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4.1 PROJECT DESCRIPTION

Hydrogen Energy International LLC (HEI or Applicant) is proposing an Integrated Gasification Combined Cycle (IGCC) project called Hydrogen Energy California (HECA or Project). The Project intends to connect to Pacific Gas & Electric's (PG&E) Midway Substation 230-kilovolt (kV) bus. The PG&E Midway Substation was selected as the Project's preferred interconnection point because it is the closest substation to the Project Site. The California Independent System Operator (CAISO) will confirm the feasibility of connecting to the Midway Substation when it issues the initial feasibility report (Phase 1 Interconnection Study) as part of the Large Generator Interconnection Procedure (LGIP) in July 2009. Additional details pertaining to the LGIP are included in Appendix A. Midway Substation is approximately 8 miles northwest of the Project, near Buttonwillow. A 230-kV, single-pole, double-circuit transmission line is planned to connect the Project to Midway Substation. No additional substation or additional transmission lines are proposed. This line is to be constructed using a single-shaft, tubular steel structure with a brace post insulation system. One circuit will be on each side of the structure. Deadend and angle structures will be similar tubular steel structures with horizontal davit arms to hold the conductors. The line will incorporate two optical shield wires. These will be used for both operational communications for the power line and for lightning shielding.

4.2 ROUTE SELECTION

Four initial route alternatives were selected for the transmission line between the Project Site and the substation. All route options are shown in Figure 4-1, Route Alternatives.

Options 1, 2, 3, and 4 leave the Project Site north along Dairy Road, then west on Adohr Road.

Option 2 turns north on Dunford Road, then northwest to the substation.

Options 2 and 4 turn north on Dunford Road, then northwest to the substation.

Option 3 turns north at Freeborn Road, continuing north through farmland to the substation.

Options 1 and 3 split into two-sub routes near the substation should there be insufficient space to connect both circuits to the north side of the substation. The split options are labeled "a" and "b."

The Project eliminated Options 1 and 3 for the reasons listed below:

- **Feasibility of Land Acquisition –** Option 1 involves the greatest number of land owners and therefore is the least feasible from the perspective of land acquisition. The remaining options had approximately the same number of land owners with whom the Project would have to negotiate.

- **Safety and Proximity to Potential Sensitive Receptors** (i.e., residences, schools, day care centers, etc.) – Option 3 potentially impacts more residences than the other options, because of the number of residences located along Wasco Way. The number of residences affected by Option 1 is similar to Option 3. Fewer residences are present along Options 2 and 4;

therefore, these options have the least potential sensitive receptor impacts. Other than residences, no other sensitive receptors are known to exist along any of the identified options.

- **Overall Economic Feasibility –** Due to the environmental impacts, proximity to sensitive receptors, and ability to acquire the land, Options 1 and 3 (along with the sub-options) were eliminated.

The Project, however, is still considering two alternatives – Options 2 and 4, which, based on the alternative evaluation, have the least potential environmental and economic impacts. Only one of these options will be built to support the Project. The Project will build the route in accordance with applicable laws, ordinances, regulations, and standards, which will result in a less-than-significant impact.

Appendix A, Transmission Network Upgrade, describes the status of the Project's Interconnection Study, currently ongoing with the CAISO, which is assessing the feasibility and associated impacts of providing a grid connection for the Project.

4.3 STRUCTURE SELECTION

4.3.1 General

The type of transmission line structure was selected based on aesthetics, economics, ease of construction, and to minimize the effect on the land for crop production after construction is complete. The Project has selected the single-pole, tangent structure because this structure has less potential impact to the environment than the lattice steel tower structure.

An example drawing of the single-pole, tangent structure is shown in Figure 4-2, Tangent Structure. An example deadend structure is shown in Figure 4-3, Deadend Structure. The single pole, tangent structure with braced post insulators is an attractive alternative to a lattice steel tower. A similar 230-kV line is in close proximity to either chosen route.

The single-pole, tangent structure is economical to fabricate, deliver, and erect. Because they are built in two or three pieces, they can be delivered by truck to just about anywhere. Construction is simple and only requires one foundation, unlike a lattice structure. A lattice structure also has many small pieces which must be fabricated individually and then assembled at the site. This is further discussed in Section 4.7.

The single pole, tangent structures, once erected, take up less ground area at the base of each pole. The single pole shaft pole requires approximately a 6- to 8-foot-diameter area at the base whereas a four legged lattice structure may require a 25- or 30-foot-square area. The space within the lattice structure, between the legs, is not usable for crop production.

4.3.2 Structure Weights and Dimensions

Table 4-1, Tangent Structure, shows the height and weight for a typical tangent structure used on this Project. Table 4-2, Deadend Structure, shows the height and weight for a deadend structure.

Table 4-1
Tangent Structure

Structure height above ground	110 feet
Structure weight	10,000 pounds, including anchor bolts

Table 4-2
Deadend Structure

Structure height above ground	115 feet
Structure weight	23,500 pounds, including anchor bolts

4.4 CONDUCTOR SELECTION

4.4.1 Introduction

The conductor selected for the preliminary design is 1,158-thousand-circular-mil (kcmil) aluminum steel-supported conductor with trapezoidal stranding (ACSS/TW) for the aluminum strands. The code word for this conductor is Genesee/ACSS/TW. The aluminum conductor steel-supported (ACSS) class of conductor is described as a "high-temperature conductor" and has been in use since the 1970s. The overall diameter of the conductor is 1.165 inches.

The selection of this conductor considered several factors, including ampacity, weight, strength, sag, and cost. Genesee/ACSS/TW was selected based on these factors. Several different conductor sizes and three conductor families were considered. Single conductor and double circuit bundles were also considered. The conductor was selected to be able to economically handle the normal operating current and ambient temperatures with only one of the two circuits in service.

An aluminum conductor, steel-reinforced (ACSR) was considered but was removed from consideration because large conductors and double bundles would be necessary. Bundling would double the cost of the conductor, more than double the cost of the connectors and conductor fittings, and significantly increase the cost of the structures and insulators.

