1 to 2 feeder lines running from the step-up substation(s) to the interconnection substation(s). There is the possibility that power will be fed to both the BPA and the PSE systems resulting in the requirement for 2 step-up substations, 2 interconnection substations and 2 separate feeder lines.

The step-up substations are located on the Project site whereas the interconnection substations are located close to the existing BPA and PSE power lines respectively where interconnection takes place. The PSE interconnection substation would be located just north of where PSE's IP Line crosses I-90. The PSE point of interconnection (POI) would also serve as the PSE point of delivery (POD). The BPA interconnection substation would be located at BPA's existing Schultz substation, located approximately 14 miles northwest of the Project site. The locations of the on-site step-up substations, the feeder lines and the interconnection substations are indicated Exhibits 1-A and 1-B. Ownership and operation of both the BPA and PSE feeder lines as shown in Exhibits 1-A and 1-B are anticipated to remain under the Project.

BPA Interconnection

If connected to BPA's system, the Project will interconnect with the Columbia to Covington 230 kV or to the Grand Coulee to Olympia 287 kV lines near the existing Schultz substation as the point of interconnection (POI). The point of delivery (POD) for power from the Project, however, would be at the location where the Project's BPA feeder line intersects the existing BPA corridor approximately 5 miles west of the Project. If connecting to the BPA system, BPA will be responsible for permitting, constructing, owning and operating a new interconnection substation located near its existing Schultz substation as well as a new feeder line extension between the POI and the POD. The full details of the Project's BPA interconnection would be included in the BPA's environmental review that would be prepared in a separate document and reviewed by the public and interested agencies under a joint NEPA/SEPA process. The Project's viability does not depend on the interconnection with BPA since interconnection can also be achieved with the PSE system.

Step-Up Substations

The main function of the step-up substation is to step up the voltage from the collection lines (at 34.5 kV) to the transmission level (287 or 230 kV) and to provide fault protection. The basic elements of the step-up substation facilities are a control house, a bank of 1 or 2 main transformers, outdoor breakers, capacitor banks, relaying equipment, high voltage bus work, steel support structures, an underground grounding grid and overhead lightning suppression conductors. All of the main outdoor electrical equipment and control house will be installed on concrete foundations that are designed for the soil conditions at the substation sites. The exact footprint of the substations will depend largely on the utility requirements, the number of turbines used and the resulting Project nameplate capacity which will affect the number of 34.5 kV feeder breakers. The substations and interconnection facilities would each consist of a graveled footprint area of approximately 2 to 3 acres, a chain link perimeter fence, and an outdoor lighting system.

Figure 2.2.3.5-2 Typical Step-Up Substation

The substation(s) will have one or two transformers which need to be filled with mineral oil on site, as they are delivered without oil in the tank. As part of the commissioning process of the main transformer(s), they will be filled and tested. The substation design will incorporate an oil containment system consisting of a perimeter containment trough, large enough to contain the full volume of transformer mineral oil with a margin of safety, surrounding the main substation transformers. The trough will be poured as part of the transformer concrete foundation, be set as a bentonite base, or will consist of a heavy oil resistant membrane buried around the perimeter of the transformer foundation. The trough and/or membrane will drain into a common collection sump area equipped with a sump pump designed to pump rain water out of the trough to the surrounding area away from any natural drainages. In order to prevent the sump from pumping oil out to the surrounding area, it will be fitted with an oil detection shut-off sensor which will shut off the sump when oil is detected. A fail-safe system with redundancy is built to the sump controls since the transformers are also equipped with oil level sensors. If the oil level inside a transformer drops due to a leak in the transformer tank, it will also shut off the sump pump system to prevent it from pumping oil and an alarm will be activated at the substation and at the main wind project control (SCADA) system.

Interconnection Substations

The main function of the interconnection substation is to mechanically terminate the Project feeder lines to the utility grid and to provide fault protection. The basic elements of the interconnection substation facilities are a main outdoor control cabinet, outdoor breakers, capacitor banks, relaying equipment, high voltage bus work, steel support structures, an underground grounding grid and overhead lightning suppression conductors. All of the main outdoor electrical equipment and control house will be installed on concrete foundations that are designed for the soil conditions at the substation sites. The exact footprint of the substations will depend largely on the utility requirements and the grid line characteristics at the point of interconnection. The substation(s) and interconnection facilities would each consist of a graveled footprint area of approximately 2 to 3 acres, a chain link perimeter fence, and an outdoor lighting system. In general appearance, the interconnection substation(s) will be very similar to the step-up substation(s) without the transformers, but with more steel poles structures and more high voltage switch breakers.

A typical one-line diagram showing both the interconnection and step-up substation(s) which would be used as a preliminary outline for the Project is included in Exhibit 2. Final adjustments to the substation and interconnect are generally made during design review with the interconnecting utility and their system protection engineers to accommodate for conditions on the grid at the time of construction.

The plant electrical system will be designed and constructed in accordance with the guidelines of the National Electric Code (NEC), National Fire Protection Agency (NFPA) and utility requirements. The general schedule for construction of the interconnection facilities and the substation shall be coordinated with the construction of the rest of the Project as outlined in Section 2.2.6, 'Project Construction Schedule and Work Force'.

Transmission System Impact Studies (SIS)

Applicant has contracted with both BPA and PSE to perform System Impact Studies (SIS) to determine the impact of injecting wind power into the grid at the proposed points of interconnection. The results of the SIS work indicates that both the PSE and BPA systems can accept the power at the proposed interconnection points. Applicant subsequently has commissioned both BPA and PSE to perform Facility Impact Studies (FIS) to determine the final tasks, schedule and costs required to interconnect with the Project.

Stand-By Power Consumption

The Project will generate power output approximately 80% of the time and will consume a small amount of power from the grid during periods of low wind. Unlike traditional power plants, the Project does not consume a large amount of power for start-up. Each wind turbine comes on line at random depending upon the local wind speed at each turbine location and power consumption is generally that used for the auxiliary systems at each turbine. As with any power plant, the transformers and auxiliary systems at the substation consume some power to stay energized. The turbines also consume some electricity to maintain power to the hydraulic systems, pumps, heaters, fans, controller electronics, lighting, etc. Overall, the Project will consume less than 1% of what it generates to support auxiliary systems with stand-by power.

Substation Transformers

The Substation is designed to work with either one or two main transformers. The step-up transformer impedances will be optimized based on the facility power output requirements and the protection requirements set forth by the utility to match the circuit breaker interrupting ratings. The transformers will be liquid-type with cooling fins and fans. Each transformer will be sized to carry its respective load without exceeding a 55 °C temperature rise. The quantity of mineral oil in each transformer is included in Section 3.16, 'Health and Safety - Spill Prevention Plan and Control'.

Capacitor Banks and Power Factor/Voltage Control

Capacitor banks will be installed at each wind turbine in a bus cabinet inside the base of each tower as well as in a central bank at the substation. The capacitor banks at the substation will be sized and configured depending on the utility's requirements and needs for switching and control. Generally, a remote terminal unit (RTU) is installed which allows the utility to switch banks on or off depending the requirements at their systems operations center. Capacitor banks have been included in the one-line diagram in Exhibit 2. The System Impact Study and Facility Impact Study work together with applicable IEEE standards will identify all provisions that will be required to maintain voltage stability and adequate system protection of the utility grid.

Protective Relaying

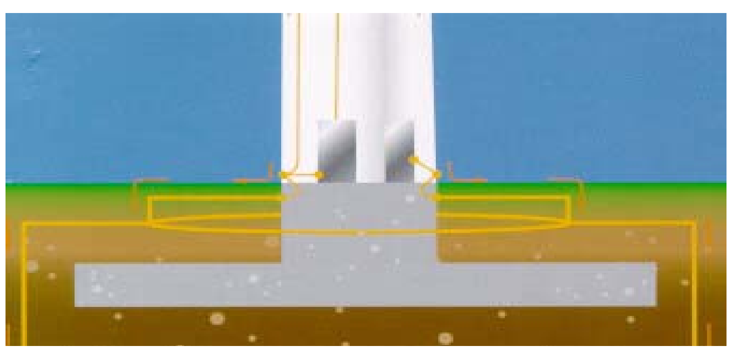
The substation central relay control cabinet generally houses all of the protective relaying devices. Protective relays are used for switchyard control, indication, metering, recording, instrumentation and annunciation. The relays provide protection of both the utility's and the wind plant's electrical systems by automatically detecting and acting to isolate faulted, or overloaded, equipment and lines. This protection will help to minimize equipment damage and limit the extent of associated system outages in the event of electrical faults, lightning strikes, etc.

