Chapter 2

Project Description

2.1 Introduction

HRW, an affiliate of RES and Renewable Energy Systems LTD, filed a Conditional Use Permit application with the Shasta County Department of Resource Management on June 6, 2006. RES proposes to construct and operate a wind energy project in eastern Shasta County. The proposed project site includes a portion of Hatchet Mountain, located approximately 7 miles west of the town of Burney and 34 miles northeast of Redding (Figure 1-1). The proposed project would be located on private land owned by Sierra Pacific Industries and the Fruit Growers Supply Company. HRW has a long-term lease agreement with Sierra Pacific Industries and is negotiating a long-term lease with Fruit Growers Supply Company for the parcels where the wind energy project would be developed.

HRW proposes to construct up to 68 three-bladed wind turbines along a 6.5-mile turbine string corridor on Hatchet Ridge. Each wind turbine would be installed on a tubular steel tower up to 262 feet (80 meters) tall. Each turbine/tower combination would have a maximum height of approximately 420 feet (128 meters), measured from the ground to the turbine blade tip at its highest point. The exact height and placement of the turbines and associated facilities within the development corridor would be determined by such factors as equipment manufacturer and environmental constraints. HRW has requested to make these final turbine and equipment siting determinations prior to construction but subsequent to this environmental analysis. However, the overall footprint of the turbines and associated facilities would not exceed the turbine development corridor boundaries as shown in Figure 2-1; the final permanent project footprint of the Hatchet Ridge Wind Energy project would be approximately 73 acres.

2.2 Background and Project Overview

The proposed project would generate up to 102 megawatts (MW) of electricity. The project may comprise up to sixty-eight 1.5-MW wind turbines (i.e., a 102-MW facility utilizing relatively small turbines) or as few as forty-two 2.4-MW wind turbines (i.e., a 100.8-MW facility utilizing relatively large turbines). The project configuration shown in Figure 2-1 is based on an array of forty-four 2.3-MW wind turbines, constituting a project with a generating capacity of 101.2 MW. The proposed project would be constructed in one or more phases and would include construction of an interconnection with an existing PG&E transmission line that crosses the leased property; the interconnection switching station would be owned by PG&E.

Each turbine would be mounted on a tubular steel tower, which would in turn be erected on a reinforced concrete foundation. The turbine foundations would generally be spaced 600–800 feet (183–244 meters) apart along a linear corridor near the crest of Hatchet Ridge. The wind turbines would be connected by an electrical collector cable system that would most likely be buried underground. The turbines would operate at wind speeds of approximately 8–56 miles per hour (mph).

HRW has determined the approximate location and end points of the turbine corridor. However, the number and spacing of turbines in the string would depend on the type and supplier of turbines that are ultimately selected by HRW. HRW has requested flexibility in the precise spacing and number of turbines in the turbine corridor, as well as in the location of the corridor within the leased area. Final selection of turbine type, siting, spacing, and clear areas would be determined in accordance with industry standards and safety measures. All final project location information would be provided to the Shasta County Department of Resource Management and other resource agencies prior to the initiation of project construction. It is anticipated that the construction period would last 6–12 months.

2.3 Project Location and Existing Site Conditions

Hatchet Ridge is a long, broad north-south trending ridgeline in the southern Cascade Mountains, leading to the summit of Hatchet Mountain at an elevation of approximately 5,470 feet. State Route 299, the main east-west highway through northeastern Shasta County, runs along the southern edge of the proposed project area. The project site is accessed from State Route 299 by an existing private road known as Bunchgrass Lookout Road, which extends north from State Route 299 along Hatchet Ridge (Figure 2-1). Most of the land east of Hatchet Ridge is either held by private timber companies or is under the jurisdiction of Lassen National Forest. Most of the land west of Hatchet Ridge is under private ownership or under the jurisdiction of the Shasta-Trinity National Forest.

In August 1992, the Fountain Fire burned 64,000 acres in eastern Shasta County, including the proposed project area. Sierra Pacific Industries replanted the burned areas along Hatchet Ridge in 1996 with ponderosa pine. However, the vegetation in the area is still recovering.

The communities of Burney, Moose Camp, Montgomery Creek, Wengler, and Big Bend are within several miles of the project vicinity (Figure 2-2).