An aluminum conductor composite core (ACCC) conductor family was also considered. ACCC conductors have an outer layer of annealed trapezoidal strands and an inner layer consisting of polymer bound carbon fibers encased in a fiberglass tube. No steel is used. The cost of ACCC is about three times the cost of ACSR, and ACCC has no advantages over ACSS for this application.

4.4.2 Sag and Tension Table

The sag and tension table for the Genesee conductor is shown in Figure 4-4, Sag and Tension Data – Genesee.

4.4.3 Conductor Electrical and Mechanical Characteristics

The conductor characteristics are described in Table 4-3.

Table 4-3
Characteristics of Genesee ACSS/TW

Cross sectional area	1,158,000 circular mils
Outer diameter	1.165 inches (the same diameter as 954 kcmil ACSR "Rail")
Rated breaking strength	20,500 lbs/22,100 lbs/25,000 lbs (standard/high strength) HS285. Standard strength conductor was used in the initial preliminary design.)
Stranding	54/7 (aluminum/steel)
Current rating	1,094 amps at 75°C
Current rating (25°C ambient)	1,350 amps at 100°C
Current rating (25°C ambient)	1,712 amps at 150°C
Current rating (25°C ambient)	1,985 amps at 200°C
Current rating (25°C ambient)	2,218 amps at 250°C

Notes:
°C = degrees Celsius
Kcmil = thousand circular mils
lbs = pounds

4.5 OVERHEAD GROUND WIRE AND OPTICAL GROUND WIRE

4.5.1 Overhead Ground Wire Selection

Currently, two optical ground wires (OPGW) are planned. If only one OPGW is included in the final design, a single overhead ground wire (OHGW) will be included and installed in parallel with the OPGW. The OHGW selected will be a 7-strand, 7/16-inch-high strength steel conductor. The overhead ground wire characteristics are described in Table 4-4, Characteristics of the Overhead Ground Wire.

Table 4-4
Characteristics of the Overhead Ground Wire

Nominal size	7/16 in. HS
Strands	7
Overall area	0.1156 square inch
Outside diameter	0.435 inch
Weight per 1,000 feet	399 pounds
Rated breaking strength	14,500 pounds

Note:
HS = high strength

A sag and tension table for the 7/16-inch-high strength steel OHGW is shown on Figure 4-5, Sag and Tension Data – HSS7-16.

4.5.2 Optical Ground Wire Selection

The OPGW conductor selected is an outer layer of alternating aluminum clad steel and aluminum wire strands, an aluminum pipe and stainless steel tube under the outer layer, and 48 strands of single mode optical fiber inside the stainless tube. The OPGW has the characteristics as shown in Table 4-5, Characteristics of the Optical Ground Wire.

Table 4-5
Characteristics of the Optical Ground Wire

Fault current capability	56 kA
Overall Area	0.2208 square inch
Outside diameter	0.646 inch
Weight per 1,000 feet	422 pounds
Fibers included	48
Type of fiber	Single-mode
Rated breaking strength	18,053 pounds
Maximum reel ship length	6,000/7,000 feet (wood/steel)

Note:
kA = thousand amps

The sag and tension table for the OPGW is shown on Figure 4-6, Sag and Tension Data – GW4810.

The OPGW or OHGW positioning will be designed to provide 30-degree shielding for lightning protection of the transmission conductors.

4.6 INSULATOR SELECTION

The insulator configuration for the tangent structures is a "braced post" insulator assembly. The braced post assembly consists of a horizontal post insulator with an additional insulator extending from the end of the horizontal post insulator up at an angle to the pole. This type of insulation system was selected based on aesthetics to match a similar line in the area of the proposed line. It was also selected to meet the electrical insulation characteristics and mechanical strength requirements necessary to support the selected conductor. This insulation system allows for an attractive, economical, and compact design. These insulators are available from at least three suppliers. A drawing of a typical braced post insulator assembly is shown on Figure 4-7, Rodurflex Insulating Crossarm. The corresponding combined loading chart is shown on Figure 4-8, Combined Load Chart.

4.7 COMPARISON OF TUBULAR STRUCTURES AND LATTICE TOWERS

4.7.1 Lattice Structures

Single-pole, tangent structures (fabricated from steel) and lattice steel towers are both commonly used for transmission line supporting structures. The lattice steel towers have been around for many years and have been used for lines from 35 kV through 765 kV. Steel poles have gained popularity more recently and are generally used for 15 kV to 345 kV lines. The lattice structure has been used where larger loads, more line-to-ground clearance, or longer spans are desired. Lattice structures tend to be more economical when larger and taller structures are required. Lattice structures tend to be used in rural or open, unpopulated areas where spans can be lengthened. Towers come in many small pieces. Each of the many pieces must be separately manufactured. At each site, each piece must be tracked, accounted for, and assembled into the finished tower. The tower legs take up much more space than the tapered pole and the space within the legs typically cannot be used for crop production.

4.7.2 Tangent Structures

The Project intends to use single-pole, tangent structures for the transmission towers for the reasons listed below. Single-pole, tangent structures—also known as tapered steel pole structures—present a much cleaner appearance than the lattice type structures. The most common finish on steel poles is simply bare galvanizing. The galvanizing on the pole, though initially appearing as a bright shiny surface, will rapidly fade to a dull grey appearance. The tapered poles are easily painted, if necessary, increasing their ability to blend with the surrounding features. Allowing the steel to oxidize can also be used as a method to blend the pole structure into the surrounding features, while at the same time, the oxidation protects the steel from corrosion. Steel pole structures have been largely accepted by the public as being more aesthetically pleasing than the lattice-type structures. However, the public is more accepting of the same type of structures being used on the same right-of-way (ROW). The mixing of steel poles and lattice structures causes a perceived visual conflict. The pole structure tends to accent the size and complexity of the adjacent lattice structure and the presence of the lattice structures detracts from the simplicity of the steel pole structure.

A subjective comparison of various features of the lattice and tubular steel structures is shown in Table 4-6, Comparison of Lattice and Tubular Steel Structures.