Lighting

The substation will be equipped with night-time and motion sensor lighting systems to provide personnel with illumination for operation under normal conditions, and for egress under emergency conditions. Emergency lighting with back-up power is also designed into the substations to allow personnel to perform manual operations during an outage of normal power sources. See Section 3.11, 'Visual Resources - Light and Glare', for additional details.

2.2.3.6 Project Grounding System

Figure 2.2.3.6-1 Turbine Earthing System at Tower Base



The Project has an extensive grounding system. In order to achieve a strong level of grounding, a number of provisions are engineered into the Project's grounding system and the electrical system design.

Each turbine has a buried grounding ring of bare copper around the outer perimeter of the tower with 4 grounding rods, which is connected to the tower base and also to an additional grounding ring with 1-2 grounding rods which is buried around the base of the adjacent pad transformer. The pad transformers are generally a grounded "Wye" type unit. The neutral of each pad transformer is connected to the grounding rings and also to the grounding system of the wind turbine. If the soil is too rocky for the grounding rods, a hole is drilled, the rod is placed in the hole and it is filled with a designated bentonite mix to ensure a surrounding ground contact. The grounding system is measured and must have a maximum resistance of 10 Ohms.

Turbine Lightning Protection and Grounding System

The WTGs are equipped with an engineered lightning protection system that connects the blades, nacelle, and tower to the earthing system at the base of the tower.

As above the wind vane and anemometer at the rear of the nacelle. Both the rear lightning rod and blades have conductive paths to the nacelle bed frame that in turn connects to the tower. The tower base is connected to the earthing system at diametrically opposed points.
Figures 2.2.3.6-1 and 2.2.3.6-2 show the general arrangement of the earthing system with respect to the tower and foundation.

The earthing system consists of a copper ring conductor connected to earthing rods driven down into the ground at diametrically opposed points outside of the foundation. The earthing system, with a resistance of less than 10 Ohms, provides a firm grounding path to divert harmful stray surge voltages away from the turbine.

The controllers and communication interfaces to the wind farm central control system are through fiber optic cables and optical signal conversion systems protecting these systems from stray surges.

Underground Collection System Grounding

The underground 34.5 kV cables will have a concentric neutral conductor shielding or will be buried with a bare copper wire in the trench to act as the neutral. The neutrals on the cable runs are terminated to the ground terminal at each pad transformer and, pursuant to National Electric Code (NEC) requirements, are tied to buried grounding rods at every ¼ mile. Additionally, at the junction boxes, pad switches and at the substation, the underground cable neutrals are tied to the common

Figure 2.2.3.6-2 WTG Lightning Diversion Paths

grounding system. In effect, the grounding system ties the tips of the blades of each turbine back to an extensive grounding network all the way back to the substation grounding grid. The detailed geotechnical investigation performed prior to final design will include testing to measure the soil's electrical and insulative properties to ensure that the grounding system and electrical design is adequate.

Substation Grounding System
The electrical system is susceptible to ground faults, lightning and switching surges that may result in high voltage which can constitute a hazard to site personnel and electrical equipment, including protective relaying equipment. The substation will be designed and constructed to have a robust grounding grid which will divert stray surges and faults. Generally, the substation grounding grid consists of heavy gauge bare copper conductor buried in a grid fashion and welded to a series of multiple underground grounding rods. Direct lightning strike protection will be provided by the use of overhead shield wires and lightning masts connected to tops of the steel dead-end structure poles which run to the switchyard ground grid. Overhead shield wires will be high strength steel wires arranged to provide shield zones of protection.

Figure 2.3.7-1 Met Tower

2.2.3.7 Meteorological Monitoring Station Towers

The Project design includes five permanent meteorological (met) towers that are fitted with multiple sensors to track and monitor wind speed and direction and temperatures. The met towers will be connected to the wind plant's central SCADA system as shown in Figure 2.2.3.3-3. The permanent towers will consist of a central lattice structure supported by 3 to 4 sets of guy wires and will be as tall as the hub height (HH) of the WTGs as shown in Figure 2.2.1-1 which is 46-80 meters (151-262 ft.).

Each met tower will also have a grounding system similar to that of the wind turbines with a buried copper ring and grounding rods which will all be tied to the lightning dissipaters or rods installed at the top of the towers to provide an umbrella of protection for the upper sensors.

2.2.3.8 Rock Quarries and Rock Crushing Facilities

Site Proximity to Existing Gravel and Concrete Sources
Due to the relatively large amounts of gravel and concrete required for the Project and the remote location of the Project site away from any existing rock quarries or concrete batch plants, three temporary rock quarries and one temporary concrete batch plant will be established on the Project site during construction. The use of existing off-site rock pits and concrete mixing plants would require more than 17,000 additional heavy truck trips to and from the Project site during construction.

Rock Quarries

A total of three temporary on-site rock quarries are planned for the Project. Each rock quarry will have a disturbance footprint of approximately 5 acres and the depth will be approximately 10-20 feet depending on the type of rock encountered at each location. The total volume of excavated material is expected to be between 200,000 and 300,000 cubic yards depending on the rock characteristics and dirt content at each of the quarry sites. Applicant anticipates that all three temporary on-site quarries could be operational concurrently depending on the material requirements of each construction phase.

Each quarry location is indicated on the Project Site Layout in Exhibit 1-B. Preliminary geotechnical analyses from 15 test pits throughout the site indicate that excavating equipment will likely encounter a very hard (R5) basalt layer at a depth between 1-3 feet. Following blasting to fracture and loosen the basalt, rock will be transported to the rock crusher. The majority of the crushed rock will be used for road building during early construction phases, with a small amount of gravel transported to the concrete batch plant for use in concrete slurry during the foundation construction phase. Blasting activities will be conducted under the auspices of professionally trained and certified explosives experts and will employ industry-standard techniques. Peak production at any one quarry is expected to total 30,000 tons of gravel per day, with an average expected production of 20,000 tons per day. The quarry would become operational two weeks prior to road construction activities and would remain in operation until WTG foundations are completed. Please see "Blasting Activities" in Section 2.2.5.3 'Site Preparation and Road Construction', for more details about explosives work on-site.

A reclamation plan for the proposed rock quarries will be submitted to EFSEC for review and approval prior to construction and will include replacement of unused material and re-seeding each location with a designated mixture of native grasses. More details regarding site restoration of the rock quarries is contained in Section 3.1.4, 'Earth – Mitigation Measures'.

Portable Rock Crusher

The primary construction-related portable equipment required for the Project is the rock crusher to create road construction material and a concrete batch plant for mixing cement. The rock crusher will be located at one of the three on-site quarry pits for the duration of the construction period and will have an average capacity of approximately 20,000 tons per day and a peak capacity of 30,000 tons per day. The crusher will operate during Project construction hours, 5 to 6 days per week during daylight hours for approximately 2 to 3 months during construction. The crusher will be located in an area approximately 500' by 500' in size, surrounded by a 1' high earth berm to contain water runoff. This area will be sprayed by a water truck several times each day for dust suppression. The crusher contains several dust-suppression features including screens and water-spray. Effective dust-control measures will be operating at all emission points during operation, including start-up and shut-down periods. During periods of sustained high winds contractors will shut down operation of the rock crusher if reduced visibility poses a safety hazard. At no point will emissions exceed the 20% opacity for three minutes in any single hour, which is the state maximum threshold. Exhibit 7 contains a Temporary

Air Quality Department of Ecology permit application for the type of rock crushing equipment anticipated for the Project. More details regarding dust suppression are contained in Section 3.2, 'Air Quality'.

The crusher will be provided by a local supplier and will require a stand-alone 40-60 kW generator unit that will draw fuel from a fuel storage tank approximately 1,000 gallons in size cradled in a containment seat. The crusher will consume approximately 30,000 to 50,000 gallons of water per day, drawn from a 20,000 gallon adjacent water storage tank that will be replenished 2 to 3 times daily. The average rate of water usage for the rock crusher is approximately 60-80 gallons per minute and the peak rate will be up to 125 gallons per minute. The equipment will be a licensed system with a current WA Department of Ecology (DOE) Temporary Air Quality permit, similar to that contained in Exhibit 7.

2.2.3.9 Concrete Batch Plant

The cement batch plant will be located on-site at a central location within an area approximately 500' by 500' in size, surrounded by a 1' high earth berm to contain water runoff. It will have a daily production capacity of approximately 600 cubic yards per day and will operate during Project construction hours of 10 hours per day, 5 to 6 days per week during daylight hours for approximately 3 to 4 months during construction. The peak production at the batch plant is approximately 700 cubic yards per day. The batch plant will be provided by a local supplier and will require a stand-alone generator unit approximately 250 kW in size that will draw fuel from a self-contained, fail-safe storage tank of approximately 1,000 gallons. The batch plant will consume approximately 20,000 to 40,000 gallons of water per day, drawn from a 20,000 gallon adjacent water storage tank that will be replenished as needed. The batch plant will also carry an operating permit from the WA DOE.

