

18 SAFETY

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18 SAFETY

This chapter describes the public safety issues in the project area and the applicable safety regulations, evaluates the potential impacts from the construction and operation of the Montezuma II Wind Energy Project, and considers mitigation measures to address the impacts found to be significant.

The chapter discusses the public safety issues related to fire risk, wind turbine rotor and tower failure, worker risk of electromagnetic shock, shadow flicker, and abandoned gas wells. The analysis references the October 13, 2010 “Montezuma II Wind Energy Center, Solano County, CA Wind Turbine Blade Throw Analysis” prepared by Epsilon Associates, Inc. for the Applicant (Appendix I). Chapter 11, Hazardous Materials, discusses safety concerns related to the presence of hazardous materials, and Chapter 18, Transportation, addresses risks associated with airport navigation.

18.1 SAFETY SETTING

The project area is subject to fire risk and has two abandoned gas wells. The identified public safety issues associated with wind development, which necessitate evaluation in this chapter, include grass fire, blade throw, tower failure, electric shock, and shadow flicker.

18.1.1 Fire Risk

The project area is predominantly used for dry-land farming and contain little infrastructure or urban development aside from surrounding wind turbines and related structures. The Montezuma Hills area is subject to fire risk due to the high ignition potential of grasslands and strong periodic winds. The risk, however, is less severe than in the mountainous areas to the northwest of Fairfield. The California Department of Forestry and Fire Protection (CAL FIRE) classifies most of the project area as a “low or none” and/or “moderate” wildland fire hazard area. Two small areas of “high” wildland fire hazard are located in the southern portion of the project area. No areas of “very high” or “extreme” wildfire risk are located in or near the project area (Solano County Planning Services 2008).

As discussed in Chapter 16, Public Utilities and Services, the Montezuma Hills Fire District provides fire and rescue services in the project area. There are four fire stations equipped for grass fires operated by this district including one at Birds Landing Road; one on Collinsville Road, near Collinsville; one on Shiloh Road; and one in Rio Vista. The Rio Vista Fire Department also provides fire and rescue services for the city of Rio Vista and surrounding areas. The department’s coverage area is approximately 100 square miles, with an estimated population of 8,500 (City of Rio Vista 2011). The department is dispatched by the Solano County Sheriff’s Department and receives as-needed support from the county and state offices of emergency services.

18.1.2 Wind Turbine Rotor Failure and Tower Integrity

Wind turbines have the potential for blade throw, blade fragment throw, and tower failure. Although unlikely, all three failures have the potential to impact project personnel or the public. Facilities that experience cold weather can also pose a risk to public safety by throwing collected ice (ice throw); however, the climate in the project area makes ice throw unlikely (KPF 2004, KPF 2010).

The blade throw hazard poses the greatest risk for wind projects in the Montezuma Hills, and this analysis uses the project-specific blade throw distance plus a safety factor to determine the

appropriate reduced setback for turbine locations that do not meet the General Plan setback requirement of three times the total turbine height.

Blade or Blade Fragment Throw

Blade throw—the loss of a blade due to hub failure—is an uncommon occurrence in wind energy projects, but blade or rotor failure can occur due to extremely high winds, excess rotor speed or from electrical system failure. Most commercially available turbines, including the turbines proposed for the project, are equipped with safety and engineering features to reduce the risk of blade failure and are designed in accordance with international construction standards (International Electrotechnical Commission; IEC 61400-1) to ensure safe operation under normal conditions.

The potential exists for a turbine blade to fail or fragment. If the failure were to occur at the hub, the turbine would throw the full blade, posing the greatest potential for damage to infrastructure and public safety. The California Energy Commission's Permitting Setback Requirements for Wind Turbines in California, prepared by the California Wind Energy Collaborative provides guidance for calculating blade throw (CEC 2006).

