Chapter 2
Program Description

2.1 Program Location and Program Area

The program area is located in the Altamont Hills of eastern Alameda County near the San Joaquin County line, north and south of I-580 and approximately 56 miles east of San Francisco. The Altamont Hills are at the geographical interface between the coastal mountains and the Central Valley (Figure 1-1).

As defined in the Alameda and Contra Costa County general plans, the APWRA encompasses approximately 49,202 acres: 36,870 acres in Alameda County and 12,332 acres in Contra Costa County. During early development of the APWRA NCCP/HCP, a new boundary for the APWRA was developed using the 70-meter wind speed data produced by CEC. The purpose of this revised boundary was to capture the extent of the area within which repowered wind turbines could be constructed. In Contra Costa County, the line was defined to match the boundary in the County of Contra Costa general plan. In Alameda County, the boundary was defined to encompass all of the County-designated APWRA, as well as those lands in the Altamont Hills with a mean wind speed of 12 miles per hour or greater, measured 70 meters (about 230 feet) above ground. Because it is anticipated that repowered wind turbines may be constructed anywhere within this revised boundary, the NCCP/HCP boundary in Alameda County (43,358 acres) is used to define the program area for this environmental analysis (Figures 1-2 and 1-3).

2.2 Program Overview and Objectives

2.2.1 Overview

This Draft PEIR evaluates repowering wind energy projects in the Alameda County portion of the APWRA. The program does not reflect any formal ordinance or adopted plan of the County, but is rather the overarching process by which the County will receive and review CUP applications. Accordingly, the program as considered in this PEIR comprises the anticipated approval by the County of a series of new CUPs to allow new windfarm uses in the APWRA, as permitted by both the ECAP and the County Zoning Ordinance. The program is the result of a combination of formal and informal agreements between the County, the windfarm operators, state and federal resource agencies, nongovernmental organizations, and property owners to initiate repowering activities in 2014 in anticipation of expiration of the existing CUPs.

Windfarm uses are conditionally permitted in the "A" (Agriculture) zone district, which encompasses the entire program area. Windfarm uses have been permitted in the APWRA since the early 1980s with such CUPs, and the terms of the currently active CUPs (last approved in 2005 for continued operation of the windfarms, and amended in 2007) are in effect through September 2018.

EBZA is the appointed body with the responsibility for taking action to approve or deny each CUP application, based on findings that the use (a) is required by the public need; (b) will be properly related to other land uses and transportation and service facilities in the vicinity; (c) will, under its particular circumstances and conditions, have no material adverse effect on the health or safety of persons residing or working in the vicinity, or be materially detrimental to the public welfare or injurious to property or improvements in the vicinity; and (d) will not be contrary to the specific intent clauses or performance standards established for the Agriculture zone district. In addition, because issuance of the CUPs qualify as projects subject to CEQA, EBZA must make required findings for each CUP that changes to the projects have been required or incorporated into their design (i.e., mitigation measures) that would avoid or substantially lessen their environmental effects, along with other required findings regarding responsible agencies, the feasibility of other mitigation measures, or alternatives to the projects.

The original CUPs (1980s and 1990s) were issued to windfarm operators on specific parcels under specific owners, in some cases allowing two or three operators on a single parcel. Individual CUPs renewed in 2005 were issued to operators according to property owner, and an operating entity (Altamont Infrastructure Company) was permitted to manage turbines owned by different operators on single parcels and also to hold single CUPs for multiple operators on individual parcels.

Under the program, CUPs would be issued directly to windfarm operators only for their operations throughout the program area—in some cases, on multiple properties. Accordingly, such operations may be separated chronologically (i.e., by phases of development) or geographically (e.g., by physical boundaries such as Interstate [I-] 580 or by intervening properties) and would warrant issuance of separate CUPs. In some circumstances, although two or more operators could manage turbines on the same property, individual CUPs would be issued to only one operator at a time.

2.2.2 Program Objectives

The two primary objectives of repowering are to facilitate efficient wind energy production through repowering and to avoid and minimize impacts on terrestrial and avian wildlife caused by repowered wind turbine construction, operation, and maintenance. Specific objectives are listed below.

- Allow for appropriate and compatible repowering and operation of wind turbines consistent with existing repowering timeline requirements set forth in the existing CUPs, related agreements, and project-specific power purchase agreements.
- Reduce avian mortality caused by wind energy generation in the program area through repowering.
- Meet the County's goals to provide environmentally sensitive, clean-renewable wind energy for the twenty-first century as identified in the ECAP (Policies 168–175 and Programs 73–76).
- Help meet the Governor's Executive Order S-14-08 in meeting the Renewables Portfolio Standard (RPS) target that all retail sellers of electricity serve 33% of their load with renewable energy by 2020.
- Contribute to state progress toward air quality improvement and greenhouse gas emission reduction goals, as set forth in Assembly Bill 32.
- Improve habitat quality in the program area through removal of roads and existing wind turbines and their supporting infrastructure, resulting in lower overall operational footprint, and providing a wide range of habitat benefits to sensitive terrestrial and avian species.

Additional objectives associated with specific repowering projects are discussed in Section 2.6. The objectives of the PEIR are identified in Chapter 1, *Introduction*.

2.3 Wind Turbine Technology

Because of the specialized nature of wind energy projects, it is important for the reader to become familiar with terminology used in describing and analyzing such projects.

2.3.1 Turbine Nomenclature

Wind turbine generator, wind turbine, or *turbine* refers to the entire structure that generates electricity. The primary structure comprises the *rotor*, *nacelle*, and *tower* anchored to a concrete foundation. Other turbine components include a controller; transformer; braking system; vibration, temperature, and fire detection systems; anemometer; safety lighting; and lightning protection. All turbines in the APWRA are horizontal axis turbines. A horizontal axis turbine has a propeller-type rotor, which rotates on a horizontal axis.

A *windfarm* is a grouping of wind turbines and supporting infrastructure. A windfarm comprises wind turbines, a collection system for moving electricity produced by the turbines onto the local power grid, roads to access turbines, and staging areas. The primary components of a wind turbine and its supporting infrastructure are defined below and shown in Figures 2-1 and 2-2. A summary of existing infrastructure in the program area is provided in Table 2-1.

Table 2-1. Summary of Existing Infrastructure in the APWRA

Infrastructure or Facility	Quantity
Wind turbines	4,210
Meteorological towers	75
Roads	236 miles

Turbine Types

Most of the turbines now operating in the APWRA were installed in the 1980s and represent first- and second- generation utility-grade commercial wind turbine technology, now considered old technology. The terms *first-generation*, *second-generation*, *third-generation*, and *fourth-generation* are used to group wind turbine types with similar technologies currently installed or to be installed in the program area. In this context, first-generation wind turbines are those designed and installed during the 1980s. Second-generation turbines are those designed and installed in the 1990s. Third-generation turbines are those installed in previous repowering projects that use similar design to turbines proposed for the program, but that are of smaller size (i.e., up to 1 MW). Fourth-generation turbines—those generally proposed for installation under the program, are large, 1.6–3 MW turbines. Additionally, experimental turbines may be installed on a limited basis in the program area.

Empirical evidence (ICF Jones & Stokes 2009; Smallwood and Karas 2009) suggests that windfarms utilizing third- and fourth-generation turbines may have significantly less impact on avian species than those using first- and second-generation technology (65–70% reduction) (Insignia

Environmental 2009; Smallwood and Karas 2009; Brown et al. 2013). This potential reduction is attributed to the much larger distance between the ground and the lowest point of the turbine blade, placing the rotor-swept area above the zone most used by resident birds, including small raptors. These turbines also rotate more slowly (in terms of revolutions per minute), potentially allowing birds time to maneuver away from the blades. However, because of the much longer blade length, the tip speed is usually greater on these turbines than on first- and second-generation turbines. In contrast, evaluation of mortality data collected at windfarms around the country (including in the APWRA) have suggested that current-generation turbines may lead to an increase in bat mortality (Barclay et al. 2007). Moreover, because of the scarcity of valid comparative data, uncertainty remains regarding the effects of repowering on avian and bat mortality.

Appendix A provides a summary of the turbines installed APWRA-wide as of October 2011.

First- and Second-Generation

The hub height of first- and second-generation turbines ranges from 18 to 55 meters (60 to 180 feet). These turbines have an approximate 20-year operating life (the length of time that an individual wind turbine is designed to remain in operation) with 40- to 500-kilowatt (kW) rated capacities and 20–25% capacity factors.

There are two types of first- and second-generation towers in the APWRA: lattice and tubular. Lattice towers are supported on three or four footings and have an external access ladder and control cabinet. Tubular towers constitute a single cylindrical support. Depending on the turbine model, tubular towers may house internal access ladders and electronic equipment such as controls, electric cables, ground support equipment, and interconnection equipment; however, some tubular towers have external ladders and down tower cabinets.

Third-Generation

Third-generation turbines resemble fourth-generation turbines: that is, they are larger than the first- and second-generation turbines and have three-blade rotors on tubular towers. Only two windfarms in the APWRA have installed third-generation turbines: Diablo Winds repowering project (Diablo Winds) (located in the program area and operational since 2004) and Buena Vista repowering project (Buena Vista) (located in Contra Costa County and operational since 2006). These turbines have nameplate capacities of 0.7–1.0 MW, with hub heights of 41–68 meters (134–223 feet) and rotor diameters of 47–61 meters (154–200 feet).

Fourth-Generation

Fourth-generation wind turbines anticipated to be installed by the project applicants have an approximate 25- to 30-year operating life and a 1.6–3 MW rated capacity. The hub heights are approximately 80–96 meters (262–315 feet), the rotor diameters are 82.5–125 meters (271–410 feet), and the rotor-swept areas are 5,356–12,259 square meters (57,652–131,955 square feet, or approximately 1–3 acres). The total turbine heights from the ground to the tip of the blade at the 12 o'clock position are 121–153 meters (397–502 feet). One repowering project in the APWRA has been installed with this category of turbine: the Vasco Winds repowering project (Vasco Winds) (in Contra Costa County, outside the program area), which was completed in May 2012.

Experimental Designs

Several types of turbines have proven to be less efficient or impractical in the APWRA. For example, a Darrieus wind turbine, commonly called an "eggbeater," is a vertical axis wind turbine (VAWT), which does not need to be oriented into the wind to be effective and can use wind from all directions. While the eggbeater design is generally more efficient than other types of VAWTs, its drawbacks are that it is not very reliable, is less efficient than the more commonly used horizontal axis wind turbines, and is more costly to construct. Additionally, it requires an external power source to start turning and cannot be activated solely by wind.

Though other experimental technologies are in development, only one is the subject of a current application with the County for installation in the APWRA: a shrouded turbine design proposed by Ogin, Inc., for installation—initially on a trial basis—in the Sand Hills Wind Project. The shrouded turbine is characterized by two concentric shrouds surrounding the turbine face and rotor: an inner and an outer shroud with an aerodynamic design intended to improve energy production compared to conventional turbine designs, as well as to reduce avian and bat fatalities. These turbines would be placed on 37-meter (121-foot) monopole towers, with the top of the outer shroud at 58 meters (198 feet).

Energy Output

The wind turbine energy output is quantified in terms of *rated capacity*, *capacity factor,* and *installed capacity*.

- **Rated capacity.** The theoretical measure of maximum power output of an individual wind turbine when operating at its rated wind speed (e.g., 1.6 MW at 11 meters per second). Also known as the nameplate capacity.
- **Capacity factor.** The ratio of actual energy output to the rated capacity over a specific time period, usually 1 year.
- **Installed capacity.** The summed rated capacity of all turbines installed in a given location (e.g., the program area).

Wind Energy Nomenclature

The following is a list of terms pertaining to wind turbines and associated facilities (in alphabetical order for ease of reference). A summary of windfarm infrastructure in the program area is provided in Table 2-1.

- **Address.** The *address* is a unique site identification for each turbine installed in the APWRA.
- **Collection system.** The *collection system* moves electricity generated by wind turbines to an electrical substation. A collection system is composed of overhead and underground low and medium voltage lines (collection lines), transformers, and a substation (Figure 2-3).
- **Down tower cabinet.** The *down tower cabinet* houses the equipment that controls how the wind turbine works (Figure 2-4). It is either placed on the pad beneath or adjacent to the tower or is housed within the tower. Down tower cabinets for existing turbines are approximately 0.6–2 meters tall by 1 meter wide by 0.3 meter deep. Down tower cabinets for current-generation turbines installed during repowering will be within the towers.

- **Power poles.** A generic term for poles that hold overhead lines or other devices necessary for the collection of electricity from wind turbines. These include riser poles, line poles, corner poles, and poles with pole-top transformers, capacitor banks, or metering sets.
- **Foundation.** The tower is bolted to a reinforced concrete *foundation* that anchors the wind turbine to the ground. Foundation types and dimensions vary depending on the turbine capacity, tower type, soil substrate, and topography. In general, foundations fall into two different types: *spread footing* or *pier* (Figure 2-4).

  A spread footing foundation is a reinforced concrete pad placed at ground level. The weight of the foundation anchors the wind turbine in place. For a lattice tower, either a single pad secures all footings, or each footing has its own pad. In some cases, a combination of a spread footing and pier foundation may be used.