The batch plant will utilize outdoor stockpiles of sand and aggregate. These stockpiles will be located to minimize exposure to wind. Cement will be discharged via screw conveyor directly into an elevated storage silo without outdoor storage. Construction managers will exercise good housekeeping practices and conduct regular cleanings of the plant, storage and stockpile areas to minimize buildup of fine materials.

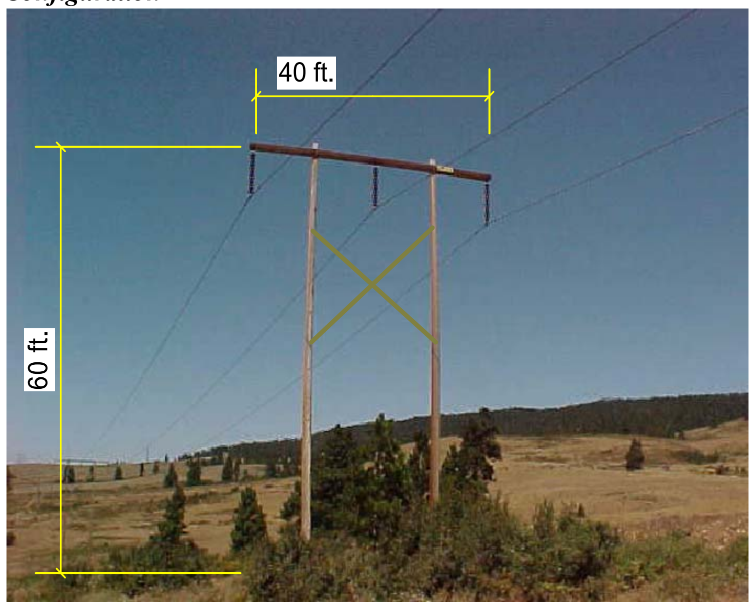
Following completion of construction activities the Applicant's contractor will rehabilitate the sites by dragging the top of both of the 500' x 500' crushing and batch plant areas with a blade machine and re-seeding the area with a designated mixture of native grasses.

2.2.3.10 Project Transmission Feeder Lines

Power from the Project will be fed from the on-site step-up substation(s) through a feeder line(s) to the interconnection substation(s). The feeder line(s) will consist of a wood frame H-pole configuration roughly 60 feet tall, a 40 foot long top cross arm and with spans of approximately 500 to 700 feet between pole structures. Figure 2.2.3.10-1 shows the typical pole line configuration anticipated for the feeder line(s). The line design will be adequate to carry the full amount of power, up to 312 MW, with additional adequate safety margins to comply with design codes and standards.

The feeder line(s) will be constructed along a 150 foot wide right of way easement secured for the Project. The schedule and plan for construction of the feeder line(s) is described in detail in Section 2.2.5, 'Construction Methodology'.

Figure 2.2.3.10-1 Typical Wood Pole H-Frame Feeder Line Configuration



<u>*Project Feeder Line to PSE*</u>

For interconnection with PSE, the Project feeder line will run south from the on-site PSE step-up substation to the PSE interconnect substation and will run over private land for a total of approximately 8 miles. The point of interconnection with PSE's IP Line would also be designated as the PSE point of delivery (POD) for the Project. Two road crossings are required, one over Vantage Highway and one over Stevens Road Exhibit 1-B, 'Project Site Layout'.

<u>*Project Feeder Line to BPA*</u>

If connected to BPA's system, the Project will interconnect with the Columbia to Covington 230 kV or to the Grand Coulee to Olympia 287 kV lines near the existing Schultz substation as the point of interconnection (POI). The point of delivery (POD) for power from the Project, however, would be at the location where the Project's BPA feeder line intersects the existing BPA corridor approximately 5 miles west of the Project. The Project's BPA feeder line runs west from the on-site BPA step-up substation to the existing BPA Schultz to Vantage 500 kV line corridor to the BPA point of delivery (POD) as shown in Exhibit 1-B, Project Site Layout'. If connecting to the BPA system, BPA will be responsible for permitting, constructing, owning and operating facilities interconnecting to their system, including a new interconnection substation located near its existing Schultz substation as well as a new 230 or 287 kV line between the BPA POI and BPA POD which are not subject to EFSEC's jurisdiction. The full details of the Project's BPA interconnection would be included in the BPA's environmental review that would be prepared in a separate document and reviewed by the public and interested agencies under a joint NEPA/SEPA process. The Project's viability does not depend on the interconnection with BPA since interconnection can also be achieved with the PSE system.

2.2.4 Design Criteria for Protection From Natural Hazards

Introduction

The Project design has been prepared to handle all natural hazards that could reasonably be expected at the site including wind, rain (heavy erosion), snow, ice and lightning storms, wild fires, and geologic hazards, such as seismic hazards (earthquakes), volcanic eruptions, and landslides. Tsunamis are not considered hazards to the site because of the Projects' high elevation on ridgelines and large distance to the nearest ocean. Because Project facilities would be located significantly outside the floodplain of the Columbia River (the closest road or turbine location to the Columbia River is more than 10 miles and 2,400 feet in elevation above the level of the river) and other water bodies, the risk of flood impacts is insignificant and is therefore not discussed here.

The following section describes the types of potential natural hazards that could occur in the area, the probability of the event occurring at the Project site, and special design measures used to protect the Project from the hazard.

2.2.4.1 Storm Design

Wind Storms

Extreme gust wind speeds have been measured and calculated for Ellensburg in a report prepared by Wantz and Sinclair 1981, J. Appl. Meteor., 20, 1044-1411, which indicates that the 100 year expected peak gust is 73 mph which is at hurricane level. The design case for all facility equipment, specifically the turbines and towers, are designed to withstand wind loads far in excess of this gust level. The tower design is certified by experienced and qualified structural engineers who have designed several generations of turbine towers that have proven themselves well in some of the most aggressive wind regions of the world. The towers and foundations are designed for a survival gust wind speed of 90+ mph with the blades pitched in their most vulnerable position.

Ice and Snow Storms

Ice storms are a relatively rare event at the Project Site (approximately 4-5 days per year as indicated by Nierenberg, 2003 in Exhibit 27). Overhead collector lines, transmission feeder lines and the wind turbine and met tower anemometers and wind vanes are the only elements of the Project facilities which are susceptible to ice loading.

Overhead power lines are designed to met the recommended loads by National Electric Safety Code (NESC). Section 25 of the NESC provides general wind and ice loading maps and methods for determining the resulting design loads on structures and conductors. These methods closely follow the American Society of Civil Engineers (ASCE) Manual 7. Local experience will also guide the designers to determine the maximum wind and the maximum ice loading that might be anticipated in this area.

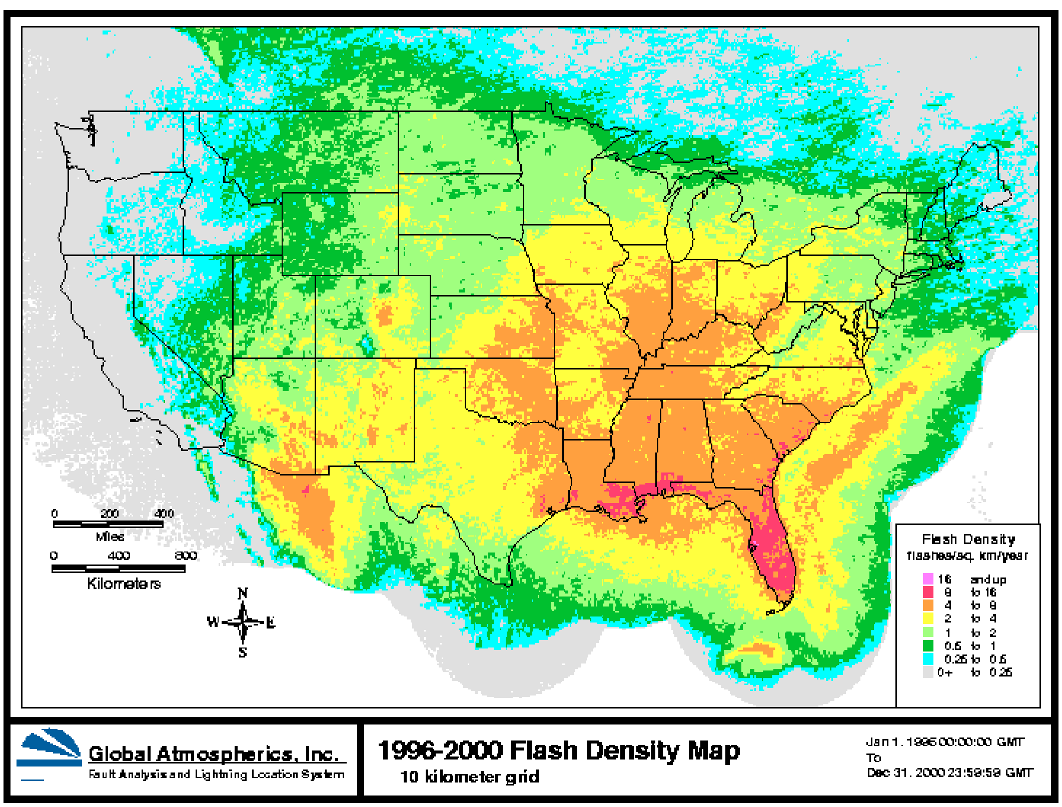
Section 26 of the NESC provides the strength requirements for the structural system, including foundations. The embedment and backfill for all poles, and the installation of guys and anchors, will be designed to the strength of the area soils. Sufficient geotechnical investigations will be conducted to characterize soils for this purpose.