Existing development on Hatchet Ridge consists of a pair of parallel 230-kilovolt (kV) transmission lines owned by PG&E, overhead and buried lower voltage electrical distribution lines, existing communication towers, and associated access roads. The project area also contains the Bunchgrass and Bear Springs radio facilities; the communication towers range in height from 50 to 140 feet. The owners/operators of the communication towers are Verizon, Jefferson Public Radio, and American Tower.

2.4 Wind Turbine Siting Considerations

RES uses a comprehensive and detailed process to evaluate and determine potentially suitable sites for wind energy projects. The evaluation of potential sites takes into consideration such factors as those listed below.

- **Wind speed and direction.** Sites with relatively high wind speeds can be used to generate relatively more electricity per wind turbine. Sites with topographical features (e.g., ridgelines) oriented perpendicular to the prevailing wind direction are preferred.
- **Proximity to existing transmission lines.** Utility-scale wind energy projects must interconnect to the existing electrical transmission system. Sites that are relatively close to existing transmission lines help to minimize the extent of needed electrical facilities.
- **Consistency with existing land uses.** Project sites with compatible existing land uses are preferred.
- **Environmental considerations.** Environmental considerations typically include existing habitat, avian and bat use, presence of listed and sensitive species, historical and archaeological resources, proximity to existing homes, proximity to airports and military flight routes, and visual impacts.
- **Proximity to utilities with demand for electricity derived from renewable energy.** There must be customers for the electricity produced by the wind energy project.

In considering the viability of a wind energy facility, the size of the proposed project is constrained by two separate and unrelated factors: the limited acreage suitable for supporting wind turbines within the project area, and the capacity of the existing PG&E transmission lines to carry additional power generation. HRW has determined that the proposed project can support the placement of up to 68 wind turbines and that the existing 230 kV lines that pass through the leased area can support up to 125 MW of generating capacity.

Wind speed and direction are other considerations for siting/placement of the turbines. Meteorological data indicate that wind at Hatchet Ridge blows primarily from southwest to northeast. While the turbines rotate automatically to orient into the prevailing wind, the turbine blades will face southwest most of the time. Microwave paths also affect siting of wind turbines; HRW is currently conducting a microwave analysis to optimize siting.

2.5 Project Objectives

The overarching objective of the proposed project is to harness wind power in order to generate and deliver electricity derived from renewable energy to one or more electric utilities. The specific objectives are listed below.

- Develop a wind power project in close proximity to existing transmission line with available capacity to receive power generated by the project.
- Develop a wind power project in a location that will have minimal impacts on birds, bats, vegetation, and other environmental resources.
- Utilize a wind resource area previously identified by the California Energy Commission as a potential site.
- Meet regional energy needs in an efficient and environmentally sound manner.

- Assist California in meeting its legislated Renewable Energy Portfolio standards for the generation of renewable energy in the state; these standards require investor-owned utilities to purchase 20% of their power from renewable sources by 2017.
- Offset the need for additional electricity generated from fossil fuels (which, unlike wind power, emit air pollutants), thereby assisting the state in meeting its air quality goals and reducing greenhouse gases.
- Develop a wind project that will produce up to 102 MW of electricity.
- Develop an economically feasible wind energy project that will support commercially available financing.

2.6 Proposed Project Components

The proposed project would consist of the components listed below. The areal extent of each component is shown in Table 2-1.

- Wind turbine generators erected on tubular steel towers approximately 16 feet in diameter at the base, set on concrete foundations, with associated crane pads, laydown areas, and transformer pads.
- A 34.5 kV electrical system used to collect energy from all wind turbine generators; this system would include individual turbine *step-up* transformers to increase the voltage of generated electricity to 34.5 kV (primarily an underground system, possibly with short stretches of overhead cabling, if necessary). Depending on the turbine selected, step-up transformers may be located within the turbine nacelle or on the ground adjacent to each turbine on a concrete pad.
- A substation to further increase the voltage of the generated electricity to 230 kV (i.e., the voltage of the existing PG&E transmission lines).
- A switching/interconnection station/facility for connecting the project to the existing PG&E transmission line.
- A single 230 kV 3-phase overhead transmission circuit to transmit electricity from the substation to the existing PG&E transmission line.
- A buried communication system/cabling.
- An operations and maintenance building/control center.
- A temporary site office.
- Access roads (approximately 1 mile of new 30-foot-wide roads) and other related road improvements, potentially including culvert installation (permanent impact of approximately 4 acres).
- Temporary construction staging areas.
- Up to four permanent meteorological masts (maximum 220 feet in height).
- Safety lighting.