  A pier foundation is a cylindrical reinforced concrete tube buried underground. Unlike a spread footing foundation, friction helps to hold the wind turbine in place, rather than weight alone. For a lattice tower with a pier foundation, each of the footings has its own foundation. For a tubular tower, a single pier foundation is installed beneath the tower base.
- **Guy wires.** *Guy wires* are wire cables that secure meteorological towers to the ground (Figure 2-5).
- **Low-voltage lines.** *Low-voltage lines* are underground collection lines of less than 600 volts that connect each wind turbine to a transformer that supports one or several wind turbines. In repowering projects, all collection lines will be constructed underground.
- **Medium-voltage lines.** *Medium-voltage lines* are collection lines between 601 volts and 35 kilovolts (kV) that connect single or multiple transformers to a substation or *utility connection point*. Medium-voltage lines may be buried or carried on overhead poles. If the lines are buried, at least one riser pole is required to link the lines with the substation. In repowering projects, all collection lines will be constructed underground whenever possible. Any medium-voltage lines constructed above-ground will conform to Avian Power Line Interaction Committee (APLIC) standards.
- **Meteorological towers.** *Meteorological towers* (Figures 2-5 and 2-6) are used to measure wind speeds and sometimes wind direction. Meteorological towers in the program area are 18.3–42.7 meters (60–180 feet) for first- and second-generation projects and 50.3–54.9 meters (165–180 feet) for the Diablo Winds repowering project. It is assumed that the height of meteorological towers for other repowering projects would be approximately the hub height of the new turbines (80–96 meters [262–315 feet]). Some meteorological towers are freestanding, whereas others are stabilized using guy wires. Permanent meteorological towers in the program area are usually sited just upwind of one or more turbines, approximately 4.6–9.2 meters (15–30 feet) in front of the turbines. Meteorological towers for repowering projects are typically used for reference and do not need to be placed so close to the turbines. Temporary meteorological towers are typically installed at a potential repowering site to measure wind speed and estimate site production capacity.
- **Nacelle.** The *nacelle* is the housing for the *main shaft, gearbox*, *generator*, *braking system*, and various control equipment. It protects the turbine mechanics and electronics from environmental exposure, comes in a variety of shapes, and is typically located behind the rotor. Most current wind turbines use an *upwind* turbine design, in which a yaw system is mounted between the nacelle and the top of the tower. This functions to keep the turbine rotor pointed

into the wind (in front of the tower; Figure 2-7). In the program area, most of the old-generation lattice tower turbines use a *downwind* design with no yaw motor, where the nacelle acts as a wind vane and the rotor operates behind the tower. The *main shaft* connects the blades to the *gearbox.* The gearbox houses the gears that connect the low-speed shaft to the high-speed shaft. It is here that the rotational speed of the rotor is increased to allow electricity to be produced by the *generator*. The *braking system* includes a disk brake that can be applied mechanically, electrically, or hydraulically to stop the rotor.

- **Pad.** The *pad* is the disturbed area, typically gravel or dirt, that encompasses the foundation, down tower cabinet, tower, and flat access areas for service trucks and mobile crane work (Figure 2-8).
- **Permanent staging areas.** *Permanent staging areas* (also called *lay-down areas*) are permanent onsite storage and work areas adjacent to existing roads. These areas serve to store equipment used for operation and maintenance of existing wind turbines (e.g., blades and nacelles) or to temporarily store parts that have been removed.
- **Riser pole.** *Riser poles* are wooden poles that connect underground medium-voltage lines to the central overhead collection lines en route to the substation.
- **Roads.** In the program area and on the private properties that contain the windfarms, there are three types of roads: *main roads*, *service roads*, and *finger roads* (Figure 2-8). Main roads are accessed from public paved roads through gated entrances to the wind farms. At each gated entrance, an asphalt apron extends approximately 6 meters (20 feet) to the gate on the main road from the public paved road. Aside from this asphalt apron, the main roads are gravel. Main roads are wide enough to accommodate two-way traffic. Service roads are narrower, gravel roads that branch off from the main roads and run the length of a turbine string. These roads allow for single vehicle travel. Finger roads are mostly short spur roads that branch off from the service roads to access each wind turbine not accessed directly from the service road. Road networks associated with repowering projects may not contain finger roads.

  Main roads typically consist of a 5.5-meter-wide (18-foot-wide) gravel bed with a 1.2-meter (4-foot) shoulder on either side. Service roads typically consist of a 4.9-meter-wide (16-foot-wide) gravel bed with a 1.2-meter (4-foot) shoulder on either side. Finger roads are graveled or dirt tracks the width of a truck, approximately 2.4 meters (8 feet) wide, with no shoulder.
- **Rotor.** The *rotor* is the portion of the wind turbine acted on by the wind. It consists of *blades* and the *hub* to which the blades are attached (Figure 2-7). The hub is the connection point between the blades and the main shaft, which is housed within the nacelle. The *turbine height* refers to the distance from the blade tip at 12 o'clock to the ground (Figure 2-2). Third- and fourth-generation turbines include blade pitch controls that regulate the angle of the rotor blade into the wind; this feature is used to control rotor speed and shutdown or slowdown in response to excessive wind speed, to reduce risk of avian mortality, and to increase turbine speed to improve efficiency in conditions of light winds.
- **String.** A *string* is one or more wind turbines in a row (Figure 2-8). First- and second-generation wind turbines are typically grouped in strings to maximize the energy generation where wind comes predominantly from one direction. Third- and fourth-generation turbines are not typically placed in strings because of their large size, required setbacks, and constraints associated with topography and property boundaries.

- **Substation.** A *substation* is the facility where the voltage level of the collection system is stepped up, by means of transformers, to that of the power grid.
- **Tower.** The *tower* elevates and supports the rotor and nacelle. Towers are either of lattice or tubular design (Figure 2-1).

2.4 Operation of Existing Turbine Facilities

The 2005 CUPs (including the 2007 CUP amendments) required that this PEIR address the "continued operation of existing turbine facilities (and progressive removal under the repowering program)." Existing turbine facilities will continue to be operated consistent with the 2005 CUPs (and the 2007 CUP Amendments) until such time as each site is repowered or decommissioned (under the 2007 CUP Amendments, the Settling Party Wind Companies are not subject to the removal schedule originally imposed by the 2005 CUP conditions). This section describes all activities associated with the 2005 CUPs that are ongoing for the life of each 2005 CUP—operation of turbines, operation of associated facilities, maintenance of turbine facilities, and site reclamation as required by the 2005 CUPs.

2.4.1 Turbine Operation

As of October 2011, there were approximately 3,490 wind turbines of 11 different types in the APWRA across both Alameda and Contra Costa Counties. This total comprises first-, second-, and third-generation wind turbines (Appendix A).

The operation of turbines is subject to several variables: wind conditions, maintenance needs, and operational requirements for seasonal shutdown and decommissioning as described in the 2005 CUPs. The minimum speed required for a wind turbine to start is called the *cut-in speed*. A command to start up the turbine can be initiated automatically by a sensor on the turbine, or the command can be sent manually from a central location (i.e., wind power company office). For first-generation turbines in the APWRA, the minimum cut-in speed is 4–6 meters per second.

The *cut-out speed* is the maximum speed at which a turbine operates. Winds exceeding the cut-out speed—or an internal fault—should cause a wind turbine to turn off. The cut-out speed of first-generation wind turbines in the APWRA is 20–25 meters per second. A wind turbine is considered a *runaway* when it is in an uncontrolled state. Any wind turbine can be manually turned on and off unless it is in a runaway state. Maintenance is conducted on runaways to bring them back into a controlled state, or the turbine is monitored until failure or the blades stop moving (when wind stops).

Since approval of the CUPs in 2005, the windfarms have operated under an Avian Wildlife Protection Program & Schedule (AWPPS, Exhibit G of the CUPs) that required the windfarms to cease operations during the peak wintertime avian migration periods, beginning with 2-month shifts of one-half of the turbines at a time. This schedule increased to the current requirement for an area-wide 3.5-month shutdown from November through mid-February. The AWPPS also required shutdown and removal (decommissioning) or relocation of high-risk turbines, and progressive removal of first- and second-generation turbines in advance of anticipated repowering.

2.4.2 Other Turbine Facility Operations

Other turbine facility operations includes operation and/or use of permanent and temporary staging and laydown areas; use of permanent and temporary meteorological towers; and use of substations, above- and belowground collection lines, power poles, and roads.

2.4.3 Wind Turbine Removal and Relocation

This activity only applies to first- and second-generation wind turbines. Reasons for wind turbine removal and relocation are varied. Some wind turbines may be in locations identified as risk areas. High-risk areas are those areas identified as having demonstrated potential high avian mortality by the Alameda County Scientific Review Committee (SRC) in a series of reports (Alameda County Scientific Review Committee 2007, 2008a, 2008b, 2008c; Smallwood 2008). Relocation is also undertaken to allow wind companies to maintain or increase the number of high-output sites. High-output sites are sites with higher wind speeds and/or long wind duration where more wind energy can be generated. For example, an existing wind turbine may be relocated from a low-output site to a high-output site for use through the end of the permit term (2018).

This activity can entail either partial or full removal of the nacelle (including blades and rotor), and installation and/or replacement of the nacelle components on an existing tower. Alternatively, it can entail removal of a wind turbine (tower, nacelle, and rotor) from one address and its relocation to another where a wind turbine has been removed. No new meteorological towers, new roads, or road infrastructure upgrades are required for removal or relocation of first- or second-generation turbines. Existing laydown areas are used for the main staging area; existing collection and communication systems may be used.

2.4.4 Maintenance

Wind companies operating in the program area conduct regular maintenance on turbines to ensure proper operation. These activities are described below.

Scheduled and Unscheduled Maintenance

Turbines and other structures require routine scheduled and unscheduled maintenance. Turbine manufacturers' guidelines dictate that regularly scheduled maintenance of windfarm facilities occur twice yearly. Scheduled maintenance typically occurs according to these requirements. Unscheduled maintenance is estimated to occur two times annually for each first- and second- generation turbine. A single turbine may be serviced as many as four times per year.

Routine maintenance activities include turbine lubrication, part replacement, turbine torque checks, making records of failures, sweeps of turbines (e.g., maintenance assessments, check-ups) that have reached a certain age, and other maintenance procedures. Turbine addresses are accessed by the existing network of main, service, and finger roads in the program area. Maintenance vehicles usually stay on designated roads. Offroad travel is infrequent, limited to maintenance of power poles, collection lines, and transformers. If a blade is lost on a first-generation wind turbine, offroad travel is occasionally required to retrieve the blade.

Scheduled maintenance occurs year-round, mostly from November 1 to March 31 during the winter low-wind season. Unscheduled maintenance occurs year-round, mostly April 1 to October 31 during the summer wind season.

Collection Lines

Most collection lines for first- and second-generation turbines are underground along turbine string roads to a turbine string transformer and then to an overhead collection line; the overhead collection line conveys power to the project substation. Aboveground lines not accessible by vehicle are accessed by foot when necessary. Aboveground collection lines are visually inspected annually. During this annual inspection, wildlife boots and other avian electrocution protection devices are checked, and missing or damaged devices are replaced. Some ground disturbance may result from vehicular and foot access.

Infrared scans are used annually to inspect overhead collection lines during online production (i.e., summer wind season). Replacement of underground lines occurs infrequently and is limited to the location where repair is required. The underground cables are trenched and replaced. The length of trench required for this activity ranges from 20 to 200 feet.

Occasionally wind companies are also responsible for maintaining a short segment of transmission line between a project applicant substation and a Pacific Gas and Electric Company (PG&E) substation.

Road Maintenance

All the roads maintained by the wind companies in the program area—main roads and service roads—are gravel. Finger roads are not regularly maintained, but they may be cleared of grass annually for fire prevention. Pavement is limited to a concrete apron extending 75–100 feet from the public road to the main road at each gated entrance.

Road maintenance typically consists of patching potholes, placing rocks (i.e., spot rocking), and minor regrading. Spot rocking is done to strengthen and protect drainage outlets and inlets for culverts and other drainage structures (e.g., ditches, berms). Grading may be conducted for as little as 6 meters to several kilometers at a time.

Road maintenance is performed with a grader, a dump truck to disperse roadbase rock, and a roller to compact it. When needed, a bulldozer is used to clear roads where a grader cannot gain access or where the necessary road maintenance exceeds the grader's capability (e.g., due to a landslide). In general, roadside maintenance activities may involve soil disturbance in a strip along the road with an average width of 4 feet on either side of the road (i.e., graded shoulder). Roads in steep areas may require maintenance activities that extend farther from the road—up to a maximum of 26 feet in areas of slopes greater than 25%. In most cases, the roads are maintained to bank to the inside to reduce potential erosion problems.

Road maintenance also includes cleaning (manually and mechanically), repairing, and replacing culverts as needed. Culverts in the program area range from 1.5 to 6 feet in diameter. Hand labor and backhoes are used to maintain culverts. Culvert repair and maintenance may affect areas as far as 8 meters from the edge of the road. New culverts may be installed as part of new road construction or to enhance road drainage for reducing erosion. Winged inlet structures, consisting of cement or rock wings flanking a ditch or culvert inlet, may also be repaired or installed to prevent erosion and improve passage of woody debris through drainage inlets.

Repairs are conducted as needed throughout the year, but generally occur between April and October, after the spring rains and before the winter wet season. Road maintenance activities typically occur throughout the entire road system once every 2 years, although some portions of the system rarely, if ever, require maintenance while other portions require maintenance one or more times each year.

Fire Prevention

Exhibit C of the 2005 CUPs describes the Altamont Pass Wind Farms Fire Requirements. Fire prevention is required as part of the County's CUPs. The main mechanism for fire prevention is the maintenance of a 30-foot-wide firebreak around buildings and structures, including turbines, riser poles, and substations. Firebreaks around turbines may surround a turbine string rather than individual turbines. Electrical lines require a 20-foot clearance of flammable vegetation. In the APWRA, vegetation management is accomplished by application of herbicide in October or November. Provision of a yaw damper or other approved method to prevent the over-twisting of pendent cables helps prevent turbine fires.

Existing firebreak requirements are based on first- and second-generation turbines, which present greater risk of fire ignition than do current-generation turbines.

2.4.5 Site Reclamation

The 2005 CUPs required that wind companies remove all facilities and restore properties to preinstallation conditions if windfarm operations cease, or if wind companies fail to implement the terms and conditions of the 2005 CUPs, including requirements to repower, unless an exception is made by the County Planning Department, or unless the resource agencies (USFWS or CDFW) require that such facilities be left in place.