4.8 CONSTRUCTION METHODS AND IMPACTS

4.8.1 Construction Methods

Construction of the line will require installing approximately 60 tubular steel transmission structures and the supporting foundations. Construction will also involve stringing the conductor and OHGW/OPGW. After the line is completed, regular preventative maintenance and inspections will be required. An occasional unscheduled repair may also be required.

Table 4-6
Comparison of Lattice and Tubular Steel Structures

Feature	Lattice Structures	Tubular Steel Structures
Voltage	34.5 kV to 765 kV	15 kV to 345 kV
Aesthetics	Not too good	Good
Components	Many	Few
Right-of-way	Wider	Narrower
Span lengths	Longer	Shorter
Land space for structure	Larger (20 to 30 feet square)	Smaller (10 to 15 feet in diameter)
Cost advantage	Above 125 to 150 feet	Below 125 to 150 feet
Construction complexity	Many pieces – longer to assemble and install	Fewer pieces – assembled and installed more quickly
Foundation requirements	Simpler (grillage in some cases, no concrete required).	More complex (single concrete foundation with rebar, 6 to 10 feet diameter with 20 to 30 feet depth)

Note:
kV = kilovolt

The line will be built using conventional methods with off-road heavy equipment. The heavy equipment will include truck-mounted foundation hole drilling equipment, dump trucks, flat bed tractor trailer units to bring in reinforcing cages and other supplies, concrete trucks, and concrete pumping trucks. Truck-mounted mobile cranes will be required to set the structures. Smaller support vehicles such as pickups and other service vehicles will also be required. Medium-sized earth-moving equipment will be needed to load surplus spoil material for removal from the site. Specialized truck-mounted equipment will be used for pulling in and sagging the conductors and shield wires.

Temporary primitive roads will need to be constructed within the transmission line ROW. A small area around each structure site will need to be disturbed temporarily during the construction period. Diagrams of the construction sites at each structure, wire stringing (pulling) sites, and other temporary construction areas can be better defined once a final route option and preliminary line design is available. The approximate area that may be temporarily disturbed is quantified in Section 4.8.3. Roadway matting may be used on the road and around the area of each structure to minimize the effects of the construction vehicles and the construction activity. The construction will likely impact the crop production for a relatively short period of time. Since the time to construct the entire transmission line is estimated to be approximately 3 months, crop production may be impacted intermittently for this duration of time.

After construction has been completed, the line will require a minimal amount of maintenance. Most of the maintenance will be routine and can be scheduled during periods when damage to the crops and the land can be minimized. Maintenance activities can be planned to occur during the dryer periods of the year to minimize soil and crop damage. Again, roadway matting may be used to reduce crop and soil damage, if necessary.

When construction and maintenance activities have been completed, the soil and crop damage can be repaired by tilling to loosen the soil and then replanting.

4.8.2 Permanent Right-of-Way

A typical 230-kV transmission line right-of-way for this type of line is 150 feet wide, 75 feet on each side. The easement grant would give the Project the right to construct, operate, maintain, and repair the transmission line and the associated communication circuits. A 150-foot-wide ROW is assumed for this preliminary design. The total acreage for this ROW would be approximately 145 acres based on an 8-mile line route.

A 25-foot-diameter area will be needed permanently at the base of each structure. Again, assuming 60 structures, the total area removed will be only about 0.67 acre total.

4.8.3 Land Disturbance During Construction

During construction a 150-foot-square area around each structure will be required to install the structure foundation and to set the structure. Assuming 60 structures total, the area disturbed for this activity will be approximately 31 acres.

In addition to the area above, construction vehicles will need to drive the ROW for construction. This will require a total area of approximately 24 acres, assuming a 25-foot-wide temporary roadway along the entire line based on an 8-mile line route. Part of the line may be adjacent to public roadways. In these areas it is possible that no temporary roadway will be required. This will reduce the total acreage required for roadway stated above.

Potential impacts associated with the construction and maintenance of the transmission line are addressed by discipline (e.g., biological, cultural, visual) in the respective sections of the AFC.

4.9 ELECTRICAL AND MAGNETIC EFFECTS

4.9.1 Introduction

The electric and magnetic effects studied included audible noise, electric fields, magnetic fields, and radio influence.

Audible noise and radio influence are effects caused by corona. Corona is a luminous discharge caused by ionization of the air surrounding an energized conductor, conductor fittings, and connectors. These discharges are caused by the voltage gradient at the discharge points exceeding a certain critical value.

Corona discharges are affected by altitude, humidity, weather, line voltage, conductor irregularities on the surfaces of the conductors, and the shape of and irregularities on conductor fittings and connectors. The configuration and spacing of the line conductors also has an effect.

Corona effects can be controlled by carefully selecting line conductors and other components for the Project during the design process. Also, corona discharges can be controlled by carefully handling the conductor to prevent damage and surface irregularities. Care should also be taken to make sure that unprotected sharp edges such as conductor ends are not left after the construction is complete.

The most effective approach that can be used during the preliminary design to minimize corona effects is to select an appropriate conductor. For this preliminary design, a conductor with a diameter of 1.165 inches was selected. For 230 kV, at the altitude of this Project (less than 500 feet), the minimum conductor diameter considered appropriate is approximately 1.108 inches. Also for this preliminary design, a conductor with homogeneous trapezoidal outer strands was selected. This homogeneous trapezoidal stranding does not have the voids between the strands and between the layers. The outside surface of the conductor is very smooth compared to a conductor containing round strands. This smooth surface will tend to reduce the corona discharge.

Audible noise is the crackling sound that a person hears when standing under or near a transmission line. This noise will vary in amplitude (intensity) and will lessen with the observer's increased distance from the line. The amplitude will also vary and increase during periods of high humidity in the air and precipitation, including rain, sleet, and snow. Again, the noise will decrease as the observer moves away from the line.

Radio influence is the buzzing and crackling one might hear coming from the speaker of an AM broadcast receiver. The influence is typically observed when listening to an AM broadcast band receiver near a transmission line. Nearby amateur radio stations using amplitude modulation signal receivers may possibly also experience, to a lesser extent, the radio influence from the line. Amateur radio stations typically use higher frequencies. The radio influence is attenuated more quickly as the received frequency and distance from the transmission line is increased. FM modulated signals, unless very weak, will not be affected by the line. With the advent of, and increased use of, new technologies such as digital radio, digital television, satellite radio, and MP3 players, the significance of the radio influence has greatly diminished.