Wind turbine anemometers and wind vanes will be heated units to prevent freezing. Also, for the cold-weather winter conditions on the Project site, special material specifications are set for material under load, especially towers, etc. to ensure that materials do not go below the brittle transition temperature.

Lightning Storms

As shown in the flash density map in Figure 2.2.4.1-1 below, the Kittitas Valley and interior Washington in general, is not a highly lightning prone area. In fact, this area falls in the second lowest of eight categories of lightning intensity. The map is based on data from lightning flash sensors installed nation-wide over a four-year period. Despite the low incident occurrence of lightning at the Project site, the Project has been designed with an extensive grounding system to divert stray surges to the ground. Additionally, all critical electrical and control systems at both the substation and wind turbines are fitted with MOVE type lightning suppressors for lightning protection.

Figure 2.2.4.1-1 Lightning Flash Density Map of the US



2.2.4.2 Seismic Hazards

The seismic hazards in the region results from three seismic sources: interplate (subduction) events, intraslab events, and crustal events. Each of these events has different causes, and therefore produces earthquakes with different characteristics (that is, peak ground accelerations, response spectra, and duration of strong shaking).

Two of the potential seismic sources, subduction and intraslab events, are related to the subduction of the Juan De Fuca plate beneath the North American plate. Subduction events occur as a result of movement at the interface of these two tectonic plates. Intraslab events originate in the subducting tectonic plate, away from its edges, when built-up stresses in the subducting plate are released. These source mechanisms are referred to as the Cascadia Subduction Zone (CSZ) source mechanism. The CSZ originates off the coast of Oregon and Washington and subducts beneath both states. The two source mechanisms associated with the CSZ currently are thought to be capable of producing moment magnitudes of approximately 9.0 and 7.5, respectively (Geomatrix, 1995).

Earthquakes caused by movements along shallow crustal faults, generally in the upper 10 to 15 miles of the crust, result in the third source mechanism. In Washington, these movements occur on the crust of the North American tectonic plate when built-up stresses near the surface are released. According to the Washington Division of Geology and Earth Resources (WDGER), all earthquakes recorded in eastern Washington have been shallow, with most measured at depths less than 3.7 miles.

Construction Earthquake Hazard Protection Measures
The State of Washington's current regulations for design use the 1997 Uniform Building Code (UBC). Pertinent design codes as they relate to geology, seismicity, and near surface soils are in Chapter 16, Divisions IV and V, Earthquake Design and Soil Profile Types, respectively (UBC, 1997). All facilities for the Project must be designed to at least these minimum standards.

Current engineering standards (UBC) will be used in the design of the Project facilities. These standards require that under the design earthquake, the factors of safety or resistance factors used in design exceed certain values. This factor of safety is introduced to account for uncertainties in the design process and to ensure that performance is acceptable. Application of the UBC in Project design will provide adequate protection for the Project facilities and ensure protection measures for human safety, given the relatively low level of risk for the site.

As noted in Section 3.1, 'Earth', based on lack of historic seismicity, earthquakes are not considered to pose a significant hazard to the proposed Project and further investigation or other mitigation measures are not warranted.

The Project area is not considered susceptible to liquefaction or lateral spreading, because liquefaction and lateral spreading require loose, saturated soils. The Project site is underlain by bedrock well above the water table. In addition, the probability of a significant earthquake event occurring during the construction activities is extremely remote. Seismic impact hazard during construction is negligible. The probability that the crustal faults in the region are active is relatively low, and, therefore, the potential for fault offsets during a large earthquake also appears to be very low.

2.2.4.3 Landslide Avoidance

Most Project facilities are not located on unstable slopes or landslide-prone terrain. The turbines are located on top of ridges and relatively flat areas, and not on slopes. Therefore, sliding of the materials is not expected. However, a large landslide is mapped on the south side of Whiskey Dick Mountain, as indicated on the map provided in Exhibit 4, 'Geotechnical Data Report'. (also see Section 3.1, 'Earth'). The location of this slide and its mechanisms of behavior could affect final turbine locations in the vicinity of the C and D strings and prior to construction a detailed geotechnical investigation including ground penetrating radar (GPR) and geotechnical drilling will be performed as necessary at each turbine location to determine if turbine locations should move slightly or be eliminated.

Field observations in this area indicated hummocky, disturbed terrain and springs. Prior to construction of the Project, further detailed site investigations utilizing ground penetrating radar (GPR) and geotechnical drilling will be conducted to delineate the limits of potential landslide area to ensure that the turbines are not placed in potentially unstable terrain. Turbine foundations anchored in or adjacent to unstable terrain or areas of past landslides have the potential for failure. At the present time, the distance separating wind turbines and their facilities (approximately 800 feet, minimum) from the mapped landslide boundary appears to be adequate. However, further exploration and evaluation of wind turbine loads and subsurface stability in this area will be conducted in order to provide final recommendations for minimum safe setback distances from slide areas.

In general, the Project is located in relatively low-gradient topography with a thin veneer of soil that overlies basaltic bedrock. Therefore, risk of a landslide appears to be minimal overall, aside from the area of concern discussed in the above paragraph. Observations of the site conducted during the geotechnical investigation and geologic site reconnaissance indicate that potential landslide-prone terrain is not visually apparent on the Project site in the vicinity of the proposed wind turbines. If slope failure were to occur, the turbine strings are typically situated at a distance from steep slopes and the turbines and their associated foundation structures would not be affected.

In the event that facilities such as roads are constructed below slopes steeper than 21 to 30 degrees, soil movement and rock fall from alluvium overburden exposed along road cut banks could impact these roads if the cut bank slope were to fail (i.e., during an earthquake or from seasonal freeze/thaw action and slope raveling). However, the proposed site layout does not include any roads below such steep slopes. The road that traverses the north side of Whiskey Dick Mountain was constructed with minor cuts and fills, but no areas of instability were observed during site visits. Furthermore, because Project access roads are used infrequently during operations, the risk associated with rock fall and/or slope movement to a vehicle and driver is low.

2.2.4.4 Volcanic Hazard Design

Within the State of Washington, the USGS recognizes five volcanoes as either active or potentially active: Mount Baker, Glacier Peak, Mount Rainier, Mount Adams, and Mount St. Helens. In the last 200 years, only Mount St. Helens has erupted more than once (USGS, 2000a). Impacts on the Project from volcanic activity can be either direct or indirect.

Direct impacts include the effects of lava flows, blast, ash fall, and avalanches of volcanic products (Waldron, 1989). Indirect effects include mudflows, flooding, and sedimentation (Waldron, 1989). Data accumulated as a result of the 1980 Mount St. Helens eruption indicate that there could be ash fallout in the geographic region surrounding the Project site if one of the five regional volcanoes were to erupt.

To help protect against the blast of dust and ash to the Project, all outdoor Project facilities key for operation are coated with corrosion resistant coatings. The turbine rotor blades and other fiberglass shrouds such as on the nacelles are very resilient to wind blown dust and precipitation. The turbines also have a closed loop air cooling system within a closed nacelle. As such, internal electrical equipment and machinery is not exposed to outside air and wind blown dust. Cooling air is drawn up from within the tower which has venting and filtering in the tower doors.

2.2.4.5 Erosion Control Design

Heavy Rain Storms: Erosion Potential
A detailed construction Storm Water Pollution Prevention Plan (SWPPP) will be developed for the Project to help minimize the potential for discharge of pollutants from the site during construction activities. The SWPPP will be designed to meet the requirements of the Washington State Department of Ecology General Permit to Discharge Storm water through its storm water pollution control program (Chapter 173-220 WAC) associated with construction activities.

The SWPPP will include both structural and non-structural best management practices (BMPs). Examples of structural BMPs could include the installation of silt curtains and/or other physical controls to divert flows from exposed soils, or otherwise limit runoff and pollutants from exposed areas of the site. Examples of non structural BMPs include management practices such implementation of materials handling, disposal requirements and spill prevention methods.

