PG&E TOWER REPLACEMENT, REPAIR, AND MAINTENANCE

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Appendix D PG&E Tower Replacement, Repair, and Maintenance

The following text was obtained as a personal communication from Mr. Dave Thomas of Pacific Gas and Electric Company (PG&E) on September 26, 2013. This text describes general procedures for power transmission and distribution tower replacement, repair, and maintenance. The procedures listed below are not specific to the South Bay Salt Pond (SBSP) Restoration Project, but some of them are similar to those procedures that will be implemented for the improvements and the maintenance of towers in or around the SBSP Restoration Project's Phase 2 areas. This information was excerpted and adapted for use in Chapter 2, Alternatives; various sections of Chapter 3, Environmental Setting, Impacts, and Mitigation Measures; and Chapter 4, Cumulative Impacts.

PG&E Tower Replacement or Repair

PG&E tower replacement or repair typically involves raising towers or strengthening the foundations or superstructures of towers. Superstructures typically are strengthened by replacement, modification, or addition of pieces of steel lattice, as determined by engineering analysis specific to each tower.

Raising Towers: Three methods are used to raise towers:

- Adding vertical leg extensions to the base of the tower on existing footings or foundations called top cage extensions.
- Adding extensions just below the tower cross arms at the "cage" of the tower called waist cage extensions.
- Adding extensions just above the tower cross arms of the tower called cage top extensions.

The first method requires lifting the tower. A tower lifter is driven beneath the tower, and its four arms are clamped to the tower legs. The legs are unbolted from the tower base, the tower is lifted, and leg extensions are installed. However, a tower lifter can be used only on level ground. Where a tower lifter cannot be used, a crane is used to hoist the tower. A level area of approximately 25 feet by 40 feet is graded immediately adjacent to the tower to serve as a crane pad. Temporary wood pole supports (shoo-flies) are constructed adjacent to the tower to support the conductors while the crane lifts the tower. The tower extension is installed, the conductors replaced, and the shoo-flies removed.

The second method entails installing the extension at the tower cage using a crane to hoist the tower. The tower cage is near the top of the tower just below the cross arms. A level area of about 25 by 40 feet is graded immediately adjacent to the tower to serve as a crane pad. Shoo-flies are constructed adjacent to the tower to support the conductors while the crane lifts the tower. The tower extension is installed, the conductors replaced, and the shoo-flies removed.

The third method entails installing the extension at the top of the tower using a crane or helicopter to place the extension. The tower cage contains one set of cross arms and is installed above the existing cross arms. Once installed the existing wires are relocated to the next higher cross arm and the lowest cross arms are removed. A level area of about 25 by 40 feet is graded immediately adjacent to the tower to serve as a crane pad.

Strengthening Tower Foundations: To strengthen tower foundations, concrete from the existing footings is broken away to expose the steel reinforcements. A new/replacement concrete footing, called a grade

beam, is poured between reinforcements. The old concrete footings are bagged in a giant tarp with ropes and bundled and taken by helicopter from the tower site and disposed of according to regulations, typically at a local landfill. For typical foundation repair procedures, first the material is staged by helicopter or barge, or a combination of both. For foundation repairs in water a cofferdam is installed at low tide to allow access to the foundation footing. The cofferdam, usually built out of 1?-inch plywood and 4x4 strong backs, is built around the footing to be repaired and is used to isolate the footing from the water. The mud is removed by hand, and the dam is pushed down to the required depth to expose the solid piling, usually 3 feet below the mud line. Typically the mud is placed in bags and taken to a landfill. If there is little mud collected than it is returned to the base of the footing after the cement is poured. The old concrete pier is chipped away to expose the pile. New pins are inserted, a new rebar cage is installed around the pile, and the concrete is replaced. The cofferdam then is removed by excavating around the outside and hoisting it from the tower.