The U.S. Federal Communications Commission in the Code of Federal Regulations (CFR) 47, Part 15, designates electrical lines as incidental emitters of radio frequency signals. These emitters must not interfere with licensed communications services that are operating in their designated service area. Should interference occur, the emitting source is responsible for mitigating the interference. In general, interference from transmission lines in lightly populated areas has not proven to be a significant issue.

Electrical and magnetic fields are produced during the operation of a transmission line. These fields are not heard as audible or radio noise. However, the electric and magnetic fields may be experienced in other ways. For example, a person may experience a tingling of the skin or a frizzing of the hair when near a transmission line. A person entering or exiting a vehicle parked under a transmission line may experience a noticeable but innocuous shock as the person touches the vehicle. Voltages can be induced into fences, railroad tracks, waterlines, etc., which are of concern but can be mitigated successfully.

An alternating electric field is generated by the voltage on the energized conductors of the transmission line. Since this line is a double circuit line, there are six conductors, one for each phase of a three phase circuit and two circuits. Two conductors at the top of the structure are also used for lightning protection and communications. These two conductors are not energized and are not considered in the electric field calculations.

The electric field near the ground produced by the transmission line is influenced by the voltage of the line, the number and configuration of the conductors in relationship to each other and the ground, and the electrical phasing of the conductors in one circuit compared to the other circuit. The electric field strength will be different if one or two circuits are energized.

An alternating magnetic field is generated by the current flowing in the energized conductors of the transmission line. The magnetic field is influenced by the current flowing in the line as well as the other factors mentioned in the electric field paragraph above. The line voltage is not a direct factor for the magnetic field. The magnetic field strength will be different if one or two circuits are energized. This is because with two circuits in service the electrical current produced by the Project will divide approximately equally in each circuit. With only one circuit in service all the Project current will flow in one circuit.

4.9.2 Mitigation of Electric and Magnetic Effects

The state of California requires no cost or low cost mitigation of the effects of transmission lines. In the case of electric and magnetic effects, mitigation was performed in two basic ways. First, the phasing of the conductors for each circuit in relationship to the other circuit was modified as shown in the assumptions table (Table 4-6, Conductor Geometry) shown below. Change in phasing has the effect of lowering the electric and magnetic fields while increasing the audible noise and radio influence levels. So, one must decide which of the conditions are most important and merit being reduced.

Another way the preliminary design has attempted to lower the electric and magnetic field levels is to move the conductors away from the observer. This is accomplished when additional clearance above that which is required is provided. The California General Order 95 (GO-95) requires a minimum conductor clearance to ground of 30 feet for a 230-kV line. The preliminary line design calls for a clearance of 40 feet for a 700-foot span. The additional clearance is also included to make it more difficult for farm machinery and other farming operations to contact or to come close to the conductors.

4.9.3 Assumptions for Electrical and Magnetic Effects Calculations

Several assumptions must be made to make a prediction of the levels for each of the electrical and magnetic effects. These assumptions are described below.

Table 4-7, Conductor Geometry, describes the configuration, geometry and phasing of the conductors on the transmission line.

Only the potential electric and magnetic effects of the subject transmission line are considered in this analysis. The existing electric and magnetic fields (EMFs) at the Project Site boundary were assumed to be zero because the Project Site is in a rural-undeveloped area without facilities in close proximity that might emit such EMFs.

A diagram for this geometry is shown in Figure 4-9, Conductor Location Diagram.

Table 4-7
Conductor Geometry

	Phase Conductor A	Phase Conductor B	Phase Conductor C
Circuit No. 1			
Above Ground	87 feet	71 feet	55 feet
From Centerline	8 feet (left)	8 feet (left)	8 feet (left)
Phasing	0 degrees	120 degrees	240 degrees
Circuit No. 2			
Above Ground	55 feet	71 feet	87 feet
From Centerline	8 feet (right)	8 feet (right)	8 feet (right)
Phasing	240 degrees	120 degrees	0 degrees

The audible noise calculations assume an L_{50} rain condition, which is not a heavy rain but a moderate steady rain. The audible noise calculation assumes a system voltage of 242 kV which is 105 percent of the nominal 230-kV system voltage. The calculations also assume an altitude of 500 feet or less for the Project. Calculations are made for 5 feet above ground, which corresponds to the approximate height of a human ear. This is also the typical elevation used for the sensor for a measuring instrument. The calculations have been run for two conditions: when one circuit is in service, and when both circuits are in service.

Similarly, the electric field calculations assume a system voltage of 242 kV and a Project altitude of less than 500 feet. The calculation assumes a height of 1 meter above the ground. Calculations for one circuit in service and two circuits in service were performed.

The magnetic field calculations were performed using the maximum current available based on the net output of the facility. Using a net capacity of the plant of 436 megawatts and a power factor of 0.90, the maximum line current is calculated as 1,216 amps. Two calculations were performed, one with both transmission line circuits in service and one calculation with only one circuit in service. With both circuits in service, the current is assumed to be divided equally between each circuit. Each line will carry 608 amps. With only one line in service, 1,216 amps will flow in one line and the other line will have no current flow. The Project intends to operate the transmission line with both circuits in service. The condition where only one circuit would be in service would be rare and would occur for a relatively short period of time. This condition might occur during maintenance or repair of the line or of the associated substation equipment at each end of the line. The outage time when only one circuit would be operational is estimated to be less than 1 week, every 2 to 3 years, assuming otherwise normal operating conditions. The magnetic field calculations assume an observer height of 1 meter above the ground.

The radio influence calculations were performed assuming a system voltage of 242 kV, a Project altitude of 500 feet or less. The calculations assume an observer height of 1 meter above the ground. The calculations were calculated at a frequency of 1,000 kHz, which is the approximate center of the AM broadcast band in the United States.

4.9.4 Results

The results shown below are for values at the edge of the ROW, which is assumed to be 75 feet from the centerline.