If a blade were to fragment, rotational forces could throw one or more fragments into the surrounding environment. A blade fragment has the potential to fly farther than an entire blade because the aerodynamic forces on it would be relatively large compared to the fragment mass (KPF 2004, Larwood 2005). Fragmentation is rare, and there is little data on the frequency of such failures. A study of turbine failures in wind projects in Germany and Denmark calculates the failure frequency of blade tips as approximately three times lower than blade failure (CEC 2006). The European study, however, used data from 1984 through 2001, which may not be representative of the proposed Siemens 2.3 blades. KPF considered the failure frequency for blade fragment throw as low due to modern construction standards, quality control, and periodic inspections (KPF 2004). If thrown, fragments have a 2 percent probability of striking nearby electrical lines at a distance of approximately 650 feet (Slegers 2009). Based on the two studies, the risk of a blade fragmenting and actually striking a nearby electrical line is insignificant.

A thrown blade would pose a hazard to people and infrastructure in the project area. People exposed to hazard include the three residences within the project area and visitors travelling along County roads. The important infrastructure in the project area potentially susceptible to damage from blade throw includes the PG&E 500-kV transmission lines and two PG&E 230-kV transmission lines, the Montezuma I and High Winds substations, and the following County roads: Montezuma Hills Road, Birds Landing Road, Collinsville Road, and Talbert Lane. The aboveground electrical distribution (collector and service) lines in the area are not considered critical infrastructure for purposes of this safety analysis because they are lower voltage lines, typically wood pole lines that are routinely subject to outages during winter storms and readily repaired without resulting in substantial impacts to the public. The safety analysis also does not consider impacts to private agricultural roads.

To protect the public and important infrastructure against such hazards, the General Plan provides minimum setback requirements, which Section 17.2.3 discusses in detail. As discussed above, the Solano County General Plan requires a minimum setback of 1,000 feet or three times (3x) the total

turbine height, whichever is greater, from County roads, residences, property boundaries, transmission facilities, and railroads.

Blade throw is a function of hub height, blade length, and rotor speed and is a greater concern for large turbines than the small turbines in the enXco V project. The Kenetech KCS 65-100 turbines models have hub heights of 60 to 80 feet, 26-foot blades and rotate at 144 feet/second. When the County approved these projects in 1990, the minimum 1,000-foot setback provided a sufficient buffer to protect the public safety from blade throw hazards from the enXco V project turbines.

Tower Failure

Tower failure—collapse of the turbine tower, particularly at the tower base—is a rare occurrence, and the risk is extremely low. However, excessive static stress, material fatigue, seismic activity, or ground settling could cause tower failure. Although tower failure is unlikely, a recent failure at ENEL North America’s Fenner Wind Farm in upstate New York in December 2009 demonstrates that it is possible for a failure to occur. The safety setbacks established at Fenner Wind Farm prior to construction were an effective mitigation against the risk of turbines making physical contact with facilities outside of the project area (ENEL 2009).

The KPFF Consulting Engineers hazard zone analysis for the previous projects identified the hazard zone for tower collapse as directly proportional to the height of the tower plus one half of rotor diameter (KPFF 2004). This is assuming the tower buckled from its base, however, as opposed to somewhere in the middle of the tower. A failure somewhere above the base (in the middle of the tower structure) would result in a smaller hazard zone (KPFF 2010). The minimum setback requirements for blade throw also provide protection against tower failure. Chapter 10, Geologic Resources, further discusses the risk of tower collapse resulting from geologic hazards such as earthquakes and ground shaking.

18.1.3 Worker Safety

Persons working within the project site are at risk of electrical shock while working on energized facilities. There is also the potential for direct impacts on the public resulting from contact with energized equipment. However, impacts on non-project-related individuals associated with electrical transmission lines and electrical disconnect mechanisms are reduced by limiting access to the project site using appropriate fencing.

18.1.4 Shadow Flicker

Shadow flicker is the on-and-off flickering effect of a shadow caused when the sun passes behind the moving rotor blade of a wind turbine (UK CLGD 2009). An indoor observer may notice shadow flicker as periodic changes in the brightness of a room or by an outdoor observer as shadows of the rotating blades on the ground or nearby structures. In some documented cases, shadow flicker has caused human annoyance or mental stress, and flicker from a single turbine has occasionally caused driver distraction (Bittner-Mackin 2006, Voll 2006).