Where the work cannot be completed from an existing boardwalk, a rubber mat is placed at the base of each footing as a work area and to minimize effects. If a lot of material is needed at the job site, a temporary section of boardwalk is built laterally from the existing boardwalk. A helicopter is then used to place the material on the temporary boardwalk, and the material is moved to the work site by hand or wheelbarrow. If additional piles are not required, footing repairs can be done within a work area extending approximately 2 feet from the footing. If additional piles are required, the work area may need to be extended to 20 feet outside the tower footprint. Rubber mats may be used for a couple of hours to gain temporary access to perform maintenance work and are placed to help protect the vegetation around the boardwalk being built.

Strengthening Tower Superstructures: Superstructures typically are strengthened by replacement, modification, or addition of pieces of steel lattice, as determined by engineering analysis specific to each tower. Telecommunications attachments typically are made by clamping apparatus and cables directly to the tower superstructure.

Other minor repairs that require accessing facilities are replacing fuses, breakers, relays, cutouts, switches, transformers, and paint. New towers require a 30-square-feet footprint. A 25-foot-by-40-foot footprint area is needed for the crane and a 25-foot-by-100-foot work area.

Access Boardwalk Repair and Replacement: PG&E has many miles of boardwalks that are used to service transmission facilities in the vegetated margins of the San Francisco Bay. The boardwalks typically extend from levees and serve to provide access across marsh and salt ponds to transmission tower footings. These boardwalks have a 15- to 20-year life and require repair and replacement. Approximately five times per year 1,500 feet of boardwalk are repaired or replaced in PG&Es system, which consists of installing replacement piles (spaced approximately 100 feet apart) and replacement planks. Boardwalk maintenance and construction activities are performed using hand tools and gas-powered tools such as drills and saws. Replacement piles are pushed into the ground using a steel bar for leverage and the weight of four people. The planking is transported along the boardwalk on special hand-dollies. Planking is slid into place, drilled, and bolted. If the boardwalk is not too degraded (i.e., still walkable), much of the work is done from the boardwalk with some work being done adjacent to the boardwalk where piles are being replaced. If PG&E is raising the height of an existing boardwalk, work is done from the boardwalk. If the boardwalk is substantially degraded, the work is done within a 10-foot corridor around the boardwalk being replaced.

Electric Line Reconductoring: New conductors are installed by temporarily splicing them to the ends of the existing conductors and pulling them through travelers (pulleys) attached to the arms of the towers or pole cross arms. New insulators with travelers are installed at each structure and the old and new insulators are installed and removed with boom trucks and hauled away in a container or dump trucks. A boom truck or winch is used to install the new insulators with travelers and removal of old insulators. In some cases, the insulators, travelers and conductors are installed by helicopter.

Reconductoring typically is conducted in 4-mile sections, with a tension site and a pull site (a total maximum width of 50 feet by 200 feet in length) for approximately one-third of the sites. The remaining reconductoring work requires installation and removal of insulators and travelers on a two-circuit line. At the pull sites, a truck- or trailer-mounted bull-wheel puller, a small truck- or trailer-mounted crane, and rewinders with collapsible reels are used to pull the conductors through the travelers. Truck-mounted tensioners, small cranes, conductor reel trailers, and conductor reels are used to tension the conductors. Previously established pull and tension sites are used where possible.

Before the conductor is pulled, clearance structures are installed at road crossings and other locations (where necessary) to prevent conductors from contacting existing electric or communication facilities or passing vehicles. These temporary structures consist of wood poles and, occasionally, a support net stretched beneath the conductors.

After the conductors are pulled into place, they are tensioned by pulling them to a predetermined sag and tension. The conductors then are permanently attached to the insulators.

An electric transmission line is typically reconductored every 30 years. Permanent effects are from a 10-foot-by-10 foot work area that could result in vegetation type conversion. One-third of the reconductoring work requires a tension and pull site, and the remaining reconductoring work requires installation and removal of insulators and travelers on a two-circuit line. Both approaches require a 50-foot-by-200-foot work site.

Pole Clearing—Distribution and Transmission

PG&E performs pole clearing around subject poles and towers on its overhead distribution and transmission facilities to maintain compliance with Public Resource Code Section 4292. Section 4292 requires that poles in an SRA with nonexempt equipment (e.g., switches, lightning arrestors) be maintained clear of 1) any vegetation that would propagate a fire for a radial distance of 10 feet from the pole/tower at ground level, 2) all brush, limbs, and foliage of living trees at 0-8 feet, and 3) dead limbs and foliage around the pole to the height of the conductor.