If a repowering project is implemented, site reclamation is typically undertaken after the repowered turbines are installed and all temporary equipment and infrastructure is removed from that area. If a repowering project is not implemented, site reclamation would be undertaken after all turbines have been decommissioned and removed. Roads that are no longer required because turbines have been removed and that are not wanted by landowners would also be reclaimed unless a resource agency (e.g., U.S. Fish and Wildlife Service [USFWS], California Department of Fish and Wildlife [CDFW]) require that they not be reclaimed. New or widened roads that were installed to accommodate construction of new turbines may be restored to a narrower width after turbine installation is complete.

Reclamation activities entail returning lands disturbed by infrastructure installation or removal to preproject conditions. Some facilities (e.g., roadways, turbine footings) may be left in place if doing so is deemed to be more protective of natural resources than removal. At each reclamation site, the entire site is contour graded (if necessary) to conform with the natural surrounding topography and reseeded with an appropriate seed mixture, unless the resource agencies request that contouring not be undertaken. No soil is removed from the site. Figure 2-9 shows reclamation of a turbine pad site. Exceptions to returning a site to preinstallation conditions may be made, upon approval of the County Planning Department, if such reclamation activities would or could create water quality issues (e.g., erosion) or if the activities may adversely affect special-status species (e.g., burrowing owl burrow complexes, upland habitat for California red-legged frog or California tiger salamander). Moreover, CDFW and USFWS have suggested that it may sometimes be preferable to avoid regrading roads or removing foundations to avoid disruption of such habitats. In such cases, the County Planning Department could change reclamation requirements accordingly.

2.5 Proposed Repowering

As mentioned in Chapter 1, *Introduction*, two repowering alternatives have been identified for analysis: Alternative 1, with a maximum capacity of 417 MW; and Alternative 2, with a maximum capacity of 450 MW. With the exception of the nameplate capacity and the resultant total number of turbines (i.e., approximately 260 turbines under Alternative 1 and 281 under Alternative 2), the two alternatives are identical in the context of the description presented below.

The description of the proposed program addresses the components listed below.

- Repowering timeline.
- Siting conditions.
- Repowering activities.
- Operations and maintenance (O&M) activities.

This PEIR is intended to facilitate the permitting of repowering projects in the program area.

2.5.1 Repowering Timeline

Once CEQA compliance is completed and new CUPs are approved, buildout of repowered windfarms is expected to take place over a 4-year period (ending on September 22, 2018, when all 2005 CUPs expire). This schedule would allow time for completion of other design and permitting activities (1–2 years); wind turbine procurement and other long-lead items (12–18 months, but overlapping with the last year of permitting activities); and construction (8–12 months). The duration of repowering project construction depends on the number of turbines repowered and the ease of access to the site. Construction time encompasses all the activities described in Section 2.5.3 with the exception of temporary meteorological tower installation. Not all repowering projects would be initiated simultaneously, but most would be expected to be under construction by the end of year 4.

CUPs will be issued for a period of 30 years. This permit term is based on the expected operating life of current-generation turbines, landowner leases, and power sales agreements. Review periods will occur at years 4, 13, and 23 consistent with finalization of reporting associated with postconstruction monitoring conducted for the first 3 years of operation, and then for 2 years beginning at years 10 and 20 of operation. During review periods, the County may examine the most current mortality data and require adaptive management measures as set forth in Section 3.4, *Biological Resources*.

2.5.2 Siting Conditions

Turbine siting depends on a number of factors. Perhaps the two most important factors are potential energy production capacity (based on wind speed and direction) and avoidance of high-risk areas for avian species. Setback requirements are often defined for human safety, specifying minimum distances from residences, roads and highways, utilities, other windfarms, property boundaries, and railroads. Potential visual impacts, including flicker effects, are also considered. No existing residences would be demolished to make room for new turbines. County setback and technological requirements are discussed below.

County Requirements

Setback requirements were originally developed for Alameda County windfarms in the 1980s and 1990s in consideration of a variety of factors, such as appropriate distance between upwind and downwind turbines for effective wind production, noise effects on sensitive land uses, visual impacts resulting from proximity to residences and possible shadow flicker, concerns with tower collapse, and blade throw hazard (where all or part of a rotor blade may break loose from the nacelle and strike an occupied area or infrastructure). While there is no ordinance dictating setback conditions in Alameda County, setbacks have historically been determined on a project-by-project basis in accordance with the standard conditions of approval for a CUP. However, while the standard conditions applied in the 1980s and 1990s were appropriate for the older generation turbines, they may not be so for the fourth-generation turbines proposed for repowering. Accordingly, the County has developed a set of updated standards to be used for proposed repowering projects. These are shown in Table 2-2.

Table 2-2. Updated Alameda County Turbine Setback Requirements

Affected Land Use or Corridor	General Setback	Setback Adjustment for Turbine Elevation Above or Below Affected Use[a]	Alternative Minimum[b]
Adjacent parcel with approved wind energy CUP[c]	1.1 times rotor length	1% TTH added or subtracted per 10 ft. of turbine elevation, respectively, above or below affected parcel	50% of general setback
Adjacent parcel without approved wind energy CUP	1.25 times TTH	1% TTH per 10 ft above or below affected parcel	1.1 times rotor length
Adjacent dwelling unit	3 times TTH	1% TTH per 10 ft above or below affected unit	50% of general or elevation differential setback
Public road (including I-580), trail, commercial or residential zoning	2.5 times TTH	1% TTH per 10 ft above or below affected right-of-way	50% of general setback with report by qualified professional, approved by Planning Director
Recreation area or property	1.25 times TTH	1% TTH per 10 ft above or below affected property	TTH
Transmission line[d]	2 times TTH	1% TTH per 10 ft above or below path of conductor line at ground level	50% of general setback with report by qualified professional, approved by Planning Director

Affected Land Use or Corridor	General Setback	Setback Adjustment for Turbine Elevation Above or Below Affected Use[a]	Alternative Minimum[b]

Note: TTH = total turbine height: the height to the top of the rotor at 12:00 position. Setback distance to be measured horizontally from center of tower at ground level.

[a] The General Setback based on TTH will be increased or reduced, respectively, based on whole 10-ft increments in the ground elevation of the turbine above or below an affected parcel, dwelling unit, road right-of-way, or transmission corridor conductor line. Any portion of a 10-ft increment in ground elevation will be disregarded (or rounded down to the nearest 10-ft interval).

[b] *Alternative Minimum* refers to a reduced setback standard, including any adjustment for elevation, allowed with a notarized agreement or an easement on the affected property, subject to approval of the Planning Director.

[c] No setback from parcel lines is required within the same wind energy CUP boundary. Knowledge of proposed wind energy CUPs on adjacent parcels to be based on best available information at the time of the subject application.

[d] Measured from the center of the conductor line nearest the turbine.

Turbine and Wind Resource Requirements

For a variety of reasons, repowered wind turbines will be installed at new addresses in different locations than the existing wind turbines. Spacing requirements, topography, and the necessity to avoid high-risk (for avian mortality) sites also guide where repowered turbines would be sited. Detailed turbine siting is determined by wind resource availability, turbine type, topography, setback requirements, and location of sensitive resources. New turbines would be spaced more widely and individually than under the current approach of arranging turbines in strings. Three factors contribute to this spatial approach.

- Current-generation turbines are vastly more efficient and productive than first- and second-generation turbines, necessitating far fewer turbines to achieve the same installed capacity.
- Current-generation turbines require considerable space to avoid wind turbulence affecting downwind turbines
- The new larger turbines may require greater distances from the program area perimeter than existing turbines.

Distances between turbines are site/project specific and are stipulated by the turbine manufacturer. For example, a turbine manufacturer may recommend specific turbine spacing to achieve the installed capacity. Minimum lateral spacing between turbine towers is typically three times the rotor diameter. Downwind spacing is typically 8–12 rotor diameters. Accordingly, repowered turbines are expected to have 141- to 277.5-meter lateral spacing and 376- to 1,110-meter downwind spacing.

2.5.3 Repowering Activities

A repowering project typically includes the following major steps.

- Temporary meteorological tower installation.
- Temporary staging area set-up.
- Existing wind turbine removal.

- Temporary meteorological tower removal.
- Road infrastructure upgrades.
- Wind turbine construction.
    - Final site selection and preparation.
    - Batch plant construction.
    - Foundation excavation and construction.
    - Crane pad construction.
    - Tower assembly.
    - Installation of turbine nacelle.
    - Attachment of rotors.
- Collection system upgrades and installation.
- Communication system installation.
- Permanent meteorological tower installation.
- Reclamation of landscape.

Each of these steps is described in detail in the following sections. Equipment used for construction of all repowering activities often includes those listed below.

- Cranes.
- Lowboys/trucks/trailers.
- Flatbed trucks.
- Service trucks (e.g., pickup trucks).
- Backhoes.
- Bull dozers.
- Excavators.
- Graders.
- Dump trucks.
- Track type dozers.
- Rock crushers.
- Water trucks.
- Compactors.
- Loaders.
- Rollers.
- Drill rigs.
- Trenching cable-laying vehicles.

- Cement trucks.
- Concrete trucks and pumps.
- Small hydraulic cranes.
- Heavy and intermediate cranes.
- Forklifts.
- Generators.

For individual projects, construction activities would typically be carried out in the seven phases listed below. There would be some overlap between most of these phases; in other words, the estimated durations should not be considered to be additive; rather, the entire construction period from decommissioning through cleanup and restoration is anticipated to require approximately 9 months for a typical 80 MW project. Although the precise schedules of individual projects are anticipated to vary, the durations listed below are used to estimate impacts in the program-level analyses.

- Phase 1—Decommissioning of existing plant: 12 weeks.
- Phase 2—Laydown areas: 12 weeks.
- Phase 3—Road construction: 8 weeks.
- Phase 4—Foundations/batch plant: 16 weeks.
- Phase 5—Turbine delivery and installation: 12 weeks.
- Phase 6—Electrical trenching: 12 weeks.
- Phase 7—Cleanup: 8 weeks.

Temporary Meteorological Tower Installation

A system of temporary meteorological towers would be installed in strategic locations in advance of repowered wind turbine siting and construction. The system of meteorological towers would typically be installed for a minimum of 1 year to measure wind speed and direction to determine whether a site's potential production capacity makes it suitable for wind turbine placement. Meteorological tower height is typically equivalent to the hub height of repowered turbines. The tower consists of a 15- to 30-centimeter-diameter pole on a square pier foundation 107–152 centimeters on a side. Some meteorological towers are freestanding; others are anchored to the ground with guy wires.

Meteorological towers are typically placed in areas where grading is not required for installation. Because the data collection system is solar-powered, wireless, or battery-powered, no data or power connections are necessary. Installation requires a staging area accommodating the tower site, crane site, and pulling site. Installation occurs over the course of 1–2 days with no seasonal restrictions.

Once the meteorological towers have collected adequate information, they are removed and the site is reclaimed (see the discussion of reclamation activities below).

Contractor Yards and Staging Areas

During construction of individual repowering projects, a main contractor yard and other temporary staging areas would typically be needed. The main contractor yard would typically encompass 5–10 acres, accommodating onsite construction trailer(s), parking for project workers, machinery maintenance and servicing area, and a take-down and set-up area where both the salvage and scrap materials of removed turbines and the components of repowered wind turbines are brought and stored until their use or disposal. Two to four additional staging areas (5–10 acres) would also be necessary, typically sited adjacent to existing roads and near turbine sites. Once construction is completed, the main contractor yard and staging areas are fully reclaimed or reduced in number or size. It may be necessary to maintain a portion of the contractor yard or other staging areas to accommodate future wind turbine maintenance. Each specific project will have its own laydown and staging area requirements.

Existing Wind Turbine Removal

The program assumes that all first- and second-generation turbines will be removed from the program area by 2018. Wind turbine removal entails removal of the wind turbine (rotor, nacelle, and tower) and down tower cabinet. Removal of the collection system, including the associated transformer, is discussed in *Collection System Upgrades and Installation*.

Existing wind turbine foundations may be fully or partially removed. Trenching and backfilling is typically used to bury foundations. For example, a backhoe is used to dig a trench around each foundation. The top 2–3 feet of the foundation, including the down tower cabinet foundation at turbines with pier foundations, is broken up and either spread in the excavated area or disposed of offsite. The excavated area is then backfilled to grade with the material that was removed during trenching, with the original topsoil placed on top. Areas of steeper slopes may require deeper coverage. As noted above, some buried features may be left in place if doing so is deemed to be more protective of natural resources than removal. Where features are left in place, steel and electrical connections would be leveled and made safe.

Grading will be avoided where appropriate to minimize and avoid disturbance of wildlife burrows that have adapted to existing grade cuts. However, in some instances such grade cuts will be graded out to match the surrounding contours, if wildlife impacts can be avoided. New grading over existing foundations, equipment pads, or finger roads may be necessary for the installation of new access roads and foundation pads for repowered turbines.

Removal of existing wind turbines is typically undertaken concurrently with other repowering activities to minimize project duration. For example, if a repowering project involves the removal of 100 turbines in several distinct locations, the project could be phased such that once turbine removal is complete in one area, road infrastructure upgrades can be initiated in that area while wind turbines are removed in another. Wind turbine removal may be limited to the dry months because of the weight of turbine components and the heavy equipment used for turbine removal. All turbine removal activities will confined to small, site-specific staging areas. These staging areas will be reclaimed on completion of the repowering project.

Meteorological Tower Removal

Temporary meteorological towers set up in advance of individual repowering projects as well as existing meteorological towers at the repowering project site would be removed prior to constructing the permanent meteorological towers. Because meteorological towers typically approximate the hub height of the turbines for which meteorological data are collected, the existing meteorological towers would not suffice for the proposed repowered turbines.