Additionally, the shadow flicker analysis included the potential for wind turbines to cause epileptic seizures. According to the American Epilepsy Foundation, an epileptics' susceptibility to seizures caused by flashing lights varies from person to person. A wind turbine typically rotates at a frequency of 1 flash per second (i.e., 1 Hertz [Hz]), whereas epileptic seizures are typically most likely to be triggered at frequencies between 5 to 30 Hz. Shadow flicker from wind turbines is therefore considered too slow to trigger seizures in epileptics (Epsilon Associates 2010, AWEA 2009, Epilepsy Foundation 2009).

18.1.5 Oil and Gas Wells – Rio Vista Natural Gas Field

As discussed in Chapter 12, Hazardous Materials, the natural gas exploration and extraction occurred in the project area on two occasions between 1921 and 1980. According to the California Department of Conservation Division of Oil and Gas (DOGGR) records, the Montezuma II Wind project site is not located within a natural gas oil field; however, DOGGR Map 612 from 2003 depicts two plugged and abandoned dry holes on the site (DOGGR). There are no active DOGGR wells mapped on or adjacent to the site. Documentation regarding the abandonment of the on-site wells is located in the Phase I Environmental Site Assessment report. If the Project were to uncover a well during construction, it could create a safety risk for workers, as well as an increased risk of soil or groundwater contamination. Remedial operations may be required in such a situation.

18.2 SAFETY REGULATORY SETTING

Federal, state, and local regulations apply to safety concerns during construction and operation of the Project.

18.2.1 Federal

The National Electric Manufacturers Association (NEMA), the American National Standards Institute (ANSI), and the California Office of Safety and Health and Administration (Cal-OSHA) set safety standards for wind project equipment.

18.2.2 State

Cal-OSHA protects workers and the public from safety hazards according to its occupational health and safety laws. Additionally, Solano County follows the California Building Code requirements for turbine setbacks from gas or oil wells, with a minimum setback of one turbine blade length plus 30 feet from any gas or oil wells on-site or off-site.

The California Fire Code establishes minimum statewide standards to reduce the risk of fire and aid firefighting, including regulations for buildings, construction sites, and roads. Section 503 and Appendix D of this code describe standards for fire apparatus access roads. Chapter 49, Requirements for Wildland-Urban Interface Fire Areas, specifically addresses standards to reduce the threat of wildfires to structures.

18.2.3 Local

The Solano County General Plan and zoning ordinance establish the applicable local public safety requirements for the project.

2008 Solano County General Plan

The General Plan includes, as part of its implementation programs in the Resources Chapter, planned revisions to the Zoning Ordinance to address the siting of commercial wind turbine installations. General Plan Implementation Program Regulation RS.1-37 provides the following proposed standards are applicable to public safety:

- Establish a procedure for plan check and testing of wind electric generators prior to use permit or building permit approval. Certification of all detailed plans for electrical systems, electrical substations, support towers, and foundations by California licensed professional engineers shall be required. Performance testing of wind turbine generators shall be required to ensure against catastrophic failure.
- Require a minimum setback of 1,000 feet or three times (3x) total turbine height, whichever is greater, from a dwelling unit, residential building site, or land zoned for residential uses. Require a minimum setback of three times (3x) total turbine height from any zoning district (other than residential) which does not allow wind turbines.
- Require a minimum setback of three times (3x) total turbine height from any property line, public roadway, transmission facility, or railroad. The minimum setback may be waived in the case of wind farms located on adjacent parcels, provided an agreement has been reached between the neighboring property owners. For the Montezuma II Wind Energy Project, the setbacks for the turbines would be 1,285 feet for the Siemens 2.3 turbines with the 161-foot blades.

Solano County Zoning Ordinance

Solano County Zoning Code Section 28.50 (b)(4) contains regulations for commercial and noncommercial wind turbines, including the following provisions:

- Wind turbines shall be set back a minimum of 1.25 times the maximum height of the turbine to the property line, and a minimum of 10 feet from any other structure on the property. Setbacks determined by height may be waved when appropriate easements are secured from adjacent property owners or when the County approves other acceptable mitigation. The setbacks from a property line under this standard would be 535 feet for the project turbines with the longer of the two proposed blade lengths.

The Project includes the installation of two meteorological towers. The Department of Resource Management has previously established setback requirements for meteorological towers equivalent to tower height plus an additional 25 percent. The two proposed 213-foot towers would, therefore, require setbacks of 267 feet.