- Water and wastewater service.

Table 2-1. Construction and Operational Components (acres) of the Proposed Hatchet Ridge Wind Project

Facility	Construction Only (temporary)	Operational Phase (permanent)
Wind turbine generators		
Turbine foundations	103.72	1.03
Turbine transformers		0.46
Turbine crane pads		10.19
Electrical system		
Substation		1.78
Interconnection facility		2.04
Overhead transmission poles		0.05
Electrical collector/communications trench	12.45	
Operations and maintenance/control room building		2.00
Site office	2.99	
Access roads		
Widened access road (on site)		21.35
New access road		23.09
Widened access road (up to site)		0.56
OH TX access road	7.71	
Cut and fill road bends		10.0
Temporary staging areas		
Turbine staging areas	3.56	
Overhead transmission line staging area	4.84	
Meteorological towers		0.06
Total	135.27	72.61

Each of these components is discussed in more detail below.

2.6.1 Wind Turbine Generators

Wind turbines consist of three main aboveground components: the turbine tower, the nacelle, and the turbine blades. The turbine tower supports and provides access to the nacelle. The nacelle is the enclosure that houses the turbine's main shaft, gearbox, generator, brakes, bearings, cooling systems, and other mechanical components. Turbine blades attach to the main shaft of the turbine at the blade hub. Figure 2-3 shows the configuration and relative sizes of the three wind turbine and tower options under consideration for the proposed project.

A wind vane is positioned on top of the nacelle to provide wind direction data to an electronic controller; the electronic controller governs a yaw mechanism that uses electrical motors to turn the nacelle and rotor to aim the turbine into the wind.

Three turbine blades are attached to the turbine's main shaft at the blade hub. Depending on the turbine model selected for the project, the turbine blades would be made of carbon fiber or laminated fiberglass. Blade length would vary from 126 to 156 feet (38.5 to 47.5 meters). The diameter of the circle described by the rotors (i.e., the rotor diameter) would be approximately 253–312 feet (77–95 meters).

The rotor's rotational speed ranges up to 20 revolutions per minute (rpm). The turbines operate on a variable pitch principal—that is, the rotor blades rotate on their axes to maintain an optimum position to maximize electrical output for all wind speeds. At speeds exceeding approximately 56 mph, the blades feather along their axes and the rotor stops turning.

Depending on the turbine selected, the turbine towers would be up to approximately 262 feet (80 meters) tall. With the nacelle and blades mounted, the total height of the wind turbine (to the turbine blade tip) would be up to approximately 420 feet (128 meters). The towers would be tapered, hollow tubular structures, approximately 16 feet in diameter at the base. They would be painted a neutral nonreflective color (typically off white or pale gray), as required by Federal Aviation Administration regulations. A controller cabinet would be located at the base inside each tower. Cables and a ladder would ascend to the nacelle to provide access for turbine maintenance. A locked door would provide access to the base of the tower. The typical wind turbine and tower would be mounted on a concrete foundation (Figure 2-4). The turbine and tower would be constructed within a cleared, compacted area approximately 23 feet in diameter. Tower foundations would be spread or pier-type footings.

2.6.2 Electrical System

The generator in each wind turbine's nacelle would generate electricity at 690 volts. Depending on the turbine selected, the electrical system of the project would consist of several key elements, listed below.

- **Individual *step-up* transformers** would increase the voltage of electricity generated by each turbine from 690 volts to 34.5 kV. In some turbine models the step-up transformer is housed within the turbine nacelle. In others, the step-up transformer is located approximately 5 feet from the tower foundation on a reinforced concrete pad approximately 9 feet by 9 feet by 12 inches thick.