Table 4-8, Audible Noise Levels, shows the audible noise levels for the line at the edge of the ROW. A graph of the audible noise levels are shown on Figure 4-10, Audible Noise.

Table 4-8
Audible Noise Levels

	Level at Edge of ROW
One line in service	43.2 dBA
Two lines in service	47.8 dBA

Notes:
dBA = A-weighted sound pressure level
ROW = right–of-way

Table 4-9, Electric Fields, shows the electric field levels for the line at the edge of the ROW. A graph of electric field levels are shown in Figure 4-11, Electric Field.

Table 4-9
Electric Fields

One line in service	0.08 kV/meter
Two lines in service	0.12 kV/meter

Note:
kV = kilovolts

Table 4-10, Magnetic Fields, shows the magnetic field levels for the line at the edge of the ROW. A graph of the magnetic field levels are shown on Figure 4-12, Magnetic Field.

Table 4-10
Magnetic Fields

One line in service	24.4 milligauss
Two lines in service	3.4 milligauss

Table 4-11, Radio Influence, shows the radio influence levels for the line at the edge of the ROW. A graph of the radio influence levels are shown in Figure 4-13, Radio Influence.

Table 4-11
Radio Influence

One line in service	57.7 dB-microvolt/meter
Two lines in service	59.4 dB-microvolt/meter

Notes:
dB = decibels

The Project will build the transmission line and interconnection in accordance with applicable LORS.

The Project will not cause any significant human health impacts related to EMF exposure. No state standards exist for EMF exposure, and available evidence has not established a link between EMF exposure and significant health impacts. Long-term residential EMF exposure from the proposed Project lines will be reduced with the implementation of design and management measures recommended by the CPUC to reduce EMF exposure. On-site worker or public exposure will be short term and at levels expected for lines of similar design and current-carrying capacity, which does not pose a significant human health hazard. As a result, impacts related to EMF exposure will be less than significant.

4.10 AVIATION SAFETY

Federal Aviation Administration (FAA) Regulations, Title 14 CFR, Part 77 establishes standards for determining obstructions in navigable airspace in the vicinity of airports that are available for public use and are listed in the Airport/Facility Directory. These regulations set forth requirements for notification of proposed obstruction that extend above the earth's surface. FAA notification is required for any potential obstruction structure erected over 200 feet in height above ground level. Notification is required if the obstruction is greater than specified heights and falls within any restricted airspace in the approach to airports. For airports with runways longer than 3,200 feet, the restricted space extends 20,000 feet (3.3 nautical miles) from the runway with no obstruction greater than a 100:1 ratio of the distance from the runway. For airports with runways measuring 3,200 feet or less, the restricted space extends 10,000 feet (1.7 nautical miles) with a 50:1 ratio of the distance from the runway. For heliports, the restricted space extends 5,000 feet (0.8 nautical mile) with a 25:1 ratio.

Buttonwillow Airport is the sole airport within the 20,000-foot restricted space. It is approximately 3.5 miles southwest from the Midway Substation and the runway length is 3,260 feet. Based on this information, notification will only be required if any structure for the transmission line exceeds approximately 160 feet in height and is 3 miles from the Buttonwillow Airport. The transmission line structures are not planned to exceed a height of 160 feet.

After the Buttonwillow Airport, the next three airports closest to the Project are the Ford City, Bakersfield, and Gottlieb airports. The Ford City Airport is located approximately 14 miles south of Tupman; the Bakersfield Airport is located approximately 22 miles east of Tupman; and the Gottlieb Airport (private) is located approximately 14 miles east of Buttonwillow. None of these airports is close enough to pose any height notification issues. As a result, impacts related to aviation safety will not be significant.

4.11 ENVIRONMENTAL CONSEQUENCES

The Project transmission line will not result in significant environmental impacts. The Project transmission lines and related facilities are not located close enough to an airport to pose an aviation hazard according to current FAA criteria. The potential for nuisance shocks will be minimized through grounding the Project's support structures. EMF, audible noise and radio influence will be mitigated by constructing the line at least 75 feet from existing occupied buildings and other field-reducing measures required by standard industry practices. Recommended mitigation measures and industry standard approaches reasonably ensure that the Project's lines will not have a significant environmental impact on public health and safety, nor cause any a significant impact related to radio/television communications interference, audible noise, fire hazards, nuisance, or hazardous shocks.

With the implementation of recommended mitigation measures and best management and design practices, the Project will conform with all applicable laws, ordinances, regulations, and standards relating to Transmission Line Safety and Nuisance and will not result in any significant impacts.

4.12 APPLICABLE LAWS, ORDINANCES, REGULATIONS, AND STANDARDS

This section provides a list of applicable laws, ordinances, regulations, and standards (LORS) that apply to the interconnecting transmission line and engineering. The following compilation of LORS is in response to Section (h) of Appendix B attached to Article 6, of Chapter 6, of Title 20 of the California Code of Regulations. Inclusion of these data is further outlined in the California Energy Commission's (CEC) publication entitled "Rules of Practice and Procedure & Power Plant Site Certification Regulations."

4.12.1 Design and Construction

Table 4-12, Design and Construction LORS, lists the applicable LORS for the design and construction of the transmission line and substations.

4.12.2 Electric and Magnetic Fields

The applicable LORS pertaining to electric and magnetic field interference are tabulated in Table 4-13, Electric and Magnetic Fields.

4.12.3 Hazardous Shock

Table 4-14, Hazardous Shock LORS, lists the LORS regarding hazardous shock protection for the Project.

4.12.4 Communication Interference

The applicable LORS pertaining to communication interference are tabulated in Table 4-15, Communications Interference LORS.