The Health and Safety Chapter of the Solano County General Plan has policies to reduce fire hazards in high grassfire risk areas. According to these policies, in areas of high grassfire risk the County and cities should create fire buffers along heavily traveled roads by thinning, mowing, discing, or controlled burning of roadside grass.

Montezuma Fire Protection District

The Fire District that serves the project area, Montezuma Fire Protection District, is one of several Fire Districts in Solano County that has its own standards for emergency vehicle access and other requirements pertaining to private access roads and other features. The Fire Districts are currently in the process of developing unified standards for the entire County. In the interim, the Project will be subject to the requirements of the Montezuma Fire Protection District, which in addition to any special standards specific to the Fire District, follows the minimum requirements for fire apparatus access roads found in the latest edition of the California Fire Code and Wildland Urban Interface Code, including appendices.

18.3 SIGNIFICANCE CRITERIA FOR SAFETY IMPACTS

The evaluation of potential safety impacts due to construction and operation considered the criteria listed below. The Montezuma II Wind Energy Project may be considered to have an impact on safety if it would:

- Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands;
- Expose people to a significant risk of loss, injury, or death due to project infrastructure or operations; and
- Impairment of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

18.4 SAFETY IMPACTS AND MITIGATION

The following are potential impacts on safety, evaluated as described above, related to construction and operation of the proposed Project.

Impact SA-1: Blade or Blade Fragment Throw and Tower Failure

Blade or Blade Fragment Throw

On behalf of the Applicant, Epsilon Associates conducted a project-specific worst-case blade throw hazard analysis to assess the potential hazards associated with a turbine setback of less than three times the total turbine height to a public road, railroad, residence, or transmission facility (NextEra 2010, prepared by Epsilon Associates) as discussed above in Section 18.1.2. A previous hazard analysis for the Shiloh III Wind Energy Project by KPFF Consulting Engineers (KPFF 2004), which involved a wind turbine with similar features, concluded that maximum blade throw distance was the governing case for a hazard zone; other hazards such as tower failure were likely within a smaller radius around the turbine. The calculated maximum blade throw distance for the proposed Project turbine with a 262-foot hub height and 161-foot blade length would be 565 feet (Epsilon Associates 2010). Appendix I contains the complete Epsilon analysis.

KPFF's previous report for the Shiloh III project recommended multiplying the calculated maximum blade toss distance by safety factor of 1.2 to account for any simplifications and uncertainties in the calculations (KPFF 2010). When adding this safety factor, the result is a

recommended 678-foot hazard zone for the Project, based on the turbine with the longer of the two proposed blade lengths. As allowed in the General Plan, when a proposed turbine location is less than the three times the total turbine height setback, in this case 1,285 feet for the Siemens 2.3 turbines with the 161-foot blades, the County typically uses the hazard zone (1.2 times turbine blade throw distance) to determine the alternative minimum setback for public roads, railroads, transmission facilities, and residences. The closest distance from a residence to a proposed wind turbine location (the distance from residence 12 to turbine 8) is approximately 1,500-feet, well beyond the maximum blade throw distance calculated by Epsilon Associates, as well as the three times the total turbine height setback prescribed in the General Plan. Five proposed turbine locations (7, 13, 20, 23, and 25) and four alternative turbine locations (Alt 1, Alt 2, Alt3, and Alt 4) are less than three times the total turbine height from a public road. Four proposed turbine locations (24, 25, 26, and 27) are less than three times the total turbine height from a transmission line.

The alternative minimum 678-foot setback, based on the turbine with the 161-foot blades, applies to the proposed locations that do not meet the General Plan requirement of three times total turbine height. Use of 148-foot blades, the shorter of the two proposed blade lengths, would reduce the hazard zone by 64 feet and would result in a 614-foot reduced setback. The Applicant has not yet determined exactly which blade lengths it will use for the Project. All of the proposed and alternate locations are outside the 678-foot hazard zone from the transmission lines and roads identified as important infrastructure in the project area.

Although not required by General Plan standards, the Applicant has proposed to locate its turbines more than 678 feet from the SMUD 21.6-kV collector line that bisects the project area, avoiding potential impacts to these aboveground collector lines.