Removal of meteorological towers typically includes several steps. The aboveground components of the tower are removed by cutting one leg and pushing the tower over in a predetermined direction. The foundation is excavated by digging a trench around the foundation (an approximately 4-foot radius). The top 2 feet of the foundation is broken up and buried in the trench. The foundation must be buried with topsoil at a minimum depth of 2 feet. If all the foundation material cannot be buried, it is removed from the site. Upon completion of tower and foundation removal, the excavated area is backfilled. It is anticipated that all temporary and existing meteorological towers will be removed. Once a meteorological tower is removed, the site will be reclaimed as described below.

Road Infrastructure Upgrades

Fourth-generation turbine towers and blades are significantly longer than older turbine components and require larger and longer trucks and cranes for transport and installation. These vehicles require wider roads with shallower turns and gradients than currently exist. Consequently, the existing road infrastructure must be upgraded to accommodate construction of the repowered turbines. Road infrastructure upgrades would include grading, widening, and re-graveling of the existing roads, as well as construction of new roads. Existing culverts may need to be upgraded for existing roads and new culverts may be needed for new roads.

Existing Roads

Most roads internal to the portion of the program area currently supporting wind energy development would be widened to accommodate larger towers as well as larger equipment necessary to install repowered turbines. It is likely that the locations requiring the most roadwork are those where roads curve as they climb hills to the ridgetops. In addition, each of the access road entrances would need to be widened to provide sufficient space for the minimum turning radius of construction cranes and other flatbed delivery trucks.

Public roads used to access the program area may also require upgrades and/or widening to support the weight of trucks and turbine components, as well as to allow passage of turbine components.

Culverts are generally installed as part of the road drainage system on slopes, although some are installed at small stream crossings. Existing culverts may need to be replaced with larger culverts or reinforced to provide adequate size and strength for construction vehicles.

New Roads

New service roads would need to be developed from existing main roads to access repowered turbine sites—especially those in the area between the general plan–defined APWRA and the revised program area boundary. New service roads would typically consist of a gravel roadbed and shoulders (including cut-and-fill slopes). Exact locations of the roads are not known at this time. In addition, new stormwater culverts may need to be installed as part of the new road infrastructure.

Wind Turbine Installation

Installation of repowered turbines would occur throughout the program area. A range of turbine types may be used during the course of repowering, although only one or two types of turbines are likely to be installed in any single repowering project. All are anticipated to fall within the parameters described in *Fourth-Generation Turbines* above.

Installation of wind turbines is typically limited to the dry months because of the weight of both the turbine components and the heavy equipment necessary to perform the work; however, some work not requiring heavy equipment could be performed at other times.

Foundation

The type of turbine foundation used depends on terrain, wind speeds, and wind turbine type. Figure 2-4 depicts two foundation types that may be used in the program area: an inverted “T” slab foundation and a concrete cylinder foundation.

An inverted T slab foundation is a type of spread footing foundation. A single concrete pad is placed at ground level. Part of the pad may be placed below ground level depending on the slope. At the center of the pad is a cylindrical concrete block to which the wind turbine tower is bolted; hence the name, inverted T. The diameter of the cylindrical concrete block is equivalent to the tower base diameter. The size of the concrete pad is determined by wind turbine size and site-specific conditions (e.g., expected maximum wind speeds, soil characteristics). Its weight must be sufficient to hold the wind turbine in place.

A concrete cylinder foundation is a type of pier foundation. A single hollow, concrete cylinder is placed underground. Anchor bolts run the length of the cylinder to an embedded ring at the cylinder’s base. Earth fill is placed inside and outside the cylinder. The friction of the earth fill against the hollow pier holds the foundation and attached wind turbine in place. The diameter of the cylinder is slightly larger than that of the wind turbine tower base. The length of the cylinder is determined by wind turbine size and site specific conditions.

Construction

Repowered turbine construction entails placement of a new tower, rotor, nacelle, transformer, and foundation. Construction and installation of repowered turbines is regulated by existing County conditions of approval, building permit requirements, and grading permit requirements.

A crane pad area would be leveled and graded at each turbine address. The crane pad—a flat, level, and compacted area—would provide the base from which the crane will work to place the turbine. This site would also be used as a laydown area for offloading turbine components. The tower foundation would be constructed within the crane pad area. All wind turbine construction activities would occur within the crane pad area. A portion of the crane pad area may be left in place following construction for future O&M activities; the remaining area would be reclaimed.

Depending on the size and location of the repowering project, a concrete batch plant may be necessary. A concrete batch plant is a facility where concrete is mixed for turbine foundations. After construction, the site of the batch plant would be reclaimed. Smaller projects may not require batch plants; instead, the concrete would be mixed individually for each turbine within the crane pad area or mixed offsite at an existing plant. It is estimated that three to eight batch plants would be required for the overall program.

The foundation would be installed immediately adjacent to the crane pad, within the crane pad area. While the foundation type is determine by terrain, wind speeds, and turbine type, in general, the foundation is formed by placing concrete in an excavated footing with reinforced steel.

The turbine towers, nacelles, and blades are delivered to each turbine location in the order of assembly, once the concrete of the foundation has set. Onsite tower assembly reduces the need to clear additional staging areas. Large cranes are brought to each site to lift and assemble the turbine components. First, the base section of the tower is secured to the foundation. The remaining tower sections are then connected to the base section. The nacelle and rotor are delivered to the turbine site. Blades are bolted to the rotor hub, lifted by a construction crane, and connected to the main shaft.

During construction of old first-generation turbines in the 1980s, when rock was excavated for the foundation or to grade a pad, it was placed in nearby piles. Depending on siting requirements of repowered turbines, relocation of some of these rock piles may be necessary to facilitate turbine placement and construction. Moving rock piles would require use of an excavator.

Lighting

The Federal Aviation Administration (FAA) determines project-specific lighting requirements, but in general, FAA requires that a single warning light can be used for groups of turbines less than 200 feet tall. Typically, turbines taller than 200 feet must be individually lit. Consequently, because fourth-generation turbines are generally well over 200 feet in height, all repowered wind turbines would require FAA lighting. Lighting of the wind farm would be in compliance with the FAA Obstruction Marking and Lighting Advisory Circular (AC70/7460-1K). Intensity of the lights would be based on a level of ambient light, with illumination less than 2 foot-candles being normal for nighttime and illumination greater than 5 foot-candles being the standard for daytime. Because some evidence suggests that lights may be an attractant for birds during nighttime migration (Kerlinger et al. 2010), the minimum number of required lights would be used to minimize attractants for birds during nighttime migration. Through its review process, the FAA could recommend that tower markings or aviation safety lighting be installed on all or only a portion of the turbine towers. The FAA could also determine that the absence of marking and/or lighting would not threaten aviation.

Collection System Upgrades and Installation

Each new repowered wind turbine must be connected to the electrical collection system. The collection system moves electricity generated by each turbine through a low-voltage line to a transformer, which boosts the voltage and conveys the electricity to a medium-voltage line that carries the electricity to a substation. The substation is where the voltage level of the collection system is stepped up to that of the power grid. From the substation, electricity is carried through a utility interconnection point onto larger utility transmission lines that distribute electricity to the power grid. Transmission lines in the program area are maintained by PG&E. Removal of old collection lines and construction of new lines (turbine to substation) are part of the program, but construction of new transmission lines (substation to power grid) is not.

As repowering projects are implemented, the aboveground components of old collection systems would be removed and new collection systems would be installed. Each wind project would have its own electrical collection system. The program-level analysis assumes that each project would construct its own substation or upgrade an existing one. As described below, some equipment will be replaced while some will be removed and not replaced. Staging areas required for collection system installation and areas where collection system components have been removed and not replaced will be reclaimed. Each of the collection system components is discussed below.

Collection Lines

Typical construction of new collection systems requires installation of underground low- and medium- voltage lines, transformers, and at least one overhead power pole. There are several types of power poles. Line poles are used to string aboveground collection lines and only have insulating devices. Corner poles have jumper wires, are located at turns or bends in the collection system alignment, and may require guy wires. Poles with pole-top transformers, capacitor banks, and metering sets may also be used. Riser poles are used where collection lines transition from underground to an elevated, aboveground configuration where the lines enter a substation. Disconnectors, cut-outs, switches, lightning arresters, and other electrical devices may be mounted on riser poles.

Low-voltage lines connect an individual turbine or group of turbines to the transformer that supports them. Low-voltage lines range from 1 to 600 volts, and a line may range from 10 to 200 feet long. All low-voltage lines are currently underground. All new lines would also be constructed underground. Because of their age, it is unlikely that any of the existing low-voltage collection lines would be used for the repowered turbines.

Medium-voltage lines connect transformers to a substation or utility interconnection point. The medium-voltage lines are normally between 601 volts and 35 kV. Typically, construction and installation of all new medium-voltage lines would be underground wherever possible, except for their point of connection with the substation and from the substation to the interconnection point. Existing aboveground lines may also be used; however, most of the existing aboveground medium-voltage lines would be removed and not replaced. If installation of new aboveground collection line facilities is required, then it would be completed in compliance with the latest recommendations of the Avian Power Line Interaction Committee (APLIC).

Installation of underground low- and medium-voltage lines is accomplished using a cut-and-cover construction method. Typically, a minimum access width of 20 feet is required to allow for the trench excavation, but this width may vary. The length of line varies with the distance to the substation. The topsoil is separated from the subsurface soil for later replacement. The trench is then plowed using a special bulldozer attachment that buries the lines while disturbing less than a meter-wide strip of soil. Once the collection lines are laid in the ditch, the trench is partially backfilled with subsurface soil. Communication lines (discussed below) are then placed in the trench as well. The trench is then backfilled with the remaining subsurface soil, compacted, and then covered with reserved topsoil.

Transformers and Power Poles

Transformers boost the voltage of the electricity produced by the turbines to the voltage of the collection system. Each repowered turbine would have its own transformer adjacent to or within the turbine.

Currently, most medium-voltage lines are aboveground and supported by power poles. Each line requires a right-of-way (typically 50 feet wide) and 26 or 27 wood or direct-embedded steel or self-supporting steel poles per linear mile. All existing poles would be removed as part of repowering. No new poles would be installed where undergrounding of electrical equipment is feasible. The installation of overhead power lines and poles would be limited to locations where underground lines are infeasible and immediately outside the substations where underground medium-voltage lines typically come aboveground to connect to the substation.

To install power poles, a laydown area is required. To mount the medium-voltage lines on a power pole, a pull site and a tension site are required. Pole sites, pull sites, tension sites, access roads, and laydown areas are cleared (i.e., mowed) if necessary. Pole holes and any necessary anchor holes are excavated. Where possible, a machine auger is used to install poles. The width and depth of the setting hole depends on the size of the pole, soil type, span, and wind loading.

Power poles are framed, devices installed, and any anchors and guy wires are installed before the pole is set. Anchors and guy wires installed during construction are left in place. After setting the pole, conductors are strung.

The removal of existing power poles, power lines, and communication lines entails removing the poles directly with an excavator and immediately loading them onto a truck for removal from the site. Wire is cut, coiled, and removed from the site for recycling/scrap value.

Substations

Substations use large transformers to boost the voltage level of the electrical collection system to that of the local power grid (operated by PG&E). Transformers are the principal component of a substation, but substations also require switches, metering devices, lightning protection, and other appurtenant facilities. A large repowering project may require multiple substations, or multiple projects may connect to a single substation where projects can be separately metered. The location of a substation is determined by the location of the power grid interconnection point. Both PG&E and wind company–operated substations are present in the program area; however, repowering activities evaluated in this PEIR are limited to those activities associated with substations owned and operated by the project applicants. Activities associated with PG&E substations are not part of the program evaluated in this PEIR.

To support the program, existing substations would be replaced, upgraded, or expanded. The typical substation would encompass approximately 3 acres, with an additional 3 acres temporarily used during construction. Substation sites are graded, paved, or surfaced (e.g., compacted and graveled), and the area is fenced and lighted for safety and security reasons. Offroad travel is not necessary because substations would be accessed by new or existing roads.

Communication System Installation

Each repowered wind turbine must be connected to the data communication system. The communication system is used to monitor, and in some cases control, the operation of wind turbines (e.g., whether a turbine is on or off or how much power it is producing) and transmits these data through communication lines or wireless technology. Communication systems may be set to trigger an alarm if certain operational conditions arise. The communication system is installed in the same alignment and at the same time as the electricity collection system. Consequently, the installation process is the same as that described for the collection system.

Permanent Meteorological Tower Installation

A system of up to 16 meteorological towers would be installed in strategic locations as part of individual repowering projects to measure wind speed and direction. All permanent meteorological towers would be freestanding towers without guy wires, approximately 80 meters tall.

Equipment Maintenance during Construction

During construction, refueling and maintenance of equipment and vehicles that are authorized for highway travel would be performed offsite at an appropriate facility. Equipment and vehicles that are not highway authorized would be serviced on the project site by a maintenance crew using a specially designed vehicle maintenance truck.

Reclamation Activities

Postconstruction Reclamation

As described in Section 2.4.5, the 2005 CUPs require that wind companies remove all facilities and restore properties to preinstallation conditions once the windfarm is decommissioned. For repowering projects, this requirement entails removing all first- and second-generation wind turbine facility infrastructure that is no longer needed for the repowered project. Site reclamation is typically implemented after the repowered turbines are installed and all temporary equipment and infrastructure is removed from that area.

Reclamation activities involve returning lands disturbed by infrastructure installation or removal to preproject conditions. Some facilities (e.g., roadways, turbine footings, underground collector lines) may be left in place if doing so is deemed to be more protective of natural resources than removal. At each reclamation site, the entire site is contour graded (if necessary and environmentally beneficial), stabilized, and reseeded with an appropriate seed mixture to maintain slope stability. No soil is removed from the site. Figure 2-9 shows reclamation of a turbine pad site. Exceptions to returning a site to preinstallation conditions may be made, with approval of the County Planning Department, if such reclamation activities would or could create water quality issues (e.g., erosion) or if the activities may adversely affect special-status species (e.g., burrowing owl burrow complexes, upland habitat for California red-legged frog or California tiger salamander).