Table 4-12
Design and Construction LORS

LORS	Applicable to	AFC Reference
General Order 95 (GO-95), CPUC, "Rules for Overhead Electric Line Construction"	The California Public Utility Commission (CPUC) rule covers required clearances, grounding techniques, maintenance, and inspection requirements.	Sections 4.2, 4.3, 4.4, 4.5, 4.6
Title 8 California Code of Regulations (CCR), § 2700 *et seq*. "High Voltage Electrical Safety Orders"	Establishes essential requirements and minimum standards for installation, operation, and maintenance of electrical installation and equipment to provide practical safety and freedom from danger.	Sections 4.3, 4.5
General Order 128 (GO-128), CPUC, "Rules for Construction of Underground Electric Supply and Communications Systems"	Establishes requirements and minimum standards to be used for the station AC power and communications circuits.	Sections 4.5.1, 4.5.2
General Order 52 (GO-52), CPUC, "Construction and Operation of Power and Communication Lines"	Applies to the design of facilities to provide or mitigate inductive interference.	Sections 4.9.1, 4.9.2, 4.9.3
Suggestive Practices for Raptor Protection on Power Lines, April 1996	Provides guidelines to avoid or reduce raptor collision and electrocution.	Sections 4.3.1, 4.3.2

Notes:
AC = alternating current
CCR = California Code of Regulations
CPUC = California Public Utility Commission

Table 4-13
Electric and Magnetic Fields

LORS	Applicable to	AFC Reference
Decision 93-11-013 of the CPUC	CPUC position on EMF reduction.	Sections 4.9.1, 4.9.2, 4.9.3
General Order 131-D (GO-131), CPUC, Rules for Planning and Construction of Electric Generation, Line, and Substation Facilities in California	CPUC construction-application requirements, including requirements related to EMF reduction.	Sections 4.9.1, 4.9.2, 4.9.3
Pacific Gas & Electric Company, "Transmission Line EMF Design Guidelines"	Large local electric utility's guidelines for EMF reduction through structure design, conductor configuration, circuit phasing, and load balancing. (In keeping with CPUC D.93-11-013 and GO-131)	Sections 4.9.1, 4.9.2, 4.9.3
ANSI/IEEE 644-1994 "Standard Procedures for Measurement of Power Frequency Electric and Magnetic Fields from AC Power Lines"	Standard procedure for measuring EMF from an electric line that is in service.	Sections 4.9.1, 4.9.2, 4.9.3

Notes:
AC = alternating current
AFC = Application for Certification
ANSI = American National Standards Institute
CPUC = California Public Utility Commission
EMF = electro-magnetic field
LORS = laws, ordinances, regulations, and standards

Table 4-14
Hazardous Shock LORS

LORS	Applicable to	AFC Reference
Title 8 CCR § 2700 *et seq*. "High Voltage Electrical Safety Orders"	Establishes essential requirements and minimum standards for installation, operation and maintenance of electrical equipment to provide practical safety and freedom from danger.	Sections 4.3, 4.4, 4.4, 4.4, 4.8
National Electrical Safety Code (NESC), ANSI C2, § 9, Article 92, Paragraph E; Article 93, Paragraph C.	Covers grounding methods for electrical supply and communications facilities.	Sections 4.5, 4.6

Notes:
AFC = Application for Certification
ANSI = American National Standards Institute
CCR = California Code of Regulations
LORS = laws, ordinances, regulations, and standards
NESC = National Electrical Safety Code

Table 4-15
Communications Interference LORS

LORS	Applicable to	AFC Reference
Title 47 CFR § 15.25, "Operating Requirements, Incidental Radiation"	Prohibits operations of any device emitting incidental radiation that causes interference to communications. The regulation also requires mitigation for any device that causes interference.	Sections 4.8.1, 4.9.1, 4.9.2, 4.9.3, 4.9.4
General Order 52 (GO-52), CPUC	Covers all aspects of the construction, operation, and maintenance of power and communication lines and specifically applies to the prevention or mitigation of inductive interference.	Sections 4.9.1, 4.9.2, 4.9.3
CEC staff, Radio Interference and Television Interference (RI-TVI) Criteria (Kern River Cogeneration) Project 82-AFC-2, Final Decision, Compliance Plan 13-7	Prescribes the CEC's RI-TVI mitigation requirements, developed and adopted by the CEC in past siting cases.	Sections 4.8.1, 4.9.1, 4.9.2, 4.9.3, 4.9.4

Notes:
AFC = Application for Certification
CEC = California Energy Commission
CPUC = California Public Utility Commission
RI-TVI = Radio Interference and Television Interference

4.12.5 Aviation Safety

Table 4-16, Aviation Safety LORS, lists the aviation safety LORS that may apply to the construction and operation of the Project transmission line.

Table 4-16
Aviation Safety LORS

LORS	Applicable to	AFC Reference
Title 14 CFR Part 77 "Objects Affecting Navigable Airspace"	Describes the criteria used to determine whether a "Notice of Proposed Construction or Alteration" (NPCA, FAA Form 7460-1) is required for potential obstruction hazards.	Section 4.10
FAA Advisory Circular No. 70/7460-1G, "Obstruction Marking and Lighting"	Describes the FAA standards for marking and lighting of obstructions as identified by Federal Aviation Regulations Part 77.	Section 4.10
PUC, § 21656-§ 21660	Discusses the permit requirements for construction of possible obstructions in the vicinity of aircraft landing areas, in navigable airspace, and near the boundary of airports.	Section 4.10

Notes:
AFC = Application for Certification
CFR = Code of Federal Regulations
FAA = Federal Aviation Administration
NPCA = Notice of Proposed Construction or Alteration
PUC = Public Utilities Code

4.12.6 Fire Hazard

Table 4-17, Fire Hazard LORS, tabulates the LORS governing fire hazard protection for the Project transmission line.