The risk of blade fragmentation to public safety and infrastructure is insignificant. While a fragment could potentially be thrown farther than a full blade, the probability of blade fragmentation occurring is less than 0.03 percent per turbine per year (CEC 2006) and the risk of a fragment actually striking transmission lines located more than 678 feet away from a turbine is another 2 percent (Slegers 2009), reducing the probably of damage to less than five in a million. The risk to vehicles on roads is also insignificant because of the low traffic volumes on the public roads in the project area and the resulting low probability that a vehicle would be in the same place that a thrown fragment would land. Chapter 18, Transportation, provides information on public road traffic in the project area.

New technologies and engineering design for wind turbines have significantly lowered the risk to public safety over the past decades. The Siemens 2.3 MW turbine model has several safety features to prevent a rotor failure. If the control system detected an over-speed, the control system would immediately shut down the machine using a combination of generator torque applied by the power electronics unit and rapid pitching of the blades to the feather position by the hydraulic pitch actuator and the hydraulic power unit. The gearbox also incorporates a fail-safe mechanical brake. In the event of hydraulic power unit failure or loss of electrical power, the turbines would power to the feather position using stored pressure. Additionally, critical components have temperature sensors and a control system to shut the system down and take it off-line if the sensors detect overheating.

Therefore, IEC certification requirements, coupled with annual inspections and Siemens 2.3 MW turbine safety features assure that risks associated with blade throw during operation of the Project would be low. With the implementation of the engineering and design methods and safety mechanisms described in Mitigation Measure SA-1a, potential impacts on public safety due to rotor or turbine failure would be less than significant.

As discussed in Chapter 14, Land Use and Population, and discussed above in Section 17.2.3, the County's General Plan requires a setback of 1,000 feet or three times (3x) the maximum height of the turbine, whichever is greater, from residences, public roads, and property lines. The setbacks for the Montezuma II Wind Energy Project would be 1,285-feet. Turbines not meeting this requirement would require a setback waiver. Implementation of Mitigation Measures SA-1a and SA-1b would reduce safety impacts related to blade throw and turbine failure for these turbines to less than significant. Please see Chapter 14, Land Use and Population, for a detailed discussion of setback requirements and setback waivers.

Tower Failure

As stated in section 18.1.2, the hazard zone for tower collapse is the height of the turbine, in this case 428 feet. This distance is smaller than the blade throw hazard of 565 feet. Tower failure would present a potential hazard only to people and vehicles within the 428-foot hazard zone and, equally important, would be very unlikely. Mitigation Measures SA-1a and SA-1b reduce safety impacts from tower failure through wind turbine design and siting.

The Applicant has sited two meteorological towers at a minimum distance of 267 feet, or 1.25 times the proposed tower height, from all public roads, residences, and transmission lines, in compliance with the County's setback requirements. The Applicant has additionally provided the same minimum setback to all property lines. Therefore, even in the event that a meteorological tower falls towards a County road, with the minimum proposed setback, it would not cause a significant safety hazard to the public, and no mitigation would be required.

Level of Significance: Potentially Significant

Mitigation Measure SA-1a: Wind Turbine Design and Safety Mechanisms. To prevent rotor and tower failure and avoid potential impacts, the Applicant shall incorporate the following measures into the project design:

- a. Turbines shall conform to international standards for wind turbine generating systems, including IEC 61400-1: Wind Turbine Generator Systems – Part I: Safety Requirements (1999) and shall be certified according to these requirements, to assure that the static, dynamic, and defined life fatigue stresses of the blade would not be exceeded under the combined load expected in the Montezuma II Wind Project Area.
- b. The Applicant shall adhere to state and local building codes during turbine installation on the foundations, which would also minimize the risk of rotor and tower failure.
- c. To prevent safety hazards due to over-speed, the Applicant shall install a comprehensive protection system on each turbine to prevent excess rotor speed and turbine and tower