Roads that are not necessary after turbine removal and that are not wanted by landowners would also be reclaimed unless a resource agency (CDFW or USFWS) determines that reclamation would be detrimental to special-status species. In addition, some roads widened for construction may be returned to preproject widths and widened areas reclaimed. Road reclamation may include contour grading to conform to natural surrounding ground levels and backfilling roadcuts on slopes.

Postproject Reclamation

At the end of the 30-year CUP term, it is anticipated that the County's conditions of approval will require that wind companies remove all turbine-related infrastructure and return the site to preturbine conditions unless an exception is made by the Planning Director. Because it is very difficult to anticipate project site conditions 30 years in advance, project applicants are required to develop a reclamation plan in coordination with the County, USFWS, and CDFW. The reclamation plan must be completed and approved by the County 6 months in advance of project decommissioning or at 29.5 years into the permit, whichever comes first, so that the plan may be implemented immediately upon cessation of turbine operation.

2.5.4 Operations

Turbines would be operated in accordance with manufacturer recommendations and avoidance and minimization measures described in Section 3.4, *Biological Resources*. Manufacturer recommendations for cut-in speed for repowered turbines are expected be 3.5–4 meters per second. The typical cut-out speed is 20–25 meters per second.

Seasonal shutdown of individual turbines may be required as an adaptive management action, but only if impacts on avian species are higher than anticipated in the estimates presented in Section 3.4 of this PEIR. Repowered turbines, once installed, would not be permanently shut down or decommissioned prior to the end of the permit term unless they fail or sustain irreversible damage during operations that necessitate their removal for safety concerns.

2.5.5 Maintenance

Facility Maintenance

Wind companies conduct regular maintenance on turbines to ensure proper operation. These activities are consistent with the maintenance activities for first- and second-generation turbines as described in Section 2.4.3 with one major exception; repowered wind turbines are not removed or relocated as part of ongoing maintenance. Current-generation turbines are much larger and require larger equipment (e.g., cranes and flatbed trucks) to install or remove. Furthermore, because the foundations of current-generation turbines are much larger than those of first- and second-generation turbines, the construction of new foundations requires significant ground disturbance. These factors render moving current-generation turbines to new locations after initial installation technically difficult and financially infeasible.

One other difference in maintenance requirements is that the level of effort to maintain underground collection lines is less than that required for aboveground lines because underground lines are protected from weather and interactions with birds.

In general, maintenance activities would consist of equipment replacement, collection system repair, and road maintenance as necessary. Maintenance-related ground disturbance would take place within the footprint of the initial construction-related disturbance areas. Repair and maintenance of access roads would take place within the footprints of existing access roads. Turbines may need to be repaired or replaced (using the existing tower and foundation) at a rate of approximately one turbine every 5 years. No new permanent effects are anticipated during maintenance activities, and temporarily affected areas, if any, would be restored following disturbance.

Fire Prevention

Windfarms with enclosed tubular towers and no overhead lines or power poles pose reduced fire risk; accordingly, it is anticipated that the County could reduce firebreak requirements in association with repowering efforts. A reduction in the number and extent of firebreaks would reduce ground-disturbing activities around repowered turbines. The California Department of Forestry and Fire Protection (CAL FIRE) would be consulted in the development of any amendments proposed by the County. Specific changes are not proposed as part of the program, but would be developed during implementation and in consultation with CAL FIRE and the County Fire Department as conditions of approval of the CUPs.

2.6 Specific Projects

Permit applications for two specific repowering projects in the program area have been submitted to the County by Golden Hills Wind, LLC (Golden Hills) (a subsidiary of NextEra), which is proposing the Golden Hills Project, and EDF RE (formerly known as enXco), which is proposing the Patterson Pass Project. These are independent wind energy repowering projects that the County has chosen to analyze in a single draft PEIR. However, like the nearby Sand Hill repowering project (which is being analyzed in a separate CEQA process), they may be approved separately from each other and from the program. Their approval is not dependent on the approval of any other repowering project, and the approval of either will not cause the repowering of any other project. The environmental impacts of these projects are evaluated in this PEIR at the project level. It is anticipated that the project-specific mitigation measures contained in this PEIR will be included as enforceable conditions of approval of any CUPs approved for these projects.

Each of the proposed projects is described below. In general, proposed development activities would be the same as those described above under *Proposed Repowering*; these activities are not repeated here. However, additional discussion is provided where necessary to address specific design, siting, or potential impact mechanisms that are not described above. Where project-level design has not been completed, project-related metrics (e.g., areas of disturbance associated with specific types of activities) are based on the recently completed Vasco Winds project in the northern (Contra Costa County) portion of the APWRA.

2.6.1 Golden Hills Wind Energy Facility Repowering Project

Golden Hills proposes to repower an existing wind energy facility in the program area to replace outdated and inefficient wind turbines with fewer and more efficient turbines. The proposed Golden Hills Project would decommission and remove existing wind turbines on the existing wind energy facility site, install new and fewer turbines, and make improvements to related infrastructure. The proposed project would comprise up to 52 new 1.7 MW GE turbines. The proposed project area, existing and proposed turbine layout are shown in Figure 2-10.

Project Location and Land Ownership

The Golden Hills project area encompasses approximately 4,528 acres on 38 parcels. Site access is from local roads through existing gates. The proposed project would improve access at gates inside and around the site. The parcels making up the project area are listed in Table 2-3.

Table 2-3. Golden Hills Project Parcels

Assessor's Parcel Number	Acreage
99A-1760-1-3	112.9
99A-1770-2-1	119.7
99A-1770-2-2	38.8

Assessor's Parcel Number	Acreage
99A-1770-2-3	47.6
99A-1770-3	157.4
99A-1770-4	159.1
99A-1770-999-99	3.8
99A-1780-1-4	549.8
99A-1785-1-14	199.4
99A-1790-1	156.8
99A-1790-2	153.1
99A-1790-3	319.9
99A-1795-1	634.7
99A-1810-1	252.0
99B-5650-1-4[a]	64.7
99B-5650-2-1	70.5
99B-5650-2-3[a]	0.1
99B-5650-2-4[a]	70.0
99B-6400-1-10	51.0
99B-6400-1-8	0.4
99B-6400-1-9	0.7
99B-6400-2-2	3.4
99B-6400-2-3	0.2
99B-6400-2-6	296.0
99B-6400-4[a]	33.0
99B-6425-2-3	252.3
99B-7800-2	10.7
99B-7800-9	38.1
99B-7890-1-3[a]	133.8
99B-7890-2-4[a]	107.5
99B-7890-5[a]	8.9
99B-7900-1-3	15.8
99B-7900-1-4	0.1
99B-7900-1-5[a]	253.8
99B-7900-1-6	6.1
99B-7900-1-7[a]	148.0
99B-7900-2[a]	9.9

[a] Acreage shown is portion of parcel within project area; remainder of parcel is outside project area boundary

Existing operations are subject to the terms and conditions of the existing lease agreements with the underlying landowners. If the County approves the proposed project (by approving the CUP), the existing easements between Golden Hills and each landowner would be revised and formalized to identify the final location of proposed project components. The creation and modification of these landowner agreements to accommodate the proposed project are not subject to CEQA requirements.

Project Need, Goals, and Objectives

As recognized by the County, the proposed project would serve the public and market need for electrical energy, the documented and public policy need to produce renewable energy, and the widely held public and regulatory agency need to substantially reduce avian mortality related to wind turbine operations. The goals of the applicant reflect those of the program: to repower its windfarm assets in compliance with the existing CUPs and applicable laws, reduce avian mortality, and meet County general plan and state goals for production of renewable energy.

The applicant's objectives for the proposed project include implementation of provisions of the 2010 *Agreement to Repower Turbines at the Altamont Pass Wind Resource Area*. Consistent with that agreement, Golden Hills intends to replace approximately 2,400 turbines between 2010 and 2014, and will shut down all its existing turbines by November 2015. Golden Hills' objective over 4 years is to replace its estimated 160 MW of generating capacity in two phases, beginning with the 88.4 MW Golden Hills Phase 1 Project, which is the project addressed in this PEIR. Golden Hills Phase 2 will be evaluated in a separate CEQA document. The 2010 Agreement was in part intended to satisfy NextEra's obligations under the 2007 Settlement Agreement.

The 2010 Agreement, among other items, specified a mitigation fee for ongoing harm to focal raptor species. Under this clause, NextEra agreed to pay a mitigation fee of $10,500 per MW of installed capacity for each repowering phase. These funds would go to support CEC's Public Integrated Energy Research Program for scientific research on the effects of wind turbines on birds and bats in the APWRA, as well as to support other entities (e.g., the East Bay Regional Park District, the Livermore Area Regional Park District) engaged in conservation efforts for bird and bat species in the APWRA and vicinity. Because this agreement is in place, that contribution is considered part of the project, and is accounted for in the discussion of impacts on biological resources in Section 3.4.

Existing Facilities

Golden Hills would remove up to 775 wind turbines on the existing windfarm site, including the associated transformers, electrical equipment, and meteorological towers. Decommissioning and removal of the existing turbines and ancillary facilities would allow the existing wind energy facility to be repowered.

The existing wind turbines, of various models, are characterized by hub heights of 18–43 meters (60–140) feet and rotor diameters of 18–33 meters (59–108 feet). The existing turbine foundations are concrete piers or pads with approximately 10 feet of drain rock placed around each foundation. The existing underground collection system would remain in place and would not be excavated.

Existing roads and other disturbed areas not needed for the proposed project's new turbines would be decommissioned, contour graded (if necessary and if environmentally beneficial), stabilized, and reseeded with an appropriate seed mixture to maintain slope stability.- Temporary erosion control measures would be implemented to maintain topsoil and revegetation.

Proposed Project

Golden Hills would install up to 52 new 1.7 MW turbines and related infrastructure with an aggregate nominal nameplate capacity of 88.4 MW. The specific equipment chosen for the proposed project would depend on final micrositing.

Siting would be determined prior to construction and on the basis of various siting criteria, such as terrain, geotechnical considerations, and the opportunity to avoid or minimize potential impacts, including impacts on avian species. Golden Hills would develop a siting strategy to avoid and minimize bird and bat mortality, using predictive models to site turbines in areas with the least potential for avian impacts to occur. These models, developed by Smallwood and Neher (2010), incorporate utilization data; digital elevation modeling; slope attributes; techniques to identify saddles, notches, and benches; and associations between bird utilization and slope attributes. The models essentially result in the identification of areas with predicted high activity where wind turbines should not be placed.

Construction of the wind turbines would incorporate best management practices (BMPs) that are standard practice and normally required by building permits for large projects (e.g., dust suppression, erosion control measures, traffic management, noise controls, covering or enclosure of dry materials, controlled handling of hazardous materials). Many of these practices would be mandated as mitigation measures identified in this PEIR; moreover, because project proponents fully anticipate implementation of such practices, many may be incorporated directly into the individual project proposals.

Wind Turbines

Golden Hills would likely select a turbine with characteristics similar to those of the GE 1.7 XLe model: a 1.7 MW turbine with a hub height of 80–96 meters (262–315 feet), a rotor diameter of 100–115 meters (328–377 feet), a total height up to 153 meters (502 feet), and a minimum distance from ground to rotor tip at 6:00 position of 30 meters (98 feet).

Foundations

Once the roads have been constructed or upgraded, turbine foundations would be constructed. A geotechnical report would be prepared to identify the appropriate turbine foundation design. Pending completion of the geotechnical analysis, each foundation is expected to require an excavation of up to 18 meters (60 feet) in diameter, with foundations constructed of steel-reinforced concrete. Concrete for the foundations would be provided from the temporary batch plant and transported using concrete trucks. A rectangular gravel crane pad area approximately 20 by 40 meters (65 by 130 feet) would be developed at the base of each tower.

Roadway Improvements

Turbine transport involves equipment and crane specifications that dictate road width and turning radii. To allow safe passage of the large transport equipment used in construction, all-weather gravel roads would be built with adequate drainage and compaction to accommodate such vehicles. The proposed road construction described below is designed to minimize disturbance, avoid sensitive resources, and maximize transportation efficiency.

After sensitive areas have been identified and marked, initial grading of access roads and interior project roads would commence. The proposed permanent gravel roads would be constructed to County standards. Cut materials will be used as fill onsite; no material would be disposed of offsite. General cut-and-fill slopes would be established at a 2:1 ratio. The final location of the road and the cut-and-fill volumes would be based on grading, construction, and environmental permitting requirements; topography; and sound engineering principles. The construction-related assumptions for roads are described below.

Interior Project Roads

The project would involve construction of about 104,000 linear feet of roadways. Interior project roads would have temporary construction widths up to 52 feet: a maximum 40-foot width plus two 6-foot shoulders. Following project construction, the permanent access roads would be finalized (see below); temporarily disturbed shoulders and passing areas would be reclaimed. To the greatest extent possible, the new roadway system would be designed to limit disturbance and avoid sensitive resources. The proposed project's interior road system would follow existing roadway alignments where possible, but grade adjustments as required by the turbine manufacturers would be made in many locations to accommodate maximum grades. The maximum road grade on access roads used during construction would be approximately 10%.

Temporary passing areas would be provided along one-way roadways approximately every 2,500 feet to facilitate safe passing of traffic through the site interior. Up to 50% of the turnout areas developed during construction would be maintained to support safe passing for subsequent O&M traffic on the interior road system. The remaining turnouts and turnaround areas would be reclaimed and temporary shoulder areas could be restored. Temporarily disturbed areas would be restored in accordance with the proposed project's reclamation plan and with all relevant permit conditions.

Drainage culverts (new or upgrade of existing) would be installed (or removed) in accordance with County standards. Primarily, these culverts would be installed to divert water away from areas where drainage swales intersect with roadways, thus preventing high stormwater flows from crossing road surfaces.