- **An electrical collector system** would collect energy from each step-up transformer, primarily using underground cabling, and deliver it to a substation. From the step-up transformer, power would be transmitted via 34.5 kV electric cables. Although designs have not been finalized, HRW believes that all electrical cable would be buried approximately 3–4 feet below the ground surface in a trench up to 3 feet wide with selected fill surrounding the cables for protection. However, RES requests flexibility in the final siting of a limited amount of overhead 34.5 kV cabling required to traverse geological and/or topographic features where underground cabling is not practical. Trenches would generally parallel both improved and new roads used for the project. Trenches would be backfilled, topsoil would be replaced on top, and the area would be returned to its original contours. There would be approximately 7 miles of underground collector cable trenches.

- **A substation** would further increase the voltage of the electricity from 34.5 kV to 230 kV, the same voltage as the existing PG&E 230 kV line. The substation would be located either near the geographic center of the turbine string or adjacent to the interconnection switching station. The 1.78-acre substation site would be a graveled, fenced area with transformer and switching equipment and an area to park utility vehicles. Transformers would be non-polychlorinated biphenyl (PCB) oil-filled types.

- **A single 3-phase 230 kV overhead transmission circuit** not to exceed 5 miles in length would deliver power from the substation to a switching station at the point of interconnection with the existing PG&E transmission line. The voltage of the overhead transmission line would be the same as the existing PG&E transmission line. The length of the overhead line would depend on the position of the substation, which in turn depends on the position of wind turbines from which the substation collects electricity. The substation may be located adjacent to the interconnection switching station, thereby minimizing the length of the overhead line. If the substation is located near the midpoint of the turbine string, the length of the overhead transmission line for the project would not exceed 5 miles. Single steel poles or double wood poles would likely support the overhead transmission lines. The distance between pole structures would be in the range of 400–500 feet.

- **An interconnection switching station** (to be owned by PG&E) would be constructed adjacent to the existing 230 kV PG&E transmission line. The switching station is planned to be located adjacent to the associated existing PG&E transmission line, most likely in Section 28 of Township 35N, Range 2E Mt. Diablo Baseline & Meridian. The switching station would occupy approximately 2 acres. It would be a graveled, fenced area with switching equipment and an area to park utility vehicles.

2.6.3 Communication System

In addition to underground and overhead electric cabling, the proposed project would include underground fiber optic or copper communications lines between the operations and maintenance facility and all wind turbines and the substation. This communication system would allow individual wind turbines, turbine strings, and other project-related facilities to be monitored and controlled both on site and from remote locations.

2.6.4 Operations and Maintenance Facility

A permanent 4,500-square-foot facility would be constructed within the project area for carrying out operations and maintenance functions as well as to serve as a control room for the project. This facility would contain office and workshop areas, a kitchen, bathroom, shower, and utility sink. It would be a pre-engineered 20-foot-tall steel structure. Depending on the facility's location, water for the bathroom and kitchen would be acquired from an onsite well or would be trucked in and stored in an onsite tank. Water use would be substantially less than 5,000 gallons per day. The bathroom and kitchen would drain into an onsite septic system. A graveled parking area for employees, visitors, and equipment would be located adjacent to the building. The entire facility would be enclosed in deer-safe fencing with a locked gate. The operations and maintenance facility would be painted in neutral earth-tone colors with a nonreflective roof; additionally, any site lighting would be directed to minimize light scatter beyond the necessary footprint for function and security purposes. Figure 2-5 shows the configuration of a typical operations and maintenance facility.

2.6.5 Roads and Access

The project site is accessed from State Route 299 and an existing private road known as Bunchgrass Lookout Road. HRW proposes to improve the existing private road as well as other private dirt roads on the leased premises. In addition, new gravel roads would be constructed to provide access for construction as well as operations and maintenance vehicles.

Existing private roads within the leased area are generally 8–16 feet wide. Improvements to allow use by construction vehicles would generally involve widening selected portions of the existing roads to up to 20 feet with 5-foot shoulders on both sides, for a total permanently disturbed road width of 30 feet with a gravel all-weather surface. During construction, selected portions may be temporarily widened an additional 5 feet on each side, then reclaimed to the 30-foot width. Existing culverts across intermittent streams would be replaced with wider or stronger culverts as necessary, and drainage improvements would be made (in accordance with an erosion control plan prepared pursuant to the National Pollutant Discharge Elimination System [NPDES] permit) as necessary to control stormwater runoff.