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- failures, such as rotor speed controlled by a redundant pitch control system and a backup disk brake system.
- d. To prevent safety hazards due to tower failure, the Applicant shall:
 - i. Design the turbine towers and foundation to withstand wind speed of 100 miles per hour at the standard height of 30 feet;
 - ii. Engineer the turbines according to California Building Code Earthquake Standards; and
 - iii. Ensure that all installed equipment shall meet the standards of NEMA, ANSI, and Cal-OSHA.
 - e. To prevent safety hazards due to electrical failure, electrical systems and the substation shall:
 - i. Be designed by California-registered electrical engineers; and
 - ii. Meet the latest editions of national electrical safety codes and other national standards, including NEMA, ANSI, and Cal-OSHA standards and the California Electrical Code.
 - f. The Applicant shall provide the County with manufacturer's specifications for the wind turbines, specifying that all turbines are equipped with a braking system, blade pitch control, and/or other mechanism for rotor control and shall have both manual and automatic over-speed controls.

Mitigation Measure SA-1b: Project Turbine Siting. To reduce potential impacts associated with turbine failure, the Applicant shall site turbines and meteorological towers an appropriate distance from public roads, railroads, transmission facilities, property lines, and residences to protect the public should a turbine or meteorological tower fail as follows:

- a. Prior to construction of the turbine or meteorological foundation, the Applicant shall furnish the Solano County Department of Resource Management with the final planned location and elevations of turbines and meteorological towers and the adjacent public roads, railroads, property lines, residences, and above ground electrical transmission facilities to review conformance with Solano County's setback requirements.
- b. Wind turbines and meteorological towers shall be located as follows:
 - i. 1,285-feet, based on three times (3x) the total turbine height, from property lines and residences, and from public roads, railroads, and above ground electrical transmission facilities, as measured to their right-of-way or easement, as applicable, unless a reduced setback is otherwise allowed by the General Plan;

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- ii. At least one turbine blade length plus 10 feet from any other structure on the property; and,
 - iii. Meteorological towers shall be setback a minimum of 1.25 times (1.25x) the maximum height of the tower (i.e., the height of the tower plus 25%) from property lines and residences, and from public roads, railroads, and above ground electrical transmission facilities as measured to their right-of-way or easement, as applicable.
- c. Where a reduced turbine setback is allowed as prescribed in paragraph b.i., above, the Applicant shall comply with the alternative minimum setback requirements prescribed in Mitigation Measure LU-1.

Level of Significance with Mitigation: Less than Significant

Impact SA-2: Electrical Shock and Accidents

Personnel working on the Project are at risk of electrical shock from electrical equipment and injury from work-related accidents that may occur during construction and operation. The implementation of the mitigation measures SA-2a and SA-2b would reduce the impacts to less than significant.

Level of Significance: Potentially Significant

Mitigation Measure SA-2a: Install Grounding and Shut-off Mechanisms on Project Facilities. To protect workers from electrical shock and other work-related accidents the following measures shall be implemented:

- a. Grounding shall be designed and implemented to the standards of the Institute of Electrical and Electronics Engineers.
- b. All turbines and utility lines shall be equipped with automatic and manual-disconnect mechanisms.
- c. Two circuit breakers that can be both manually and automatically operated shall be provided between each turbine and the connection to the electrical grid.
- d. The electrical systems and substations shall be designed by California-registered electrical engineers and shall meet the latest editions of the national electrical safety codes and other national standards, including NEMA, ANSI, and Cal-OSHA standards and the California Electrical Code.
- e. These mechanisms shall be installed and tested before interconnection.

Mitigation Measure SA-2b: Health and Safety Plan. Prior to construction, the Applicant shall develop a project-specific Health and Safety Plan for implementation during construction and operation to minimize the potential for work-related accidents. The Health and Safety Plan shall include emergency contacts, location of the nearest hospital, and proper emergency protocol. The plan shall also include a section that outlines the Applicant

training procedures for its operations personnel. The Applicant shall be responsible for ensuring that all personnel receive adequate training and that new employees receive supervision by trained personnel.

Level of Significance with Mitigation: Less than Significant

Impact SA-3: Accidents Involving the General Public (Other Than Turbine Failure)

Although there would be potential for incidental or intentional entry onto the project site and subsequent risk to human safety, with the implementation of Mitigation Measure SA-3, impacts would be reduced to less than significant.