Postconstruction Project Road Conditions

Following road construction, all roads will be inspected to determine if and where any additional grading or additional gravel will be necessary to meet County standards. Additionally, final road shaping will be completed to ensure proper water flow away from cut-and-fill slopes and into ditches and culverts. Erosion control devices also will be installed or completed, disturbed areas adjoining the roads will be restored, and the appropriate erosion control devices will be installed.

Following construction, depending on whether they will be needed to provide access for O&M, roads will be left in place or restored in conformance with County standards. Roads left in place will be inspected and graded where low spots and ruts have formed. Culverts will be left in place and road edges will be restored.

Improvements at Local Access Roads

Proposed project ingress/egress to the site would be via North Flynn Road, Patterson Pass Road, and Midway Road.

To the extent possible, existing roads would be used for proposed project construction and operations. The existing roadway system primarily consists of gravel access roads up to 16 feet wide. All-weather gravel roads would be built with adequate drainage and compaction to accommodate equipment transport vehicles. Improvements could require the widening of roadways outlined above to provide additional shoulder and lane widths. Minor drainage improvements could be required to adjust existing drainage inlets to grade and provide roadside ditches.

All road improvements would be designed according to Alameda County design standards. Preliminary design for the project ingress and egress points would be provided to the Alameda County Public Works Department. Encroachment permits, for minor roadway improvements if needed, would be needed from the Alameda County Public Works Department and would be designed to meet Alameda County Design Standards (and Caltrans Highway Design Manual Standards, as applicable). An encroachment permit for improvements within the public right-of-way falling within Alameda County would be needed, and the Alameda County Public Works Department would conduct design review of the proposed improvements.

After construction, the permanent access roads would be reduced in width to 25 feet and the remaining disturbed area would be reclaimed. Temporarily disturbed areas would be reclaimed as determined through consultations with USFW, CDFW, and the County. Erosion control devices would be installed or completed. Drainage culverts would be installed or removed as appropriate in accordance with Alameda County standards to prevent high stormwater flows from crossing road surfaces.

Golden Hills would repair, repave, or reconstruct those portions of existing County roads damaged during construction in accordance with applicable design standards agreed upon prior to beginning construction.

Power Collection System

Collection Lines

The power collection system would consist of medium-voltage, high-density, insulated underground cables that would connect the turbines to the onsite substation. The underground collection cables are generally buried in trenches adjacent to the roadbed of the interior access roads. Communication lines would be installed in the same trenches. No existing collection lines would be used.

Trenching equipment would be used to excavate trenches in or near the access roadbed to allow installation of the insulated underground cables that would connect each turbine to the substation. The trenches typically would be 12–24 inches wide and 48 inches deep, but their depth and number would be determined ultimately by the size of the cable required and the thermal conductivity of the soil or rock surrounding the trench. The large conductor cables would be placed within the trenches, packed in sand or native materials depending on the soil properties, and covered to protect the cables from damage or possible contact. Optical fiber communication links and communication lines for turbine performance remote-sensing equipment would be placed in the same trenches as the conductor cables. In locations where two or more sets of underground lines converged, pad-mounted switch panels would be used to tie the lines together into one or more sets of larger feeder conductors. The accumulated cables from the individual arrays would be spaced 10 feet apart on either side of the road system in “home runs” to the onsite substation. The locations of the buried infrastructure would be recorded in as-built project diagrams that would be developed at the end of the construction period. Because a significant portion of the underground collection cables would be installed parallel to and within the footprint of areas temporarily disturbed by road construction, installation of the collection system is only expected to result in minimal additional permanent surface disturbance.

Because underground collection cables would be installed parallel to and within the footprint of areas temporarily disturbed by road construction, installation of the collection system is not expected to result in permanent surface disturbance. Installation would result in an estimated 14.3 acres of temporary disturbance.

Collector Substation

The main functions of a collector substation are to step up the voltage from the collection lines (34.5 kV) to the transmission level (115 kV) and to provide fault protection. The basic elements of the substation facilities are a control house, a bank of one or two main transformers, outdoor breakers, capacitor banks, relaying equipment, high-voltage bus work, steel support structures, an underground grounding grid, and overhead lightning-suppression conductors. The main outdoor electrical equipment and control house are installed on a concrete foundation.

The existing onsite substation (Midway) serves as the collector substation for the existing windfarm. This substation would be replaced by another in the same general location. The substation would consist of a graveled footprint area of approximately 2 acres, a 12-foot chain-link perimeter fence, and an outdoor lighting system. The new lights would be shielded or directed downward to reduce glare. For the purposes of this analysis it is assumed that these lights would remain on from dusk to dawn. Construction of the substation would entail a total disturbance area of up to 6 acres. Of these 6 acres, 3 acres would be disturbed temporarily during construction and would be restored after construction is complete. The remaining 3 acres would be permanently disturbed.

An energy storage unit encompassing approximately 1 acre would be constructed within the 3-acre permanent disturbance footprint of the collector substation facility. The modular design would accommodate lithium-ion batteries, either in a building or in approximately thirty 40-foot International Standard Organization (ISO) containers. The facility would contain all necessary energy management hardware and software to manage energy supply from the turbines to the power grid, as well as a fire detection and suppression system and air conditioning. Construction is anticipated to require approximately 4 months. Battery replacement would be required over the life of the project, and waste batteries would be removed from the site and transported either to the manufacturer or to an approved battery reprocessor for recycling or disposal.

Meteorological Towers

The proposed project would entail construction of four permanent meteorological towers distributed through the project area to monitor weather conditions and wind speed. Each freestanding tower would be mounted on a circular pier or slab foundation surrounded by a circular area of gravel to a radius of about 15 feet.

Operations and Maintenance Facilities and Other Project Elements

Operations and maintenance facilities would involve a permanent disturbance of 2 acres. The precise location of these facilities has not yet been identified.

Up to four portable toilets would be maintained year-round onsite and serviced by a contractor. No other water, wastewater, or sewer/septic systems are present at the existing windfarm, and no changes to the water, wastewater, or sewer/septic system are proposed to support the proposed project.

Project Construction

Turbines would likely be delivered to the site from the Port of Stockton or other nearby port or rail transfer location. Tower assembly requires the use of one large track-mounted crane and two small cranes. The turbine towers, nacelles, and rotor blades would be delivered to each foundation site and unloaded by crane. A large track-mounted crane would be used to hoist the base tower section vertically then lower it over the threaded foundation bolts. The large crane would then raise each additional tower section to be bolted through the attached flanges to the tower section below. The crane then would raise the nacelle, rotor hub, and blades to be installed atop the tower. Two smaller wheeled cranes would be used to offload turbine components from trucks and to assist in the precise alignment of the tower sections.

Schedule

Proposed project construction would proceed after all construction-related permits are issued. These activities are anticipated to proceed according to the phases outlined in Section 2.5.3, *Repowering Activities*. Construction-related best management practices (BMPs) would be implemented during the November–April wet season. The final approved work hours would be specified in the proposed project's CUP. If extended hours are necessary or desired, the appropriate approvals would be sought.

Workforce

Based on data provided for typical wind energy projects of similar size, approximately 50 workers would be employed to decommission the existing wind farm. On average, approximately 200 workers would be employed during construction, with a peak workforce of 300. Craft workers would include millwrights, iron workers, electricians, equipment operators, carpenters, laborers, and truck drivers. Local construction contractors and suppliers would be used to the extent possible.

Construction Equipment and Ancillary Construction Facilities

The types of equipment listed in Section 2.5.3, *Repowering Activities*, would be used during the various stages of decommissioning and construction. On average, all equipment is assumed to operate for approximately 10 hours per day. The probable fuel type is diesel.

Temporary Concrete Batch Plant

Depending on weather conditions, concrete typically needs to be poured within 90 minutes of mixing with water. Delivery time to onsite pour locations would likely exceed 90 minutes from existing concrete suppliers in the proposed project vicinity. Accordingly, Golden Hills proposes to construct an onsite temporary concrete batch plant to facilitate concrete delivery for the turbine foundations.

The temporary batch plant would operate only during construction. The batch plant would require a stand-alone generator of approximately 250 kW. Fuel for the generator would be obtained from an aboveground storage tank (AST) with secondary containment for spill prevention. It is estimated that the batch plant would consume up to 5,400 gallons of water per day. A temporary 5,000-gallon water tank would be placed onsite to replenish the batch plant water, as needed.

Stockpiles of sand and aggregate would be situated near the batch plant in a manner that would minimize exposure to wind. Concrete would be discharged using a screw conveyor directly into an elevated storage silo. The construction managers and crew would use BMPs and standard operating procedures to keep the plant, storage, and stockpile areas clean and to minimize the buildup of fine materials.

Portable Rock Crusher

To construct and improve proposed project roads, a rock crusher would be required to provide appropriately sized aggregate for fill and road base. The portable rock crusher would be co-located with the batch plant. In accordance with BMPs, the rock-crushing area would be sprayed by a water truck to suppress dust. The crusher proposed for this project incorporates several dust-suppression features, including screens and water spray. Dust-control measures would be used at all emission points during operation, including startup and shutdown periods, as required.

Equipment Maintenance

During construction, refueling and maintenance of equipment and vehicles that are authorized for highway travel would be performed offsite at an appropriate facility. Equipment and vehicles that are not highway authorized would be serviced on site by a maintenance crew using a specially designed vehicle maintenance truck.

Staging and Laydown Areas

The proposed project includes construction staging areas (for storage of project components and equipment) and additional laydown areas at each turbine location (for offloading and storage of the tower components).

Construction Staging Areas

Temporary staging areas would be used during construction. It is anticipated that up to six staging areas, ranging from 1.7 to 7.0 acres (average 3.4 acres), would be used for the storage of turbine components, construction equipment, office trailers, and other supplies including hazardous materials. The batch plant, rock crusher, and associated fuel and water tanks would be co-located within the disturbed area footprint of one of the staging areas. Trailers would be placed at the staging areas to support workforce needs and site security. The trailers would also house a first aid station, emergency shelter, and hand tool storage area for the construction workforce. Vegetation would be cleared and each construction staging area would be graded to be level. It then would be covered with a 4-inch gravel surface and appropriate erosion control device (e.g., earth berm, silt fences, straw bales) would be installed to manage water runoff. Diversion ditches would be installed, as necessary, to prevent stormwater from running onto the site from surrounding areas. Following completion of construction activities, the contractor would restore the temporary construction staging areas. The gravel surface would be removed and the areas would be contour graded (if necessary and if environmentally beneficial) to conform with the natural topography, stockpiled topsoil would be replaced, and the area would be stabilized and reseeded with an appropriate seed mixture.

Laydown Areas

A laydown area would be constructed at each new turbine pad to accommodate offloading and storage of the tower sections, nacelle, rotor hub, and blades, as well as some construction equipment. Each laydown area would occupy approximately 0.5 acre. The laydown areas would include a compacted, gravel-surfaced crane pad within the 0.5-acre area. The crane pad would be approximately 65 feet wide (adjacent to the turbine access road) to allow a large track-mounted crane to access the turbine foundations. The laydown areas must be level or nearly level to allow the crane to lift the large and extremely heavy turbine components safely, and vegetation clearing and/or grading would be necessary. The crane pad would be constructed using standard cut-and-fill road construction procedures. The laydown areas would generally be circular. The actual dimensions of the individual laydown areas would be based on site topography and the need to minimize cut and fill.

Hazardous Materials Storage

Hazardous materials would be stored at one of the staging areas (use of extremely hazardous materials is not anticipated). To minimize the potential for harmful releases of hazardous materials through spills or contaminated runoff, these substances would be stored within secondary containment areas in accordance with federal, state, and local requirements and permit conditions. Storage facilities for petroleum products would be constructed, operated, and maintained in accordance with the Spill Prevention Control and Countermeasures (SPCC) Plan that would be prepared and implemented for the proposed project (Code of Federal Regulations [CFR], Title 40, Part 112). The SPCC Plan would specify engineering standards (for example, secondary containment); administrative standards (for example, training with special emphasis on spill prevention, standard operating procedures, inspections); and BMPs.

A Hazardous Materials Business Plan (HMBP) would be developed for the proposed project. The HMBP would contain specific information regarding the types and quantities of hazardous materials, as well as their production, use, storage, spill response, transport, and disposal.

Traffic and Parking

Golden Hills would prepare a Traffic Management Plan for the proposed project to reduce hazards that would result from the increased truck traffic, and to ensure that traffic flow on local public roads and highways would not be adversely affected. This plan would incorporate measures such as informational signs, traffic cones, and flashing lights to identify any necessary changes in temporary land configuration. Flaggers with two-way radios would be used to control construction traffic and reduce the potential for accidents along roads. Speed limits would be set commensurate with road type, traffic volume, vehicle type, and site-specific conditions as necessary to ensure safe and efficient traffic flow. Onsite construction traffic would be restricted to the roads developed for the proposed project. Use of existing unimproved roads would be restricted to emergency situations.

Preconstruction decommissioning activities and delivery of construction materials and equipment would require approximately 16,513 fully loaded inbound trips of large trucks to the site from offsite sources, for a total of up to 33,026 inbound and (empty) outbound truck trips associated with the proposed project. It is estimated that up to 900 of these trips would include oversized vehicles delivering wind turbine generator and substation materials, heavy equipment, and other construction-related materials. Construction of the proposed project components (roads, turbines, substation, and electrical/communication lines) would occur at about the same time, using individual vehicles for multiple tasks. Based on data provided for typical similarly sized wind energy projects, it is anticipated that during the construction period, there would be approximately 60 daily round trips by vehicles transporting construction personnel to the site. Assuming that construction material deliveries from external sources would occur over the 8-month construction period at 20 workdays per month, an average of about 81 one-way truck trips per day (that is, 40.5 trucks generating one trip to the proposed project site and one trip from the site) would be added to background traffic volumes on area roadways. In addition to these large truck loads, dump trucks, concrete trucks, water trucks, cranes, and other construction and trade vehicles operating within the project area would entail more than 12,000 truck trips.