Table 4-17
Fire Hazard LORS

LORS	Applicable to	AFC Reference
Title 14 CCR § 1250 § 1258, "Fire Prevention Standards for Electric Utilities"	Provides specific exemptions from electric pole and tower firebreak and electric conductor clearance standards, and specifies when and where standards apply.	Section 4.1, 4.2
General Order 95 (GO-95), CPUC, "Rules for Overhead Electric Line Construction" § 35	CPUC rule covers all aspects of design, construction, operation, and maintenance of electrical transmission line and fire safety (hazards).	Sections 4.2, 4.3, 4.4, 4.5

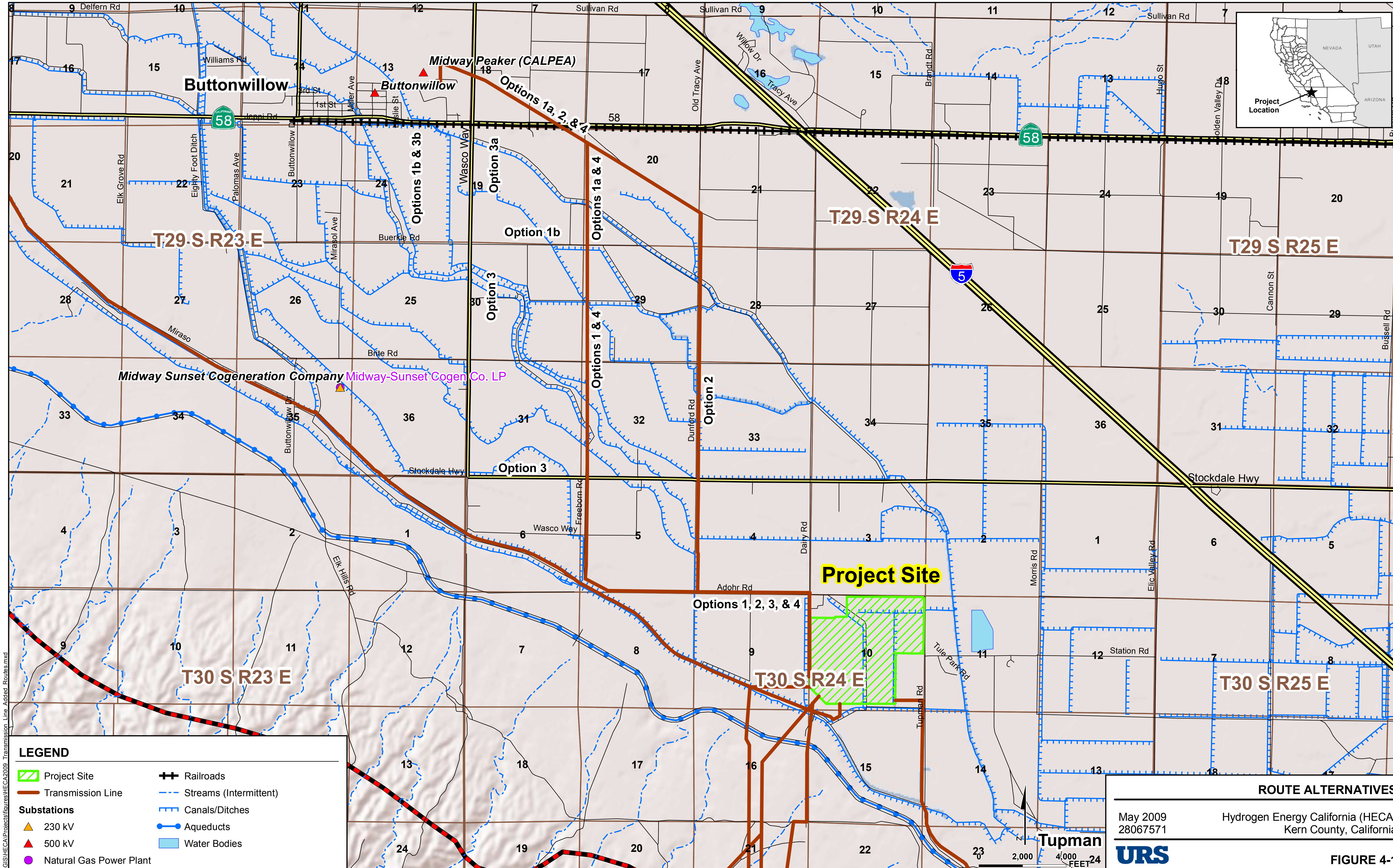
Notes:
CCR = California Code of Regulations
CPUC = California Public Utility Commission
LORS = laws, ordinances, regulations, and standards

4.12.7 Project Transmission Line Jurisdiction

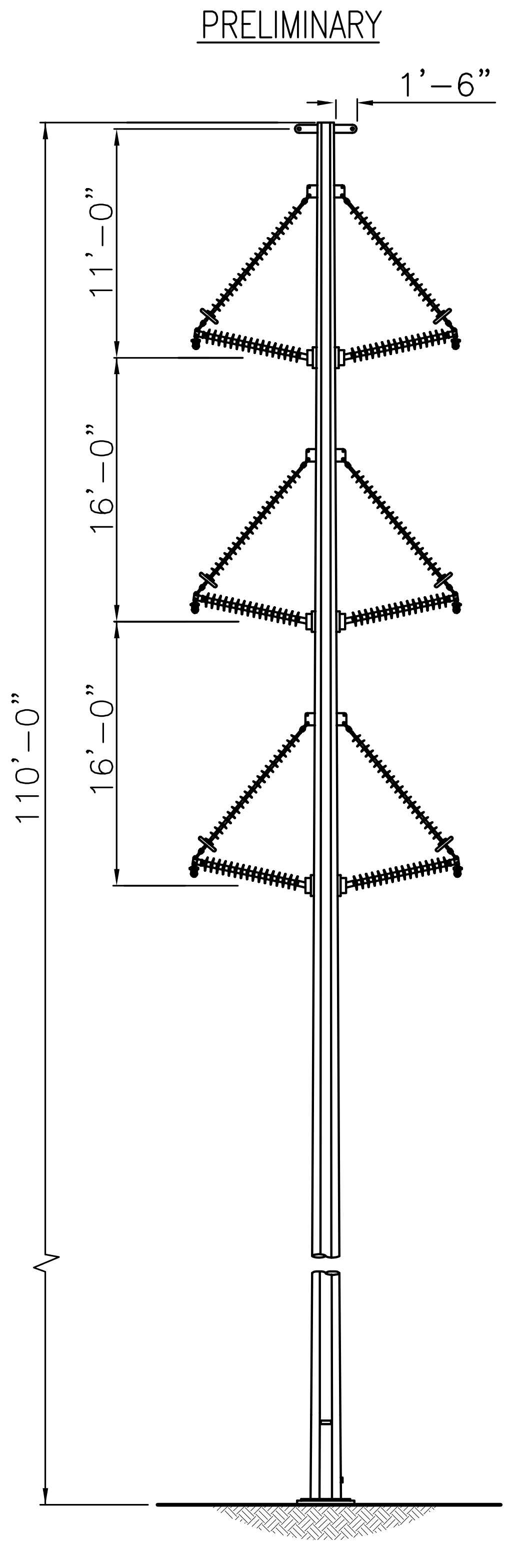
Table 4-18, Jurisdiction, identifies national, state, and local agencies with jurisdiction to issue permits or approvals, conduct inspections, and/or enforce the above-referenced LORS. Table 4-18 also identifies the associated responsibilities of these agencies as they relate to the construction and operation of the Project transmission line.