In areas where existing roads do not provide access, new graveled roads would be constructed. Generally, these new roads would be up to 20 feet wide with permanent 5-foot shoulders on both sides, and an additional 5 feet of temporary disturbance on either side. A typical road cross section is shown in Figure 2-6. The temporarily disturbed area would be restored to current contours following construction as described below. New roads would be constructed parallel to the proposed turbine string. The volume of earthwork (grading, cut, and fill) required for the project has not been calculated; however, all such activities would be subject to a grading permit from the Shasta County Building Division.

In addition to the permanent access roads described above, temporary access routes may be necessary for constructing some facilities. For example, constructing the underground collector cables may require that heavy equipment access trench locations that are not directly adjacent to existing roads. Generally, equipment would be driven across open ground to accomplish this construction. In some locations (e.g., sites that would be determined only after final pole locations for the 230 kV overhead line have been selected), minor grading may be required to allow safe access to construction locations. These temporary access routes would be graded and replanted as necessary to restore vegetation after construction is completed.

2.6.6 Permanent Meteorological Towers

One or two permanent meteorological towers would be constructed in the project area. The meteorological towers, up to approximately 220 feet tall, would collect meteorological data. Permanent meteorological towers 200 feet or taller would comply with Federal Aviation Administration (FAA) lighting regulations. In addition, all new permanent meteorological towers would be freestanding structures without guy wires to minimize impacts on avian species.

In addition, up to five meteorological towers would be installed on a temporary basis for the purpose of verifying the power generating capability of selected wind turbines. These meteorological masts would be installed immediately after turbines are erected and would be in place no more than 1 month each.

2.6.7 Additional Features

Safety Lighting

The project is located approximately 20 miles from Fall River Mills Airport, 27 miles from the Shingletown Airport, and 39 miles from the Redding Municipal Airport and Benton Field. At these distances, the project would not result in a change in air traffic patterns. However, the project has the potential to present a hazard to air traffic and must meet federal and state safety standards, including requirements for being visible to airplanes during both the daytime and the nighttime.

FAA requires that wind energy projects be illuminated so that aircraft can easily identify and avoid the wind turbines (Patterson 2005). Wind turbine obstruction lighting schemes recommended by FAA primarily address nighttime lighting, as the off-white to light grey paint most often found on wind turbine units is the most effective daytime early warning device for aircraft. FAA suggests a single incandescent or rapid discharge flashing red light; studies have suggested that use of a flashing red light reduces the visual impacts on neighboring communities. For wind projects arranged in a linear configuration along a ridgeline (such as the proposed project), FAA recommends that a single light be placed on the turbines at either end of the line or string of turbines and that additional turbines be equipped with a single light such that any lit turbine is no more than 0.5 mile from the nearest lit turbine. Lighting would be limited to only that necessary for safety and security and to comply with federal and state regulation.

Water and Wastewater Service

Construction of the project would require water for road construction, underground electric cable installation, wetting of concrete, dust control, and other activities. During construction, the contractor would arrange for delivery of water to the site by water trucks from a source with an existing water right. Onsite portable toilets would be used during construction.

For operations, water would be used for bathroom and kitchen purposes. Water for the operations and maintenance facility would come from one of two sources: a licensed installer would install a domestic well to serve the operations and maintenance facility, or a water storage tank would be installed at the building with water periodically transported to the tank. Any efforts to install a domestic well would be conducted in accordance with the rules and regulations of the Shasta County Department of Resource Management's Environmental Health Division and would be overseen by that agency.

Wastewater generated at the operations and maintenance facility would discharge to a septic system installed on site. This system would conform to all County design standards and specifications to avoid impacts on ground- or surface waters.

The project would be served by the Burney Transfer Station and the West Central Landfill, located approximately 4 and 42 miles from the project area, respectively.

Drainage Facilities

The proposed project would maintain the local surface drainage patterns. Impermeable surfaces created by the project (e.g., the concrete tower foundations) would be limited; accordingly, stormwater runoff would not be collected or treated. Instead, stormwater would run off impermeable surfaces and infiltrate the surrounding ground. Runoff from impermeable surfaces would be limited to the amount of rainfall deposited onto the turbine foundations (approximately 20 feet in diameter), foundations for turbine transformers (if applicable), substations, the interconnection facility, and operations and maintenance buildings. Graveled access roads would be permeable and allow stormwater percolation into surrounding soils.