Construction-related parking would be located in construction staging areas. Carpooling from a location within 10 miles of the site, other than the O&M facility, would also be used.

After construction, O&M of the proposed project would require approximately eight round trips per day using pickups or other light-duty trucks.

Water and Wastewater Needs

Water for project construction activities would be provided through an agreement with municipal or private suppliers. Temporary onsite water tanks and water trucks would be made available for fire water support, dust suppression, and construction needs. One or more 3,500-gallon tanks or other means of fire water support would be subject to approval by Alameda County.

During construction, up to 50 million gallons of water would be used for dust control on roads and during grading and site work, as well as for mixing with cement and aggregate to form concrete. Daily water use would vary, depending on the weather conditions and time of year, which affect the need for dust control. Hot, dry, windy conditions would necessitate greater amounts of water. Tanker trucks would apply water to construction areas where needed to aid in road compaction and reduce construction-generated dust.

For construction of foundations, water would be transported to the batch plant site where it would be used to mix concrete. A minimal amount of water would be required for construction worker needs (drinking water, sanitation facilities). This water would be trucked in or delivered as bottled drinking water. A local sanitation company would provide and maintain appropriate construction sanitation facilities. Portable toilets would be placed at each of the crane assembly areas, the concrete batch plant, the substation, and the trailer pad area. When necessary, additional facilities would be placed at specific construction locations.

Appropriate BMP training would be provided to truck operators to prevent runoff from dust suppression and control activities. Water used for cement mixing and truck washing would be managed in accordance with applicable permit conditions (and BMPs) and would not be discharged offsite.

Demarcation of Sensitive Resources

Sensitive resources adjacent to and within construction areas would be marked to ensure adequate avoidance. Sensitive areas identified through the environmental approval and permitting processes would be staked and flagged. Prior to construction, an environmental inspector (if required), the construction contractor, and any subcontractors would conduct a walk-through of areas to be affected, or potentially affected, by construction activities. The preconstruction walk-throughs would be conducted regularly to identify sensitive resources to be avoided, limits of clearing, location of drainage features, and the layout for sedimentation and erosion control measures. Following identification of these features, specific construction measures would be reviewed, and any modifications to construction methods or locations would be agreed upon before construction could begin. Resource agency representatives would be consulted or included on these walk-throughs as needed.

Materials and Services

Approximately 200,000 cubic yards of aggregate would be brought onto the proposed project site for roadway construction, turbine foundations, and the onsite substations.

Inspection and Startup Testing

Prior to operation, each completed turbine would be inspected and checked for mechanical, electrical, and control functions in accordance with the manufacturer's specifications before being released for startup testing. A series of startup procedures would then be performed by the manufacturer's technicians. Electrical tests on the transformers, underground power lines, and collector substation would be performed by qualified engineers, electricians, and test personnel to ensure that electrical equipment is operating within tolerances and that the equipment had been installed in accordance with design specifications. The aboveground power lines interconnecting to the PG&E system would be tested and inspected as required.

Cleanup and Restoration

Clearing and disposing of trash, debris, and scrub on those portions of the site where construction would occur would be performed at the end of each workday through all stages of construction. Existing vegetation would be cleared only where necessary. All excavations made by clearing would be backfilled with compacted earth and aggregate as soon as cable infrastructure is tested. Disposal of cuttings and debris would be in an approved facility designed to handle the waste.

Before construction is complete, all remaining trash and debris would be removed from the site. All temporarily disturbed areas would be returned to their previous contours and any debris would be removed and properly disposed of offsite consistent with Alameda County restoration requirements and described in a Reclamation Plan, which would be developed prior to construction as part of the construction planning and permitting process. Any material placed in the areas of the foundations or roads would be compacted as required for soil stability.

Operation and Maintenance

O&M activities for the proposed project would be similar to the O&M activities presently conducted for the existing wind facility.

Safety and Environmental Compliance Programs

Quality Assurance and Quality Control

A quality assurance/quality control (QA/QC) program would be implemented to ensure that construction and startup of the facility are completed as specified. Golden Hills would be responsible for ensuring implementation of the QA/QC program prior to construction. The program would specify implementing and maintaining QA/QC procedures, environmental compliance programs and procedures, and health and safety compliance programs and procedures, and would integrate Golden Hill's activities with the contractors during project construction. The engineering procurement and construction (EPC) contractor and turbine supplier would be responsible for enforcing compliance with the construction procedures program of all of its subcontractors.

Environmental Compliance

Orientation of construction staff would include education on the potential environmental impacts of project construction. The construction manager would establish procedures for staff to formally report any issues associated with the environmental impacts, to keep management informed, and to facilitate rapid response.

Stormwater Control

Because the proposed project would disturb more than 1 acre, it would require coverage under the state's General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (Order 2010-0014-DWQ) (Construction General Permit). Permit coverage would be obtained by submitting permit registration documents (PRDs) to the State Water Resources Control Board through its Stormwater Multiple Application and Report Tracking System (SMARTS) website. The PRDs include a notice of intent, site maps, a stormwater pollution prevention plan (SWPPP), a risk level assessment, and other materials. The SWPPP would include the elements described in Section A of the Construction General Permit and maps that show the location and type of erosion control, sediment control, and non-stormwater BMPs, which are intended to prevent significant water quality impacts on receiving waters. Depending on the risk level, the SWPPP may also specify that sampling of pH and turbidity in the runoff leaving the site be conducted during construction. The SWPPP would also describe site inspection, monitoring, and BMP maintenance procedures and schedules.

Safety Compliance

Golden Hills and its construction contractors and subcontractors would be responsible for construction health and safety issues. Each contractor and subcontractor would provide a health and safety (H&S) coordinator, who would ensure that applicable laws, regulations, ordinances, and standards concerning health and safety are followed and that any identified deficiencies are corrected as quickly as possible. The H&S coordinator would conduct onsite orientation and safety training for contract and subcontract employees and would report back to the onsite construction manager. Upon identification of a health and safety issue, the H&S coordinator would work with the construction manager and responsible subcontractor or direct hire workers to correct the violation.

Emergency Situations

If severe storms result in a downed interconnection power line, standard O&M procedures would be applied. The turbines would be equipped with internal protective control mechanisms to safely shut them down in the event of a high-voltage grid outage or a turbine failure related to fire or mechanical problems. A separate low-voltage distribution service feed might be connected to the low-voltage side of the collector substation as a backup system to provide auxiliary power to project facilities in case of outages. For safety, the collector substation would be fenced, locked, and properly signed to prevent access to high-voltage equipment. Safety signage would be posted around turbines, transformers, other high-voltage facilities, and along roads, as required.

Public Access and Security

The proposed project would be located entirely on private property and public property with restricted public access. Only authorized access to the project site would be allowed. The site is fenced and the collector substations would be fenced with an additional 12-foot-high, chain-link fence to prevent public and wildlife access to high-voltage equipment. Safety signs would be posted in conformance with applicable state and federal regulations around all turbines, transformers, and other high-voltage facilities and along access roads. Vegetation clearance would be maintained adjacent to project ingress and egress points and around the collector substations, transformers, and interconnection riser poles.

Hazardous Materials Storage and Handling

The County's Hazardous Materials Program Division is the Certified Unified Program Agency (CUPA) for all areas of Alameda County. Management of hazardous materials would be conducted in accordance with a County-approved HMBP developed for the proposed project pursuant to the requirements of the CUPA. Hazardous materials used during O&M activities would be stored within the existing O&M building in aboveground containers with appropriate spill containment features as prescribed by the local fire code or the SPCC Plan for the O&M building as stipulated by the appropriate regulatory authority. Such materials would be similar in type and amount to those currently stored and used for O&M for the existing facility.

Lubricants used in the turbine gearbox are potentially hazardous. The gearbox would be sealed to prevent lubricant leakage. The gearbox lubricant would be sampled periodically and tested to confirm that it retains adequate lubricating properties. When the lubricants have degraded to the point where they are no longer adequate, the gearbox would be drained, new lubricant would be added, and the used lubricants would be disposed of at an appropriate facility in accordance with all applicable laws and regulations.

Transformers contain oil for heat dissipation. The transformers are sealed and contain no polychlorinated biphenyls (PCBs) or moving parts. The transformer oil would not be subject to periodic inspection and does not need replacement.

O&M vehicles would be properly maintained to minimize leaks of motor oil, hydraulic fluid, and fuel. During operation, O&M vehicles would be serviced and fueled at the existing O&M building (using mobile fuel tanks) or at an offsite location. No storage tanks are located at the existing windfarm, and none are proposed.

Operation and Maintenance Activities

Maintenance of turbines and associated infrastructure includes a wide variety of activities. Routine maintenance involves activities such as checking torque on tower bolts and anchors; checking for cracks and other signs of stress on the turbine mainframe itself and other turbine components; inspecting for leakage of lubricants, hydraulic fluids, and other hazardous materials and replacing them as necessary; inspecting the grounding cables, wire ropes and clips, and surge arrestors; cleaning; and repainting. Most routine maintenance activities occur within and around the tower and the nacelle. Cleanup from routine maintenance activities would be performed at the time maintenance is performed by the O&M personnel. While performing most routine maintenance activities, O&M staff would travel by pickup or other light-duty trucks. In addition, on routine maintenance such as repair or replacement of rotors or other major components could be necessary.

Such maintenance would involve use of one or more cranes and equipment transport vehicles, though the cranes would not be as large as the track-mounted cranes used to erect the turbine towers.

Monitoring of the proposed project's operations would be computer-based; computers in the base of each turbine tower would be connected to the existing O&M facility through fiber-optic telecommunication links.

The O&M workforce is not anticipated to change from the existing turbine technicians, operations personnel, administrative personnel, and management staff. O&M staff would continue to monitor turbine and system operation, perform routine maintenance, shut down and restart turbines when necessary, and provide security. All O&M staff would be trained regularly to observe BMPs.

Ultimate Decommissioning and Reclamation

The anticipated life of the windfarm is more than 30 years, as upgrading and replacing equipment could extend the operating life indefinitely with appropriate permit approvals. However, the life of the proposed project for CEQA purposes would be coterminous with the term of the CUP required for its operation

The ultimate decommissioning and removal of the proposed project would be similar to the decommissioning and removal of existing windfarm components that would be undertaken prior to construction of repowered facilities, except that considerably fewer turbines would be removed. In addition, existing service roads would be used. No new access roads would be required, and no roads extant at that time are expected to require widening.

Decommissioning would involve removing the turbines, transformers, substations, foundations and related infrastructure to a depth of 3 feet below grade. A single large crane would be used to disassemble the turbines, and smaller cranes would lift the parts onto trucks to be hauled away. Generally, turbines, electrical components, and towers would either be refurbished and resold or recycled for scrap. All unsalvageable materials would be disposed of at authorized sites in accordance with federal, state, and local laws, regulations, ordinances, and adopted County policies in effect at the time of final decommissioning. Following removal of the equipment and structures, a dozer would be used to spread dirt over the foundations. Road reclamation would be accomplished using scrapers and gravel trucks. Site reclamation after decommissioning would be subject to a County-approved reclamation plan (County Code Article 88-3.8). Based on site-specific requirements, the reclamation plan would include regrading, spot replacement of topsoil, and revegetation of disturbed areas with an approved seed mix.

2.6.2 Patterson Pass Project

Project Location and Land Ownership

The Patterson Pass Wind Farm Repowering Project (Patterson Pass Project) would entail repowering of the existing 21.8 MW windfarm, permitted under CUP C-8263, ENXCO, Inc./ Patterson Pass Farms, owned by Patterson Pass Wind Farm, LLC (Patterson Pass). The existing windfarm originally comprised 336 Nordank and Bonus 65 kW turbines, of which 317 turbines remain operational. The Patterson Pass Project is depicted in Figure 2-11.

Access to the Patterson Pass Project would be through existing private gates, likely from Patterson Pass Road, Jess Ranch Road, or both.

Project Need, Goals, and Objectives

The project objective is to repower the existing Patterson Pass Wind Farm on private land owned by EDF RE and develop a 19.8 MW commercially viable wind energy facility that would deliver renewable energy to the PG&E/CAISO power grid to meet the state's RPS goals. Patterson Pass Wind, LLC and its parent company EDF RE were party to the 2007 Settlement Agreement described above; the proposed repowering would fulfill EDF RE's obligations under that agreement.

The proposed project elements are listed below.

- A total nameplate generation capacity of up to 19.8 MW.
- Removal of existing wind turbines and installation of 8–12 new wind turbine generators, towers, foundations, and pad-mounted transformers to meet milestones set forth in the project's power purchase agreement.
- Development of project roads and installation of a power collection system as necessary.
- Use of existing electrical power transmission lines to convey the wind energy produced by the project to local and regional energy markets.
- Use of existing roads that provide access throughout much of the program area.
- Use of existing substation and switchyard (with potential upgrades of the existing equipment within the footprint of the existing facility).
- Use of the existing O&M facility and other support facilities adjacent to the project area that are available for project utilization and that will continue to receive power from the substation during the repowering process.

Existing Facilities

The Patterson Pass Wind Farm, commissioned in 1984, has been operational for 27 years. It comprises three parcels, totaling approximately 952 acres, wholly owned by Patterson Pass, a subsidiary of EDF RE (Table 2-4). The location of the project and the distribution of the existing first-generation turbines are shown in Figure 2-11.

Table 2-4. Patterson Pass Project Parcels

Assessor's Parcel Number	Approximate Acres
099A-1800-001-00	617.8
099A-1800-002-01	148.7
099B-7985-001-02	185.4

Operation and Maintenance

The existing Patterson Pass O&M building, encompassing approximately 4,600 square feet, houses maintenance equipment, spare parts inventories, collection/communication systems equipment, and the windfarm control center.