Level of Significance: Potentially Significant

Mitigation Measure SA-3: Limit Public Access to the Project Area. The Applicant shall minimize accidents involving the public and impacts on the public by limiting access to the project area. The Applicant shall limit access to the project area by:

- a. Installing locking gates where new access roads constructed within the project area connects to existing public access roads. To further limit access from public roads the Applicant shall:
 - i. Only provide keys to authorized personnel and landowners, thereby preventing access by the public;
 - ii. Post and maintain no-trespassing signs at the entrance gates; and
 - iii. Post and maintain signs at the entrance gates noting the existence of high-voltage and underground cable on the site and warning people of electrocution hazards;
- b. Installing locks on the turbine towers and the substation, and the Applicant shall:
 - i. Only provide keys to authorized personnel, thereby preventing access by the public;
 - ii. Install a sign with high-voltage warning at the substation;
- c. Ensuring that all facilities in a. and b. above are maintained, locked, and/or otherwise secured at all times to discourage unauthorized access;
- d. In addition to existing agricultural fencing that is already in place, installing additional fencing as requested by the landowner and agreed to in landowner agreements, which will further inhibit public access;
- e. Providing training for project personnel to monitor for unauthorized individuals and activities during construction activities and throughout operation and to report such observations to the project superintendent on duty;

- f. During operation of the Project, long-term staff shall conduct periodic surveillance of the project area to identify access or signs of access (e.g., vandalism) by unauthorized individuals and shall report such incidents to the project superintendent on duty. The Applicant shall rectify such incidents (e.g., installing additional locks or increasing intervals of surveillance) and, as necessary, work with Solano County and local enforcement agencies in doing so; and
- g. Ensuring that all tower-climbing apparatus and blade tips of the wind turbines shall be no closer than fifteen feet from ground level unless enclosed by a 6-foot fence.

Level of Significance with Mitigation: Less than Significant

Impact SA-4: Impacts from Shadow Flicker

The Project would introduce structures into the skyline that may cast shadows onto adjacent parcels. As discussed above, environmental factors such as the season, time of day, surrounding terrain and obstacles (including vegetation), wind speed and direction, and weather affect the intensity of shadow. In addition to these environmental factors, the height and rotor size of the turbines can also increase the intensity of the shadow flicker effect.

No formal standards for the significance of shadow flicker impacts on human receptors have been adopted locally or on a State or federal level. One limit for allowable flicker commonly used in Europe, provided for general discussion purposes only, is a maximum of 30 hours per year based on predicted values (County of Essex 2007, MTC 2007). This value represents a moderate level of effect and is based on a worst case, maximum shadow scenario (i.e., a scenario in which the sun is shining continuously within a cloudless sky, sufficient wind exists to turn the rotor, and there are no obstacles such as vegetation). Solano County has not adopted, nor formally debated, a formal threshold of significance, given the current absence of any public input on the subject. Other factors affecting shadow flicker exposure include mean hours per day as well as the time of day the flickering occurs. Shadow flicker occurs at a frequency that is not likely to cause epileptic seizures.

Nonetheless, given the number of wind turbines the Project would add to the Montezuma Hills the Applicant retained Epsilon Associates to prepare a study that demonstrates the extent that shadows cast by the turbines would impact adjacent properties. The study, which is provided in Appendix H, numbers residences differently than this EIR (See Figure 15.2-1 in the Draft EIR for the updated numbering). The study shows that of the 38 adjacent residences evaluated, nine (numbers 1, 2, 4, 6, 7, 11, 12, 13, and 14 in the study) would experience some level of shadow flicker impacts. Three of these residences, numbers 1, 2, and 7 in the study (or corresponding numbers 14, 11 and 13 in Figure 15.2-1 of the Draft EIR), would experience impacts resulting from shadow flicker in excess of 30 hours annually. All three residences are located within the project area. The maximum impact on one of these residences, labeled number 7 in the study (or number 13 in Figure 15.2-1 of the Draft EIR), would be 65 hours of shadow flicker annually (Epsilon Associates 2010). Impacts associated with shadow flicker are inherent in wind projects, and no mitigation can reduce these impacts; however, the three residences that would experience the greatest impacts are, as indicated, all within the Project boundaries, i.e., the owners are project participants.