2.7 Construction Activities

2.7.1 Construction Schedule and Workforce

The project construction period is expected to last 6–12 months. The turbines and towers would likely be manufactured in North America, Europe, or Asia. These components would then be transported in large sections to the project site by a combination of ship, rail, and highway transportation.

The local construction workforce for the proposed project is estimated to be in the range of up to 200 construction workers at any given time.

2.7.2 Construction Sequence

The construction phase would entail the tasks listed below. These construction tasks are shown in generally chronological order. All construction activities would be conducted during daylight hours.

- **Construct access roads.** During this initial phase of the construction process, existing access roads would be widened, and new and temporary access roads would be established as described above.
- **Establish temporary construction staging areas.** Two or three temporary staging areas would be established in the project area to serve as temporary storage areas for tower sections, nacelles, blades, and other project components. Each staging area would encompass approximately 4 acres. In addition, one or two other staging areas would be established to accommodate construction vehicles, construction employees' personal vehicles, and other construction equipment and materials (e.g., cranes, graders, bulldozers, gravel and concrete). These additional staging areas would each encompass approximately 1 acre. All temporary staging areas would be graded and replanted to their original condition upon completion of construction activities.
- **Establish turbine laydown areas and crane pads.** At each turbine location, an area of approximately 1,400 square feet would be temporarily established for setting turbine and tower components prior to installation. In addition, a gravel pad would be established for supporting a crane to be used to erect the towers and turbines. Each temporary laydown area and crane pad would be graded and reseeded to return the area to its original condition.
- **Construct project substation.** A 2-acre substation site would be cleared and graded for the project substation. One or more concrete pads would be formed for electrical equipment, and transformers and other facilities would be installed.
- **Construct turbine foundations.** Depending on ground conditions, foundations would be either spread footing foundations or pier-type foundations. For spread footing foundations, a 40- by 40-foot hole would be excavated and filled with a layer of backfill, a 3.5-foot layer of reinforced concrete, a 3-foot-high reinforced concrete pedestal, 2.5 feet of additional backfill, and 6 inches of topsoil. For pier-type footings, a hole would be dug 25 feet deep and 16 feet in diameter. Two concentric corrugated metals cylinders would be placed in the hole. The space between the two forms would be filled with reinforced concrete, and the space inside the inner cylinder would be filled with soil backfill.

- **Install towers and turbines.** Tower sections, then nacelles, then rotor/blade assemblies would be erected using a construction crane.
- **Trench and install underground electrical and communications cables.** Trenches 3–4 feet deep and 3 feet wide would be excavated. All electrical cable and communication lines would be buried directly in the trench or installed in conduits that would be buried in the trench. Selected backfill would surround the cables or conduits for protection.
- **Construct the overhead transmission line.** The project would require a 3-phase overhead transmission line from the substation to the point of interconnection with the existing 230 kV PG&E transmission line. However, the project substation may be located adjacent to the interconnection switching station, thereby minimizing the length of the overhead transmission line. The voltage of the overhead line would be 230 kV, the same voltage as the existing PG&E line to which it interconnects. A right-of-way for the overhead line would be surveyed and a licensed surveyor would stake the locations for the wood or steel pole structures. Construction materials would be transported to staging areas. Holes 3 feet in diameter and 10 feet deep would be drilled or augured. Poles would be erected and the overhead line would be strung using conductor stringing equipment. Final cleanup and site restoration would then occur.
- **Construct the interconnection.** PG&E would be responsible for construction of the interconnection facilities. The construction process for the interconnection facilities would be similar to that for the project substation: a 2-acre site would be cleared and graded, concrete pads would be constructed, and electrical facilities would be installed.
- **Construct the operations and maintenance building/control center.** A 2-acre site would be cleared and graded for the operations and maintenance facility. A foundation pad would be constructed, the building would be framed and finished, and electrical wiring, plumbing, and (if applicable) a septic system would be installed.
- **Conduct final testing.** Final testing would entail inspections to ensure that all systems are working properly and according to design and guarantees.
- **Conduct final road grading, final erosion control, and site cleanup.** Throughout construction, erosion control procedures would be implemented in accordance with the NPDES permit and the associated Storm Water Pollution Prevention Plan (SWPPP) and erosion control plan. A final site cleanup, including removal of all waste materials, would be conducted.