The SWPPP will be prepared and provided to EFSEC for review and approval, along with detailed Project grading plan design by the Engineering, Procurement and Construction (EPC) Contractor when design level topographic surveying and mapping is prepared for the Project site. Implementation of the construction BMPs is carried out by the EPC Contractor, with supervison by the Project's resident Site Environmental Protection Manager (SEPMA) who will be responsible for implementing the SWPPP.

Site-specific BMPs will be identified on the construction plans for the site slopes, construction activities, weather conditions, and vegetative buffers. The sequence and methods of construction activities will be controlled to limit erosion. Clearing, excavation, and grading will be limited to the minimum areas necessary for construction of the Project. Surface protection measures, such as erosion control blankets or straw matting, also may be required prior to final disturbance and restoration if potential for erosion is high.

A reclamation plan for the proposed rock quarries will be submitted to EFSEC for review and approval prior to construction.

All construction practices will emphasize erosion control over sediment control through such activities as the following:

- Straw mulching and vegetating disturbed surfaces;
- Retaining original vegetation wherever possible;
- Directing surface runoff away from denuded areas;
- Keeping runoff velocities low through minimization of slope steepness and length; and
- Providing and maintaining stabilized construction entrances.

A more detailed description of the materials, methods and approaches used as part of the BMP for effective storm water pollution prevention and erosion control is provided in Section 3.3.2, 'Water Resources-Impacts of the Proposed Action - Construction'.

2.2.4.6 Fire Restraint Design

In order protect against the threat of wild fires, the turbines, transformers, substations and all other Project facilities are surrounded by graveled areas by design and weed and vegetation control is managed as part of regular operations. The roads themselves act as fire breaks and help restrain the spread of fire.

2.2.4.7 Transmission Feeder Line Design for Natural Hazards

The transmission line structures and conductors, along with the guys and anchors, will be designed together as a structural system that safely supports conductor tensions and all anticipated environmental loads. The transmission line design will comply in all respects with the current edition of the National Electrical Safety Code (NESC), also known as American National Standards Institute C2. At this writing, the current edition is NESC-2002 Edition (ANSI C2-2002), and this standard is revised approximately every three years.

Wind and Ice Storm Loads
Section 25 of the NESC provides general wind and ice loading maps and methods for determining the resulting design loads on structures and conductors. These methods closely follow the American Society of Civil Engineers (ASCE) Manual 7. Local experience will also guide the designers to determine the maximum wind and the maximum ice loading that might be anticipated in this area.

Section 26 of the NESC provides the strength requirements for the structural system, including foundations. The embedment and backfill for all poles, and the installation of guys and anchors, will be designed to the strength of the area soils. Sufficient geotechnical investigations will be conducted to characterize soils for this purpose.

Seismic Hazard Design
Transmission lines are not rigid structural systems, and because of this, they have prven to be resistant to seismic damage. Seismic movements of structures and conductors tend to be damped by energy dissipating deflections of poles, insulators, and conductors. NESC Rule 250 A.4 stipulates the following: "The structural capacity provided by meeting the loading and strength requirements of Sections 25 and 26 provides sufficient capability to resist earthquake ground motions."

2.2.5 Construction Methodology

2.2.5.1 Introduction

The Project's wind turbines, site roads, underground cables, and other supporting infrastructure are located on ridge tops with good wind exposure and not in wetlands or watercourses. Environmental mitigation activities include the installation of erosion, drainage, and storm water systems along disturbed slopes. No special water rerouting or dewatering is required or anticipated for construction, as described in Section 3.3.2.1, 'Water Resources – Impacts of the Proposed Action - Construction'. Several pieces of large construction equipment will be required to complete Project construction as described in each of the sections below regarding the specific phase and discipline of construction.

The construction of the Wild Horse Wind Power Project will be performed in a manner that will incorporate the impact mitigation methods outlined in other sections of this application, including, but not limited to erosion control measures (see Section 3.3, 'Water Resources'); emission controls (see Section 3.2, 'Air Quality'); surface-water control measures (see Section 3.3. 'Water Resources'); spillage prevention and control measures (see Section 3.16, 'Health and Safety'); traffic control measures (see Section 3.15, 'Traffic and Transportation'); and other construction practice measures (see Section 3.13, 'Public Services and Utilities/Recreation') that will minimize the Project's impact on the environment and the surrounding area.

Project construction will be performed in several stages and will include the following main elements and activities:

- Grading of the field construction office and substation areas (also used for O&M building);
- Construction of site roads, turn-around areas and crane pads at each wind turbine location;
- Construction of the turbine tower foundations and transformer pads;
- Installation of the electrical collection system – underground and some overhead lines;
- Assembly and erection of the wind turbines;
- Construction and installation of the substation;
- Plant commissioning and energization.

The Applicant intends to enter into two primary agreements for the construction of the Project including an agreement for the supply, erection and commissioning of the wind turbines as well as an Engineering, Procurement and Construction ('EPC') contract for the construction of the balance of plant ('BOP') which includes all other Project facilities and infrastructure such as the roads, electrical collection system, substation (s), O&M Facility, etc.

Existing Conditions

The Project will be located on open rangeland which is zoned as Forest & Range and Commercial Agriculture by Kittitas County. The Project area has undergone thorough examination by wildlife and plant biologists to map and study the types of areas that will be disturbed by Project construction. An aerial view of the Project site layout is contained in Exhibit 1-C which illustrates the overall land types and proximity of the Project facilities to slopes and creek beds. The Project site is predominantly grassland and sparse to moderate shrub steppe with thin soil coverage due to high wind erosion and exposed fractured basalt. No wetlands or known jurisdictional waters have been identified in areas where Project facilities will be constructed.

2.2.5.2 Detailed Design and Specifications

Field Survey and Geotechnical Investigations:

Before construction can commence, a site survey will be performed to stake out the exact location of the wind turbines, the site roads, electrical cables, access entryways from public roads, substation areas, etc.

Once the surveys are complete, a detailed geotechnical investigation will be performed to identify subsurface conditions which will dictate much of the design work of the roads, foundations, underground trenching and electrical grounding systems. Typically, the geotechnical investigation involves a drill rig which bores to the engineer's required depths (typically 8 inch diameter drill to 30-40 feet deep) and a backhoe to identify the subsurface soil and rock types and strength properties by sampling and lab testing. Testing is also done to measure the soil's electrical properties to ensure proper grounding system design. A geotechnical investigation is generally performed at each turbine location, at the substation location and at the O&M building location.

Design and Construction Specifications:
Using all of the data that has been gathered for the Project including geotechnical information, environmental and climatic conditions, site topography, etc., the Applicant's engineering group will establish a set of site-specific construction specifications for the various portions of the Project. The design specifications are based on well proven and established sets of construction standards set forth by the approriate standard industry practice groups such as the American Concrete Institute (ACI), Institute for Electrical and Electronic Engineers (IEEE), National Electric Code (NEC), National Fire Protection Agency (NFPA), and Construction Standards Institute (CSI), etc. The design and construction specifications are custom tailored for site-specific conditions by technical staff and engineers. The Project engineering team will also ensure that all aspects of the specifications as well as the actual on-site construction comply with all of the applicable federal, state and local codes and good industry practice.

Equipment procurement will also be undertaken using the Project site specifications. The primary EPC Contractor will use the design specifications as a guideline to complete the detailed construction plans for the Project. The design basis approach ensures that the Project will be designed and constructed to meet the minimum 20 year design life.

2.2.5.3 Site Preparation and Road Construction

Construction activities will begin with site preparation, including the construction of Project site access entry ways from public roads, rough grading of the roads, leveling of the field construction site office parking area and the installation of about 6 to 8 temporary site office trailers sited near the O&M Facility Location indicated in Exhibit 1-B.

The Project roads will be gravel surfaced and generally designed with a low profile without ditches to allow storm water pass over top. Road construction will be performed in multiple passes starting with the rough grading and leveling of the roadway areas. Once rough grade is achieved, base rock will be spread and compacted to create a road base. A capping rock will then be spread over the road base and roll-compacted to finished grade.

Once heavy construction is complete, a final pass will be made with the grading equipment to level-out road surfaces and more capping rock will be spread and compacted in areas where needed. Water bars, similar to speed bumps, will be cut in to the roads in areas where needed to allow for natural drainage of water over the road surface and to prevent road washout. This will be done in accordance with a formal Storm Water Pollution Prevention Plan for the Project as outlined in Section 3.3.2, 'Water Resources'.