Pole clearing can be divided into two subcategories: maintenance of previously cleared poles and maintenance of poles that have never been cleared of vegetation. Both subcategories occur annually. Vegetation clearing for existing poles applies to vegetation that has grown over the course of the year (i.e., grasses, forbs, saplings, and branches). Vegetation clearing for new poles requires the removal of all vegetation within 10 feet of a pole that could propagate a fire. Vegetation management includes annual patrol of overhead facilities, removal of material capable of propagating a fire, and-with property owner consent-chemical treatment with herbicides to prevent regrowth. In some cases, because of vegetation regrowth, it is necessary to clear a pole more than once during a given season.

Access Road Management: Unsurfaced access roads must be maintained to permit vehicular passage for routine patrols. Access road maintenance usually is limited to blading the road and may occasionally

require import of fill or gravel. Local fire districts periodically require PG&E to abate ruderal vegetation and annual grasses along PG&E-owned access roads when fire districts determine that a fire hazard exists.

Maintenance and Repair

Aerial Patrol: PG&E conducts aerial patrols of electric transmission lines, distribution lines, and associated facilities annually using helicopters.

Ground Patrol: If electric transmission lines and associated facilities are located in no-fly zones, PG&E personnel conduct ground patrols on foot or with off-road utility vehicles (OUVs), or by using rubber-tired vehicles on existing access and pipeline patrol roads. These patrols occur on a 1- to 5-year cycle depending on whether the facility is wood or steel. Vegetation management personnel conduct annual ground patrols of transmission and distribution lines by vehicle and by foot. Electric meters are read during routine ground patrols. It is estimated that 33.3% (7,664 miles) of the electric distribution system and 87.5% (3,876 miles) of the transmission system is patrolled each year. Approximately 95% of the patrolled system length is accessible by existing roads or is patrolled on foot or by helicopter.

Inspections

These inspections are conducted using off-road travel by light trucks, OUVs, or on foot.

Tower, Pole, and Equipment Inspection: Tower footings and poles routinely are inspected to verify stability, structural integrity, and equipment condition (e.g., fuses, breakers, relays, cutouts, switches, transformers, paint). Footings and poles are accessed by existing roads or off-road in vehicles or on foot.

Outage Inspection: When outages and CPUC Reportable Incidents occur because of weather, accidents, equipment failure, or other reasons, PG&E inspects lines to determine the location and probable cause of the outage. Lines may be inspected by helicopter, accessed by existing roads, off-road vehicles, or on foot.

Electric Insulator Washing or Replacement: Insulators are washed periodically to prevent faults. Faults result from the accumulation of conductive debris such as airborne particles or bird droppings on ceramic or polymer type insulators. Insulators are washed using a truck- or trailer-mounted spray system or by helicopter. Washing typically is carried out during energized conditions (i.e., while the power lines are operating). Distilled water is used to wash the insulators; dry washing using ground corn hulls also is used. Insulators are replaced when they have been damaged by gunshot, lightning, or heavy corrosion, or when they no longer can be washed. They can be replaced while energized or de-energized depending on access, loading, and safety. Replacement typically takes a four- to six-person crew with a small truck for hauling crewmembers, tools, and materials. If access is limited, a helicopter may be used to land crewmembers and tools on a tower. Insulators are washed or replaced approximately once annually.

Electric System Outage Repair: Outage repair are necessary to maintain public safety as required by the CPUC. Outages typically are caused by weather, equipment failure, accidents, fire, or bird electrocution. When an outage is reported, the line is patrolled until the cause of the outage is determined. Access is primarily on existing roads, although some overland access with rubber-tired vehicles is expected. Depending on the cause of the outage, repair may entail anything from reclosing a switch to replacing a transformer or pole. The circuit is repaired and restored as quickly as possible. An approximate 22-foot-

by-22-foot work area may be needed for soil excavation, soil stockpiling, and the use of construction equipment during each repair.