The windfarm is staffed 5 days a week, 8 hours a day, with weekend monitoring. Most existing wind turbines are fitted with control systems at the turbine towers; these systems are in communication with a remote, centralized control center, connected to the Opto-22 SCADA system to collect data. Additionally, each turbine functions as a standalone unit.

The wind turbine control and monitoring systems utilize communication lines that generally run parallel with the collection system lines and connect back to the Patterson Pass O&M building through the Opto-22 SCADA system.

Turbine Foundations

The existing turbine foundations are concrete, single spread or pier foundations supporting tubular towers. Each foundation has a footprint of approximately 20 by 20 feet.

Access Roads

Access to the project area is through locked gates from County and private roads (Patterson Pass Road and Jess Ranch Road, respectively). In the project area, main access roads connect turbine strings, and spur roads branch from the main access roads to individual turbines and other facilities.

Collection System

Electricity is collected from each wind turbine and transmitted to the ADCC substation, where its voltage is increased for interconnection with PG&E's transmission lines, which traverse the project area. The collection system includes pad-mounted transformers, underground cables, overhead cables on approximately 100 wooden poles, assorted circuit breakers and switches, electrical metering/protection devices, and the ADCC substation itself. Existing collection lines in the project area are owned by Patterson Pass. The Patterson Pass Project connects directly with PG&E through the ADCC substation to the 330 kVA transmission lines.

Meteorological Towers

Approximately 13 meteorological towers, 18–80 meters (60–263 feet) tall are present onsite. These towers monitor and record meteorological data such as wind speed, wind direction, and atmospheric pressure. Up to two existing towers will be utilized as the two permanent meteorological towers for the proposed project. All other existing meteorological towers will be removed during decommissioning or construction.

Proposed Project

The proposed project components are described below. The proposed project would entail three phases: decommissioning and removal of the existing windfarm facilities, construction of the proposed Patterson Pass Project, and operation of the proposed project. A conceptual layout of the proposed project is shown in Figure 2-11.

Decommissioning the Existing Facilities

Decommissioning the existing project would require removal of the wind turbine nacelles, blades, towers, and other facilities. Some facilities—such as the O&M building, substation, and one 80-meter meteorological towers—would be retained and may be upgraded as necessary. The O&M facility would continue to operate in support of the repowering project. In general, other facilities from the existing project that could not be reused—such as collection lines, some access roads, and turbine foundations—would be removed where feasible and in alignment with resource agency (USFWS and CDFW) recommendations. All removal activities would be carried out to minimize disturbance. It is anticipated that existing roads may be left in place to minimize disturbance (with upgrades as noted below). Equipment that cannot be salvaged would be disposed of at a properly licensed landfill. A list of existing structures and turbines that may be removed is shown in Table 2-5.

Table 2-5. Structures to be Decommissioned

Component	Quantity	Size
Wind turbines		
Turbine rotors to be removed	324	7.5-meter blades
Turbines/towers to be disassembled	128	60 ft
Turbines/towers to be disassembled	196	80 ft
Nordtank 65	118	80 ft
Bonus 65	206	80 ft
Turbines/towers to be removed	128	60 ft
Turbines/towers to be removed	196	80 ft
Turbine foundations to be buried	336	20 by 20 ft
Down tower box removed	n/a	
Down tower box foundation buried	n/a	
Electrical Equipment		
Transformers removed	46	500 kVA
Transformer foundations buried	46	13.5 by10 ft
Electrical poles with equip (fire safety clearing requirement)	48	
Riser poles	67	
Electrical OH lines removed (includes poles) (miles)	3.1	21 kVA
Underground power and communication lines 21kVA (miles)	3.59	21 kVA
Underground power and communication lines 480V (miles)	9.02	480 Volt
Met Towers		
Lattice met towers	5	60 ft
Lattice met towers	1	80 ft
Pole met towers	4	80 ft
Pole met towers	2	120 ft

Wind Turbines

The proposed turbines would be three-blade, upwind turbines on tubular towers (Figure 2-2). A range of turbines are being considered for the proposed project; each would have a nameplate capacity of 2.4–3.3 MW, a rotor diameter of 90–125 meters (295–410 feet), towers up to 84 meters (276 feet), and a maximum turbine height of 146 meters (480 feet). For example, the Vestas V112 3.3 MW turbine, with a 112-meter (367–foot) rotor diameter and 84-meter (276-foot) hub height, turns at 16.1 rpm. The tubular steel towers would have internal ladders to the nacelle, the color of towers and rotors would be neutral and nonreflective (e.g., dull white or light gray), and nacelles would be completely enclosed to minimize perching opportunities.

Each turbine would involve a 0.5-acre temporary laydown area to accommodate turbine components and the equipment necessary for turbine installation. Following installation, the laydown areas would be restored to preproject conditions.

Turbine placement would conform to the setback conditions shown in Table 2-2. All turbines would be sited no less than three times the total turbine height (i.e., from the ground surface to the tip of the blade in the 12 o'clock position) from any dwelling unit and 2.5 times the total turbine height from any public road, trail, recreation area, commercial or residential zoning, unless information in a report prepared by a qualified professional and verified by the County demonstrates that a lesser setback is adequate. In no case would a setback less than 50% of the established setback be allowed.

Temporary Staging Areas

The proposed project would likely require up to three temporary staging areas encompassing a total of up to 10 acres. To the extent possible, the laydown areas would be located in areas with existing turbines and access roads to minimize disturbance of natural habitats. Patterson Pass would use the staging areas for storage of turbine components, construction equipment, job trailers, and the materials needed for project construction. Access to the temporary staging areas would be from either Patterson Pass Road or Jess Ranch Road. Upon completion of construction, the temporary staging areas would be removed.

Foundations

The freestanding tubular towers would be mounted on steel and concrete foundations. Two types are being considered: the inverted T spread footing and the tensionless pier footing (Figure 2-4). Foundations would be designed in consideration of site-specific conditions and the design engineer's requirements. Once the foundation is constructed, the turbine towers would be anchored to the base with long steel bolts. The area surrounding each foundation would be restored by backfilling, compacting, and burying the foundation. Following backfilling, the foundation pedestal would stand approximately 1 foot above the surrounding grade.

Roadway Improvements

The proposed project would require up to 7 miles of private onsite access roads (Figure 2-11). During construction, access roads would be graded and temporarily graveled up to a width of 35 feet to allow sufficient space for two lanes of travel and to facilitate movement of large equipment (e.g., cranes, turbine components). Cut and fill necessary for road construction would be balanced onsite. No soil would be imported or exported for road construction. Gravel for construction of new roads would be trucked in from an existing source and would be compacted to form a stable road surface. To the extent possible, existing access roads would be reused; however the existing roads were constructed to accommodate much smaller first-generation turbines, and in many cases are not adequate to support construction or operation of the new project.

After construction, the road edges would be restored and reseeded, where appropriate, and the width of the roads would be reduced to 16 feet for continued use during O&M activities.

Access to the project area will be from Patterson Pass Road at the southern portion of the project area and from Jess Ranch Road at the northeast corner of the project area. Improvements to Patterson Pass Road (straightening, widening, or improving the turn into the project area) may be necessary to facilitate the delivery of turbines and associated parts. These improvements would be undertaken within the existing County right of way and/or within the project area, which abuts Patterson Pass Road. Improvements to Jess Ranch Road (widening the existing turn) may also be required to facilitate the turn into the project area.

A new access road would be constructed from Jess Ranch Road (shown in green in Figure 2-11). This modified alignment would avoid both wetlands and occupied burrowing owl habitat and would be built regardless of which of the additional three road options (discussed below) is selected.

Three roadway options are being considered to reduce onsite grading, of which only one would be selected. Option 1 (shown in purple in Figure 2-11) would be approximately 4,562 feet long and was considered as the likely option in the Draft PEIR. Option 1 would result in the most disturbance. Option 2 (shown in blue in Figure 2-11) would be approximately 2,719 feet long and would entail improving an existing road from the north through the Golden Hills project area. (The proponent of the Golden Hills Project proposes improvement of this existing access road as part of the Golden Hills Project, as shown in Figure 2-10 of the Draft PEIR.) For Option 2, approximately 350 feet of new roadway would be constructed to connect the Golden Hills project area to the Patterson Pass project area. Option 3, approximately 2,312 feet long, would bypass burrowing owl habitat and would consequently result in fewer impacts than Option 1. Option 3 would likely be selected if access rights for Option 2 cannot be obtained. Both Options 2 and 3 would create fewer temporary and permanent impacts than Option 1, which was analyzed and disclosed in the Draft PEIR; accordingly, selection of either option would not result in any new significant impacts.

Power Collection System

Electrical collection lines for the proposed project would be underground from each turbine site to the existing substation. The buried cable system may include junction boxes that would house cable splices and allow access to the cable for any needed maintenance or repairs. The cables be buries using an open trenching method or would be installed using horizontal directional drilling (HDD) technology. The cables would be buried approximately 36–48 inches deep. The conceptual layout of the power collection system is shown in Figure 2-11. The temporary disturbance area for cable installation would be minimized to the extent feasible; it would typically be approximately 20 feet wide in most locations.

The power collection system would connect to the existing ADCC substation, and then through the short existing gen-tie overhead line into the existing PG&E transmission lines that traverse the project area. Because the proposed project would have electrical generation capacity similar to that of the existing project, no substantial modifications to the substation (outside the existing fenceline) or PG&E transmission line are anticipated. Some minor equipment improvements within the existing substation footprint may be completed to replace old equipment or to bring the equipment up to current safety and operational standards. All work would be conducted within the graveled footprint of the existing substation.

Operations and Maintenance Facility and Other Project Elements

The proposed project would use the existing 4,600-square-foot O&M building. Operations, storage, and repairs would take place at the existing facility, which would receive power from a temporary generator during the decommissioning and construction phases. Upon completion of construction, the O&M facility would receive power from the existing powerlines on Patterson Pass Road. Some expansion of the O&M facility may be necessary to accommodate construction and new security requirements. Portable restrooms would be used during the construction phase, and the existing O&M building restroom facilities would be used during O&M activities.

Project Construction

Patterson Pass would begin construction of the proposed project after certification of a Final EIR and receipt of all required permits. Construction, including decommissioning of the existing facilities, would likely occur early in 2015 and would conclude 6–9 months later. Typical construction steps are listed below.

- Demarcation of construction areas and any sensitive biological, cultural, or other resources needing protection.
- Decommissioning of the existing wind farm.
  - Disassembly of existing turbines.
  - Removal of foundations as required for new road and turbine construction.
  - Restoration.
- Construction of temporary staging areas.
- Grading and road construction.
- Turbine foundation construction.
- Power collection system and communication line installation.
- Turbine installation.
- Upgrades to the substation (as required).
- Erosion and sediment control.
- Final road construction.
- Final cleanup and restoration.

The construction of any expansion necessary at the existing O&M building would not depend on the sequence of construction for the rest of the project.

The construction contractors would prepare the project area, deliver and install the project facilities, oversee construction, and complete final cleanup and restoration of the construction sites. Patterson Pass would implement BMPs consistent with standard practice and with the requirements of this EIR and any state or federal permits to minimize soil erosion, sedimentation of drainages downslope of the project area, and any other environmental impacts. Examples of likely erosion control measures are listed below.

- Use of straw wattles, silt fences/straw bale dikes, and straw bales to minimize erosion and collect sediment (to protect wildlife, no monofilament-covered sediment control measures would be used).
- Re-seeding and restoration of the site.

- Maintenance of erosion control measures.
- Regular inspection and maintenance of erosion control measures.

Construction traffic routing would be established in a Construction Traffic Plan, which would include a traffic safety and signing plan prepared by EDF RE in coordination with the County and other relevant agencies. The plan would define hours, routes, and safety and management requirements.

The construction activities and the approximate duration of each are listed below.

- Phase 1—Decommissioning of existing plant: 4 weeks.
- Phase 2—Laydown area: 2 weeks.
- Phase 3—Road construction: 16 weeks.
- Phase 4—Foundations/electrical: 12 weeks.
- Phase 5—Turbine delivery and installation: 12 weeks.
- Phase 6—Electrical trenching: 14 weeks.
- Phase 7—Cleanup: 12 weeks.

Project Decommissioning

The proposed project is assumed to have a useful life of approximately 25–30 years, based on current turbine designs and expected service life. New technology may become available for another repowering of the proposed project in the future. Decommissioning the proposed project would require removal of the wind turbine nacelles, blades, towers, and other facilities.
In general, other project facilities that could not be reused—such as collection lines, some access roads, and turbine foundations—would be removed, except in cases where removal would result in substantial impacts on terrestrial species or habitats (e.g., some turbine foundations, roads). Any removal of facilities would be undertaken to minimize disturbance.

2.7 Other Future Projects and Applications

Several potential repowering projects would be undertaken in the APWRA. At this time, there is not enough specific detail on these projects to evaluate them at a project level. Table 2-6 shows the names of each of these projects, and the nameplate capacity of each project.

Table 2-6. Other Future Projects

Project Name	Nameplate Capacity (MW)
Golden Hills Phase 2 (Golden Hills)[a]	41
Summit Wind (AWI)	95
Mulqueeney Ranch (Brookfield)	80
Sand Hills Wind (Ogin)[a]	34

[a] Golden Hills Phase 2 is a proposed project that would be evaluated under a subsequent CEQA document. The project consists of approximately 24 General Electric 1.7 MW turbines on 80-meter towers. The Golden Hills Phase 2 CEQA document is anticipated for release shortly after the completion of the Final PEIR.

[b] Sand Hills Wind is a 34 MW project currently being evaluated under a separate CEQA document. Although a 4 MW pilot project using an experimental turbine design is currently in development, for the purposes of the program-level analysis in this PEIR, it has been assumed that the Sand Hills project in its entirety would be constructed using conventional fourth-generation turbines.

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