Water bars and sunken grades have been chosen over paved drainage channels across the roadways. Paved drainage channels have several disadvantages compared to water bars or sunken grades: (1) They tend to clog up with the road gravel and road capping rock fines; (2) They tend to wash-out along their sides creating a gap step between the road surface and the paved barrier hindering the access of larger vehicles with low-boy type trailers; (3) They tend not to dissipate the energy in the flowing water as it sheds from the road surface, causing it to accelerate and washout at the exit ends unless additional rock dams and silt fencing provisions are made. Water bars or sunken grades will be used to facilitate water shedding in steeper grade areas and rock dams with silt fencing or straw bales along with a re-seeding program will be used as the exit path of the water bars to prevent storm water pollution. During construction, areas with steeper grades which are prone to washout will be designed to shed water in one direction to a collection ditch fitted with rock dams and silt fencing or straw bales. Water bars will be graded into place once construction is complete.

The Project is located on open rangeland. Excavated soil and rock that arises through grading will be spread across the site to the natural grade and will be reseeded with native grasses to control erosion by water and wind. Larger excavated rocks will be used for reclamation of the gravel pits.

Project road construction will involve the use of several pieces of heavy machinery including bulldozers, track-hoe excavators, front-end loaders, dump trucks, motor graders, water trucks and rollers for compaction. Section 3.2.2, 'Air Quality-Impacts of the Proposed Action - Emissions' contains a description of anticipated on site construction vehicles. Storm water controls, such as hay bales and diversion ditches in some areas will control storm water runoff during construction. Access from Vantage Highway will have a controlled gate.

<u>Blasting Activities</u>

Blasting will be required throughout the construction phase of the Project. Blasting will be required at each of the three on-site gravel pits once the top layers of rock have been removed. Applicant expects that multiple charges would be set initially to fracture rock. This blasting would occur prior to assembly of the rock crusher on-site. Blasting will be conducted by licensed explosives professionals and will observe applicable regulations and industry best practices.

Additional blasting may be required at foundation sites depending on the substrate encountered. Such blasting would continue as required until all foundation sites have been excavated. Air quality impact estimates used in this application, are conservative and call for blasting at all WTG foundation sites to excavate 240 cubic yards of material from each. Applicant expects that actual blasting requirements will be significantly less than this estimate. Applicant estimates that an average of 2 to 3 WTG foundations will be completed each day during the foundation construction phase, with a peak rate of 4 WTG foundations per day.

2.2.5.4 Foundation Construction

The Project will require numerous foundations including bases for each turbine and pad transformer, the substation equipment and the O&M facility. Often, separate subcontractors are mobilized for each type of foundation they specialize in constructing.

Once the roads are complete for a particular row of turbines, turbine foundation construction will commence on that completed road section. Foundation construction occurs in several stages including drilling, blasting and hole excavation, outer form setting, rebar and bolt cage assembly, casting and finishing of the concrete, removal of the forms, backfilling and compacting, construction of the pad transformer foundation, and foundation site area restoration.

Excavation and foundation construction will be conducted in a manner that will minimize the size and duration of excavated areas required to install foundations. Portions of the work may require over excavation and/or shoring. Foundation work for a given excavation will commence after excavation of the area is complete. Backfill for the foundations will be installed immediately after approval by the engineer's field inspectors. The Applicant plans on using on-site excavated materials for backfill to the extent possible.

Based on preliminary calculations and depending on the type of foundation design used, approximately 125 cubic yards of excavated rock and soil will remain from each turbine foundation excavation. The excess soils not used as backfill for the foundations will be used to level out low spots on the crane pads and roads consistent with the surounding grade and reseeded with a designated seed mix of around the edges of the disturbed areas. Larger cobbles and rock will be crushed into smaller rock for use as backfill or road material. All excavation and foundation construction work will be done in accordance to a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 3.3.2, 'Water Resources-Impacts of the Proposed Action - Construction'.

The foundation work requires the use of several pieces of heavy machinery including track-hoe excavators, drill rigs, front-end loaders, dump trucks, transportation trucks for materials, cranes and boom trucks for off-loading and assembly, compactors, concrete trucks, concrete pump trucks, backhoes and small skid-steer type loaders. Foundation work will not require the use of any trucks for de-watering, as no de-watering is expected.

2.2.5.5 Electrical Collection System Construction

Once the roads, turbine foundations, and transformer pads are complete for a particular row of turbines, underground cables will be installed on that completed road section. First of all, a trench is cut to the required depth with a rock trencher. Due to the rocky conditions at the site, clean fill will be placed above and below the cables for the first several inches of fill to prevent cable pinching. All cables and trenches are inspected before backfilling. Once the clean fill is covering the cables, the excavated material is then used to complete the backfilling. In areas where solid rock is encountered close to the surface, blasting will be done or a shallower trench will be cut using rock cutting equipment and the cables will be covered with a concrete slurry mix to protect the cables and comply with code and engineering specifications.

The high voltage underground cables are fed through the trenches and into conduits at the pad transformers at each turbine. The cables run to the pad transformers' high voltage (34.5 kV) compartment and are connected to the terminals. Low voltage cables are fed through another set of underground conduits from the pad transformer to the bus cabinet inside the base of the wind turbine tower. The low voltage cable will be terminated at each end and the whole system will be inspected and tested prior to energization.

The short runs of overhead pole collector line on the north side of Whiskey Dick Mountain will require a detailed field survey to determine the exact pole locations. Once the survey and design work are done, the installation of poles and cross-arms to support the conductors can commence. The poles are first assembled and fitted with all of their cross-arms, cable supports and insulator hardware on the ground at each pole location. Holes for each pole will then be excavated or drilled and the poles will be erected and set in place using a small crane or boom truck. Once it is set in place, concrete will be poured in place around the base of the tower, or a clean fill will be compacted around the tower base according to the engineer's specifications. The overhead lines will connect to underground cables at each end through a switchable, visible, lockable riser disconnect with fuses.

Excavated soil and rock that is not reused in backfilling the trenches will be spread across the site to the natural grade to be reseeded with native grasses to control erosion by water and wind. Larger excess excavated rocks will be crushed or used in reclamation of gravel quarries. All excavation, trenching and electrical system construction work will be done in accordance to a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 3.3.2, 'Water Resources-Impacts of the Proposed Action - Construction'.

The electrical construction work will require the use of several pieces of heavy machinery including a track-hoe, a rock trencher, rock cutting equipment, front-end loaders, drill rigs for the pole-line, dump trucks for import of clean back fill, transportation trucks for the materials, small cranes and boom trucks for off-loading and setting of the poles and pad transformers, concrete trucks, cable spool trucks used to un-spool the cable, man-lift bucket trucks for the pole-line work and a winch truck to pull the cable from the spools onto the poles.

2.2.5.6 Substation Construction

The construction schedule for the substation(s) and interconnection facilities is largely dictated by the delivery schedule of major equipment such as the main transformers, breakers, capacitors, outdoor relaying equipment, the control house, etc. The utility (PSE and/or BPA) is generally responsible for the construction of the interconnection facilities, as they will remain under utility control and jurisdiction.

The substation(s) and interconnection facilities construction involves several stages of work including, but not limited to, grading of the area, the construction of several foundations for the transformers, steel work, breakers, control houses, and other outdoor equipment, the erection and placement of the steel work and all outdoor equipment, and electrical work for all of the required terminations. All excavation, trenching and electrical system construction work will be done in accordance to a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 3.3.2, 'Water Resources-Construction'. Once physical completion is achieved a rigorous inspection and commissioning test plan is executed prior to energization of the substation.

The substation and interconnection facilities construction work requires the use of several pieces of heavy machinery including a bulldozer, drill rig and concrete trucks for the foundations, a trencher, a back-hoe, front-end loaders, dump trucks for import of clean back fill, transportation trucks for the materials, boom trucks and cranes for off-loading of the equipment and materials, concrete trucks for areas needing slurry backfill, man-lift bucket trucks for the steel work and pole-line work, etc.

2.2.5.7 Wind Turbine Assembly and Erection

The wind turbines consist of 3 main components: the towers, the nacelles (machine house) and the rotor blades. Other smaller components include hubs, nose cones, cabling, control panels and tower internal facilities such as lighting, ladders, etc. All turbine components will be delivered to the Project site on flatbed transport trucks and main components will be off-loaded at the individual turbine sites.

Turbine erection is performed in multiple stages including: setting of the bus cabinet and ground control panels on the foundation, erection of the tower (usually in 2-3 sections), erection of the nacelle, assembly and erection of the rotor, connection and termination of the internal cables, and inspection and testing of the electrical system prior to energization.

Turbine assembly and erection involves mainly the use of large truck or track mounted cranes, smaller rough terrain cranes, boom trucks, rough terrain fork-lifts for loading and off-loading materials and equipment, flat bed and low-boy trucks for transporting materials to site.