2.8 Operations and Maintenance Activities

2.8.1 Staffing and Hours/Seasons of Operation and Ongoing Maintenance Activities

The Hatchet Ridge Wind Energy facility would be capable of operating 24 hours/day, except during maintenance activities, high winds, or seasonal shutdowns. On an annual basis, wind energy projects are typically available to generate electricity more than 97% of the time, although the actual periodicity of generation depends on the available wind resource. Project operations would require new staff at the operations and maintenance facility. It is anticipated that a crew of approximately 6–10 full-time persons working normal work shifts of approximately 7 a.m. to 5 p.m. would staff the facility. Anticipated operation and maintenance activities are listed below.

- **Project administration.**
- **Project performance monitoring.** Performance monitoring would include monitoring of the performance of turbines and electrical systems, as well as analysis of the overall efficiency of the operation.
- **Scheduled and unscheduled wind turbine maintenance.** These activities include minor repairs and replacements (e.g., replacement of lubricating oils, coolant, failed wind speed sensors); repair and replacement of turbine components (e.g., blades, generators); and wind turbine replacement (uncommon prior to decommissioning).
- **Scheduled and unscheduled plant maintenance.** These activities entail maintenance of roads, electrical infrastructure, and the operations and maintenance facility.
- **Environmental monitoring.** Environmental monitoring would be conducted in accordance with the approved mitigation and monitoring plan, and would likely to include avian monitoring surveys and monitoring to ensure maintenance of erosion control measures.

2.8.2 Security

Public access to the wind turbines would be restricted to avoid potential safety hazards. All turbine towers would be locked, and the substation and switching station would be fenced and locked to prevent unauthorized entry. These features would minimize the need for surveillance and response from the Shasta County Sheriff and the California Highway Patrol.

2.9 Project Decommissioning and Repowering

The project's wind turbines, towers, and electrical infrastructure would have a minimum design life of 20 years. Before and after this horizon, however, it could become desirable to replace some or all installed wind turbines with newer, state-of-the-art wind turbines. Such *repowering* typically makes use of existing infrastructure (e.g., roads, substation, and PG&E-owned interconnecting switching station). Any repowering project would be subject to the terms of the leases with Sierra Pacific Industries and Fruit Growers Supply Company, as well as to the conditions of permits from public agencies and additional environmental review.

While the project is expected to be operational for 25 years, permit conditions, wind energy leases, and economic conditions may prohibit continued operation and repowering of the facility. Under such circumstances, the project would decommissioned, existing equipment removed, and the site returned to a condition as close to preconstruction conditions as feasible.

2.10 Required Approvals and Permits

The local, state, and federal permits listed in Table 2-2 may be required for the proposed project.

Table 2-2. Approvals and Permits Potentially Required for the Proposed Project

Local	Shasta County—Conditional Use Permit
	Department of Resource Management Environmental Health Division—septic system permit
	Shasta County Building Division—building permit, grading permit
State	California Department of Forestry & Fire Protection—timberland conversion permit
	California Department of Transportation Division of Aeronautics—permit required per PUC Section 21656
	California Energy Commission—To be determined
	California Public Utilities Commission—potential purchasers of electricity generated by the project may choose to seek an order indicating Commission approval of such purchase and other related actions
	California Regional Water Quality Control Board—NPDES Construction Stormwater Permit, CWA Section 401 Water Quality Certification
Federal	Federal Energy Regulatory Commission—approval to be an Electric Wholesale Generator and to sell electricity at market-based rates
	Federal Aviation Administration—notice of proposed construction

2.11 Alternatives

This Draft EIR considers a range of potential alternatives (e.g., alternative technologies, alternative sites, a phased project, an alternative site plan, a smaller project) as described in Chapter 4. These alternatives were developed and analyzed in accordance with CEQA requirements. The analysis is presented in Chapter 4, *Other CEQA Considerations*.