Level of Significance: Less than Significant

Impact SA-5: Impacts from Wildfires

Construction activities associated with the Project in vegetated areas may create a temporary increase in the risk of wildfires. During the construction phase, heavy equipment and passenger vehicles driving on vegetated areas prior to clearing and grading could increase the danger of fire. Heated mufflers could potentially start surrounding vegetation on fire. Construction of the Project would also require the use of welding equipment, which produces sparks capable of igniting grassfires.

Access roads throughout the project area would reduce fire hazards because they act as firebreaks. Additionally, the roads would enable firefighting equipment access to the property that would not otherwise be available. The implementation of Mitigation Measure SA-5a (Grass Fire Control Plan) and SA-5b (Comply with Fire Code Requirements for Access Roads) below would reduce impacts due to wildfire to less than significant. The Fire Districts follow the minimum requirements for fire apparatus access roads found in the latest edition of the California Fire Code and the Wildland Urban Interface Code, including appendices.

Level of Significance: Potentially Significant

Mitigation Measure SA-5a: Wind Project Grass Fire Control Plan. To minimize the potential for grass fires, the following shall be required:

- a. Prior to commencing construction, the Applicant shall develop and implement a Grass Fire Control Plan for use during construction and operation. The Grass Fire Control Plan shall include notification procedures and emergency fire precautions.
- b. During project construction, the Applicant shall comply with the following:
 - i. All internal combustion engines, stationary and mobile, shall be equipped with spark arresters;
 - ii. Spark arresters shall be in good working order;
 - iii. Light trucks and cars with factory-installed (type) mufflers, in good condition, may be used on roads where the roadway is cleared of vegetation;
 - iv. No smoking signs and fire rules shall be posted on the project bulletin board at the contractor's field office and in areas visible to employees during the fire season; and
 - v. Equipment parking areas and small stationary engine sites shall be cleared of all extraneous flammable materials.
- c. During project operation, the Applicant shall comply with the following:
 - i. Warning signs for high-voltage equipment shall be posted;

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- ii. Brush and other dried vegetation around pad-mount transformers and riser poles shall be cleared annually;
 - iii. Employees shall be trained in using extinguishers and communicating with the Montezuma Fire Protection District; and
 - iv. Accommodate inspections by the Montezuma Fire Protection District.
- d. The Grass Fire Control Plan shall be submitted to the County for approval. The Applicant shall not commence construction activities until the County has approved the plan.
 - e. The Applicant shall provide a copy of the Grass Fire Control Plan, along with maps of the Montezuma II Wind Energy Project Area and roads, to the Montezuma Fire Protection District for their approval.
 - f. The Applicant shall provide the Montezuma Fire Protection District access to its water storage tanks, if needed.

Mitigation Measure SA-5b: Comply with Fire Code Requirements for Access Roads.

In order to provide safe access for fire apparatus in the event of fire, and reduce potential fire impacts to a less than significant level, the Applicant shall design and construct access roads within the project boundaries in compliance with applicable Fire Code standards as determined by the Montezuma Fire Protection District. Prior to construction, the Applicant shall submit project plans to the Montezuma Fire Protection District for review and approval. No grading permit shall be issued until such time as the County has received written approval of the Project, including access road plans, from the Fire District.

Level of Significance with Mitigation: Less than Significant

Impact SA-6: Safety Impacts Related to Accidentally Damaging or Uncovering Gas Storage Wells in the Project Area

If a natural gas storage well was uncovered or damaged during construction, remedial operations may be required. The Applicant must contact the DOGGR's Sacramento District office to obtain information on the requirements for and approval to perform remedial operations. DOGGR also recommends that no structure be built over or in proximity to an abandoned well location. Table 12.1-1 in Chapter 12, Hazardous Materials, contains a complete list of wells in area. According to the current proposed layout, the closest turbine to an existing natural gas well is turbine 15, which would be more than 700-feet from a well. This distance would exceed California Building Code requirements. Additionally, with the implementation of Mitigation Measure HAZ-2, which requires that that Applicant prepare a plan for encountering contaminated soil, groundwater, natural gas wells, and other hazards, impacts on worker safety would be reduced to less than significant.

Level of Significance with Mitigation: Less than Significant

18.5 REFERENCES

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