2.2.5.8 Plant Energization and Commissioning (Start-Up)

Plant commissioning follows mechanical completion of the Project. Commissioning of the Project will commence with a detailed plan for testing and energizing the interconnection substation, feeder lines and step-up sustations and electrical collection system in a defined sequence with lock and tags on breakers to ensure safety and allow for fault detection prior to the energization of any one component of the system. Once the step-up substation is energized, feeder lines will be brought on-line one-by-one and then individual turbines will be tested extensively, commissioned and brought on-line one-by-one. Commissioning does not require any heavy machinery to complete.

2.2.5.9 O&M Facility Construction

Construction of the Operations and Maintenance (O&M) Facility will commence with the preparation and pouring of its foundation, framing the structure and roof trusses, installing the outer siding, installing plumbing and electrical work and finishing the interior carpentry.

Construction of the O&M Facility will require the use of concrete trucks, boom trucks for roof truss installation, and light trucks for transportation of materials.

2.2.5.10 Transmission Feeder Line Construction

Transmission Line construction will start with the surveying and staking of the transmission line corridor and tower locations. Once this is complete a construction trail will be cleared to allow for vehicle access and drilling of the holes for the poles will commence. Once the holes are excavated, the poles will be delivered, hardware will be assembled on the poles on the ground and the pole structures will be erected into place and stabilized in the holes with backfill and compaction or a slurry mix concrete as required.

Once construction is complete, disturbed areas will be reseeded to control erosion by water and wind. All construction clean-up work and permanent erosion control measures will be done in accordance with a formal Storm Water Pollution Prevention Plan (SWPPP) for the Project as outlined in Section 3.3.2, 'Water Resources-Impacts of the Proposed Action - Construction'.

Construction of the feeder lines will require the use of several pieces of heavy machinery including a back-hoe, rock drill rigs for the pole-line, dump trucks for import of clean back fill, transportation trucks for the poles and hardware, boom trucks for off-loading and setting of the poles, cable spool trucks used to un-spool the cable, man-lift bucket trucks for the pole-line work and a winch truck to pull the cable from the spools onto the poles.

2.2.5.11 Project Construction Clean Up

Since Project clean up generally consists of landscaping and earthwork, it is very weather and season sensitive. Landscaping clean up is generally completed during the first allowable and suitable weather conditions after all of the heavy construction activities have been completed. Disturbed areas outside of the graveled areas will be reseeded to control erosion by water and wind. All construction clean up work and permanent erosion control measures will be done in accordance to a formal Storm Water Pollution

Prevention Plan (SWPPP) for the Project as outlined in Section 3.3.2, 'Water Resources-Impacts of the Proposed Action - Construction'.

Other Project clean up activities might include interior finishing of the O&M building, landscaping around the substation area, painting of scratches on towers and exposed bolts as well as other miscellaneous tasks that are part of normal construction clean-up.

Construction clean up will require the use of a motor grader, dump trucks, front-end loaders, and light trucks for transportation of any waste materials, packaging, etc.

2.2.6 Project Construction Schedule and Workforce

2.2.6.1 Introduction

The construction of the Wild Horse Wind Power Project will be performed in several stages and will include the following main elements and activities:

- Grading of the field construction office area (also used for O&M building);
- Construction of site roads, turn-around areas and crane pads at each wind turbine location;
- Construction of the turbine tower foundations and transformer pads;
- Installation of the electrical collection system – underground and some overhead lines;
- Assembly and erection of the wind turbines;
- Construction and installation of the substation(s);
- Plant commissioning and energization.

The Applicant intends to enter into two primary agreements for the construction of the Project: including an agreement for the supply, erection and commissioning of the wind turbines as well as an Engineering, Procurement and Construction ('EPC') contract for the construction of the balance of plant ('BOP') which includes all other Project facilities and infrastructure such as the roads, electrical collection system, substation, O&M Facility, etc.

The construction schedules described below are based on obtaining a site certificate from Washington EFSEC by November 15, 2004.

The construction schedule will closely follow the construction methodologies discussed below in Section 2.2.5, 'Construction Methodology'.

2.2.6.2 Construction Schedule, Activities and Milestones

This section describes the engineering, procurement, construction, and start-up schedule milestones for the Project. For wind power projects, the longest lead-time items are typically the substation transformers, usually requiring from 8-12 months from time of order to delivery and the wind turbines, generally requiring from 5 to 8 months. These long lead-time items will be ordered as soon as possible immediately following obtaining site certification from EFSEC. WTG vendor and model selection will be determined following qualification of vendors and development of detailed site engineering and meteorological analyses. Following successful completion of this process, Applicant will begin negotiations and enter into a Turbine Supply Agreement from the final vendor. The process of qualification and negotiation is expected to take approximately four months in total, and will be substantially complete prior to issuance of the site certificate.

The proposed Project construction schedule summary showing the major tasks and key milestones is included below in Table 2.2.6.2-1. Also shown in Table 2.2.6.2-1 is the number of expected on-site personnel to perform each of the key tasks. It is expected that Project construction will occur over a period of approximately 12 months from the time of site certification to commercial operation and will require the involvement of about 250 personnel. A detailed construction schedule is being developed - these estimates reflect reasonable assumptions based on the currently available data.

Table 2.2.6.2-1 Proposed Project Construction Schedule Summary

	TASK / MILESTONE	**Start**	**Finish**	**Approx. On-Site Manpower for Task**
1	EFSEC Site Certification	15-Nov-04	15-Nov-04	
2	Engineering/Design/Specifications/Surveys	15-Nov-04	7-Jan-05	18
3	Order/Fabricate Wind Turbines	15-Nov-04	29-Apr-05	0
4	Order/Fabricate Substation Transformer	15-Nov-04	8-Jul-05	0
5	Road Construction	15-Apr-05	18-Aug-05	30
6	Foundations Construction	6-May-05	3-Nov-05	60
7	Electrical Collection System Construction	3-Jun-05	17-Nov-05	40
8	Substation Construction	4-Apr-05	19-Aug-05	20
9	Wind Turbine Assembly and Erection	3-Jun-05	27-Oct-05	40
10	Plant Energization	19-Aug-05	19-Aug-05	30
11	WTG Commissioning	22-Aug-05	11-Nov-05	15
12	Commercial Online Date	11-Nov-05	11-Nov-05	
	Total			**253**

Project Schedule with Different Turbine Sizes

The construction schedule would not be significantly affected by the selection of different WTG sizes or manufacturers. Ordering, delivery, and installation times for each size WTG from each manufacturer are substantially similar. The amount of road construction required under each scenario is the same. The installation of larger or smaller numbers of WTG's will impact the construction schedule as shown in table 2.2.6.2-2.

Table 2.2.6.2-2: WTG Alternative Configuration Impacts on Construction Schedule			
	Most Likely Scenario	**Large WTG Scenario**	**Small WTG Scenario**
Number of WTG's	136	104	158
Total Road mileage	31.7	31.7	31.7
Construction/ Erection days	45	35	53
Variance from Most Likely Scenario (days)	0	-11	7

Notes:

Assumes foundation construction/ erection of 3 WTG/day

The maximum variance under the different scenarios is less than two weeks.

2.2.6.3 Construction Workforce and Employment Levels

The amount of craft and noncraft employment is outlined in Table 2.2.6.3-1 "Labor Force Mix". Overall, the Project anticipates the involvement of about 250 on-site personnel.

Table 2.2.6.3-1 Construction Labor Force Mix (Approximate # Personnel)					
Construction Phase	**Project Management &Engineers**	**Field Technical Staff**	**Skilled Labor & Equip Operators**	**Unskilled Labor**	**TOTAL**
Engineering/Surveying/Design	6	12	0	0	**18**
Road Construction	5	5	15	5	**30**
Foundations Construction	3	4	23	30	**60**
Electrical Collection System Construction	2	3	23	12	**40**
Substation Construction	5	3	8	4	**20**
Wind Turbine Assembly and Erection	4	6	15	15	**40**
Plant Energization and Commissioning	5	10	15	0	**30**
Construction Punchlist Clean-Up	1	1	3	10	**15**
TOTALS	**31**	**44**	**102**	**76**	**253**

Table 2.2.6.3-2 "Construction Labor Resource Loading" presents the estimated total workforce resource loading, by month, for the construction of the Project. At peak, it is expected that about 160 personnel will be on-site at once as multiple disciplines of contractors complete their work simultaneously. All employees are assumed to work single 10-hour shifts, 5 or 6 days per week, as the work demands, for the duration of Project construction. During turbine erection, both stand-by days and days with double shifts are anticipated to allow for turbine erection in low wind conditions.

A detailed discussion of where the construction workforce is anticipated to come from, where they will be housed and how they will travel to the Project site is included in Section 3.12.2, 'Population, Housing and Economics – Impacts of the Proposed Action - Construction'. It is anticipated that roughly half of all construction worker vehicles will be parked at the O&M facility location and the other half will be dispersed across the various turbine strings. With a peak workforce of approximately 160 people, the maximum number of worker vehicles anticipated at any one time is approximately 107, assuming that efforts to encourage carpooling will result in about one third of construction workers carpooling to and from the Project site.

Table 2.2.6.3-2 Construction Labor Resource Loading (Approximate # Personnel)

Month Before Commercial Operation	Project Management &Engineers	Field Technical Staff	Skilled Labor & Equipment Operators	Unskilled Labor	TOTAL
14	6	0	0	0	**6**
13	6	12	0	0	**18**
12	5	5	15	5	**30**
11	8	9	38	35	**90**
10	10	12	61	47	**130**
9	10	12	61	47	**130**
8	10	10	54	46	**120**
7	10	10	54	46	**120**
6	14	16	69	61	**160**
5	14	19	38	19	**90**
4	9	16	30	15	**70**
3	9	16	30	15	**70**
2	9	16	30	15	**70**
1	5	10	15	0	**30**
0	5	10	15	0	**30**
CLEAN UP	1	1	3	10	**15**

2.2.7 Operations and Maintenance

2.2.7.1 Operating Schedule

The Project will be in operation 24 hours per day, 365 days per year. The Operations and Maintenance (O&M) team will staff the Project during core operating hours 8 hours per day, 5 days per week, from 8:00am to 5:00pm with weekend shifts and extended hours as required. The Project's central Supervisory Control and Data Acquisition (SCADA) system stays on-line full time, 24 hours per day, 365 days per year. In the event of turbine or plant facility outages, the SCADA system will send alarm messages to on-call technicians via pager or cell phone to notify them of the outage. The Project will always have a local, on-call local technician who can respond quickly in the event of any emergency notification or critical outage. Operating technicians will rotate the duty of being on-call for outages.

2.2.7.2 O&M Staff

The Project will be operated and maintained by a team of approximately 14 to 18 personnel consisting of the following staff positions:

Position	Number of Personnel
Project Asset Manager	1
Operations Manager	1
Operating Technicians	10-14*
Turbine Warranty Manager	1
Turbine Warranty Assistant	1
TOTAL	14-18

* depends on final quantity and type of turbine used

The Operating Technicians will be responsible for all routine maintenance of the WTGs, and therefore no additional staff will be present for routine maintenance operations. Emergency repair staffing would be dictated by the nature and extent of the emergency. The risk of such an emergency that would threaten life or safety is very low at an operating wind power project and has not occurred anywhere to-date.

2.2.7.3 Facility Availability

Typically, the wind blows enough at the Project site to allow the Project to generate power 80% of the time over the course of a year. Availability is defined as the amount of time the Project is ready and capable of producing power. The Wild Horse Wind Power Project will utilize heavy-duty, utility grade equipment. Other wind power projects with similar configurations and grades of high quality, reliable and proven equipment have demonstrated operating availability figures in the mid to high-90% range over the past decade. The availability of wind power projects rivals that of conventional power plants that are generally in the low-90 % to mid-90% range. The Project is expected to operate consistently with an availability in the mid-90% to high-90% percent range. Facility unavailability is due to several factors and generally is classified as scheduled (planned) or unscheduled (forced) outages.

2.2.7.4 Scheduled Maintenance - Planned Outages

The amount of downtime due to scheduled maintenance is generally very predictable from year to year. The proposed Project operating plan includes a planned outage schedule cycle that consists of WTG inspections and maintenance after the first 3 months of operation, a break-in diagnostic inspection, and subsequent services every 6 months. The 6-month service routines generally take a WTG off-line for just one day. The 6-month routines are very rigorous and consist of inspections and testing of all safety systems, inspection of wear-and-tear components such as seals, bearings, bushings, etc., lubrication of the mechanical systems, electronic diagnostics on the control systems, pre-tension verification of mechanical fasteners and overall inspection of the structural components of the WTGs. Blades are inspected and, if heavily soiled, rinsed once per year to maintain overall aerodynamic efficiency. Blade washing is not anticipated as a requirement for the Project since the fall and spring rains will remove most if not all blade soiling.
Electrical equipment such as breakers, relays, transformers, etc. generally require weekly visual inspections, which do not affect overall availability, and testing or calibrations every 1-3 years which may force outages.

Individual WTGs are taken off-line for maintenance, leaving the remaining WTGs in that string fully operational. Maintenance operations at the operating Project would service approximately 17-26 WTGs each month to maintain the 6-month service interval at each WTG.

To the extent practical, the short-term off-line routine maintenance procedures are coordinated with periods of little or no generation (i.e. low wind) as to minimize the impact to the amount of overall generation.

2.2.7.5 Unscheduled Maintenance - Forced Outages

Modern wind power projects generally operate with availabilities in the 95% to 99% range. Several components and systems of an individual wind turbine can be responsible for forced, non-routine outages such as the mechanical, electrical or computer controls. Most of the outages are from auxiliaries and controls and not the heavy rotating machinery. Most developing heavy machinery failures are found prior to failure, during the frequent inspections, so that the failing part is replaced prior to complete failure.

Although the newer control systems have added a high level of detection and diagnostic capability, they normally require frequent minor adjustments in the first few months of operation. As a result, availabilities of a wind power project are generally lower in the first few months until they are fully tuned. Once a wind plant is properly tuned, unplanned outages are generally very rare and downtime is generally limited to the routine service schedule.

The O&M facility is always stocked with sufficient spare parts to support high levels of availability during operation. The modular design of modern wind turbines results in the majority of parts being "quick-change" in configuration, especially in the electrical and control systems. This modularity and the fact that all of the turbines are identical allows for the swapping of components quickly between turbines to quickly determine root causes of failures even if the correct spare part is not readily available in the O&M building. As part of their supply agreements, major turbine equipment vendors guarantee the availability of spare parts for 20 years.

2.2.7.6 Project Capacity Factor

A power project's capacity factor is defined as the amount of energy it generates in a year divided by the amount of energy it could have generated if it operated at full output capacity and remained on-line 100% operating of the time for a full year.

$$\text{Capacity Factor} = \frac{\text{Total Energy Generated (MWh)}}{\text{Project Nameplate (MW)} * 8760 \text{ hrs/yr}} \quad X \ 100\%$$

Fuel burning power plants operate within a wide range of capacity factors ranging from as low as 2-3% for peaking generators, which come on line only to meet super peak demands a few times per year and accommodate for low water years, to as high as 60-80% for some of the primary system generators. Northwest hydro system facilities operate typically with capacity factors in the 40-60% range with the average running at about 50%. More exact figures for Northwest generating facilities can be obtained from the Northwest Power Planning Council's (NWPPC) website at http://www.nwppc.org/energy/powersupply/Default.htm.

As shown on the NWPPC web-site, the Grand Coulee dam indicates a capacity factor of just over 34% over its operating history. The Wild Horse Project is expected to operate with annual capacity factors in the range of 30-40% depending of the amount of wind resource that flows through the Kittitas Valley in a year.

Average Capacity (aMW = average MW)
A power project's average capacity is defined as the average amount of power output a facility generates over a full year. This is the same as:

Average Capacity = Capacity Factor * Nameplate Capacity (MW)

This is also called the "average MW" of a plant. Therefore, the Project will have an average capacity of approximately 30 to 40% of its installed nameplate capacity. With an installed nameplate capacity of 204 MW, the Project will have an average capacity in the range of 30% X 204 aMW = 61.2 MW to 40% X 204 MW = 81.6 aMW. For comparison, Grand Coulee Dam has an average capacity of 34.2% X 6,832.5 MW = 2,335 aMW.

2.2.8 Project Cost Estimates

The Project site presents several items which make the anticipated costs higher than other wind power projects including challenging terrain, relatively long feeder lines and at least 2 substations (one for voltage step-up and one for interconnection). Total project costs, including the equipment, construction, development, financing, permitting, legal, study costs etc. for projects similar to the one being proposed are typically $1,000 per kilowatt of installed nameplate capacity. Therefore Project cost would range from as low as $158 million to $312 million depending on the Project size and is expected to be in the $200 million range as defined in Table 2.2.8-1. Typically for wind power projects, the wind turbines make up 75% to 80% of the Project cost and the remaining portions of construction including soft costs of design and administration, financing, permitting, legal, etc., constitute 20% to 25% of the total cost.

Table 2.2.8-1 Project Cost Summary for Various Project Size Scenarios

	Most Likely Scenario	**Large WTG Scenario**	**Small WTG Scenario**
Turbine Nameplate	1.5 MW	1 MW	3 MW
Number of WTGs	136	158	104
Project Nameplate	204 MW	158 MW	312 MW
Estimated TOTAL COST (in millions)	$ 204	$ 158	$ 343