Table 4-18
Jurisdiction

Agency	Contact	Responsibility
California Energy Commission (CEC)	1516 Ninth Street Sacramento, CA 95814-5512	Has jurisdiction over new transmission lines associated with thermal power plants that are 50 megawatts (MW) or more. (PRC 25500)
		Has jurisdiction of lines out of a thermal power plant to the interconnection point to the utility grid. (PRC 25107)
		Has jurisdiction over modifications of existing facilities that increase peak operating voltage or peak kilowatt capacity 25 percent. (PRC 25123)
		Regulates construction and operation of overhead transmission lines. (General Order No. 95 and 131-D) (those not regulated by the CEC)
		Regulates construction and operation of power and communications lines for the prevention of inductive interference. (General Order No. 52)
Federal Aviation Administration (FAA)	Western-Pacific Region 15000 Aviation Boulevard Hawthorne, CA 90250	Establishes regulations for marking and lighting of obstructions in navigable airspace. (AC No. 70/7460-1G)
California Independent System Operator (CAISO)	Folsom, CA	Provides Final Interconnection Approval.
Federal Communications Commission (FCC)	445 12th Street, SW Washington, DC 20554	Enforces regulations for incidental emitters of radio frequency energy such as electrical transmission lines.



Sources: Utility data (POWERmap, www.powermap.platts.com Platts, A Division of The McGraw-Hill Companies, 2007). Other basemap features (ESRI and State of California).



Source:
Commonwealth Associates, Inc. (CAI);
Hydrogen Energy International, HECA Project, 230kV Transmission Line;
Tangent Structure (Sh. 1), May 2008

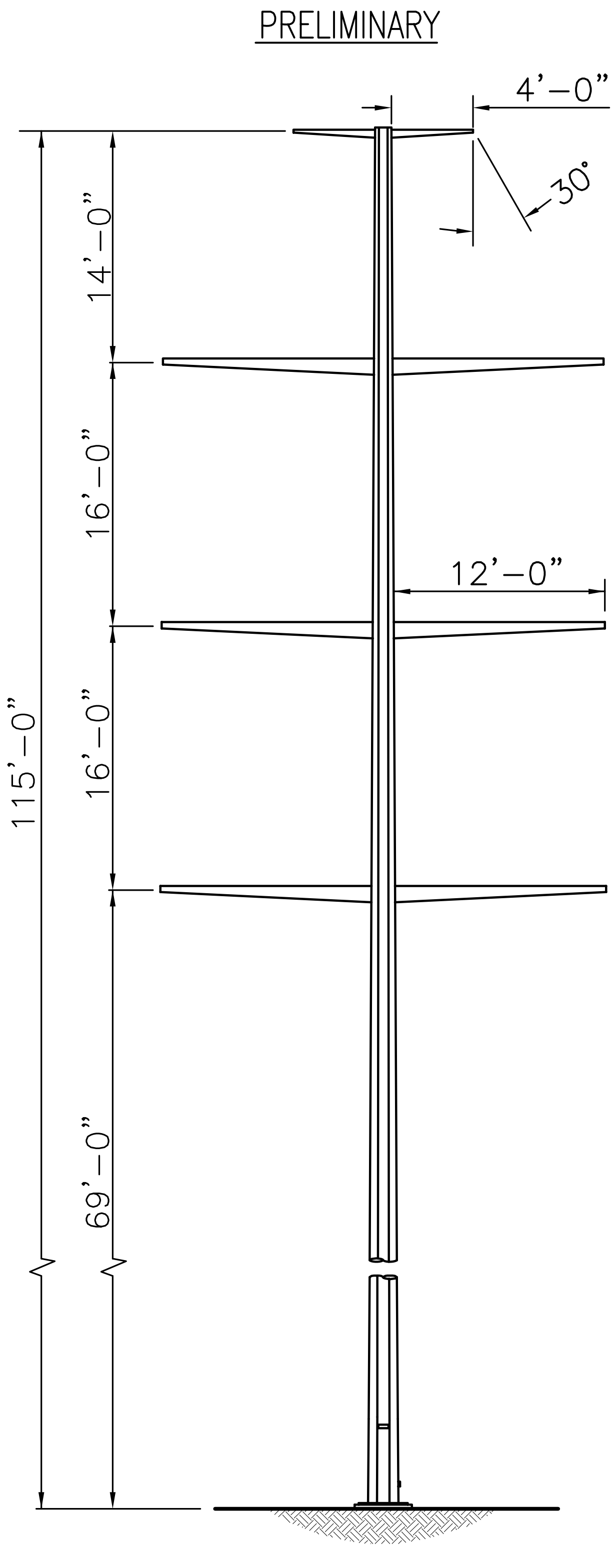
TANGENT STRUCTURE

May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 4-2



Source:
Commonwealth Associates, Inc. (CAI);
Hydrogen Energy International, HECA Project, 230kV Transmission Line;
Deadend Structure (Sh. 1), May 2008

DEADEND STRUCTURE

May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 4-3

5/15/09 vsa/hk..T:\HECA\GRAPHICS\4.0 Elec Trans\4-3_deadend.ai

ALUMINUM COMPANY OF AMERICA SAG AND TENSION DATA

HEI TRANSMISSION LINE
230KV DOUBLE CIRCUIT TRANSMISSION LINE

Conductor GENESEE/ACSS/T1158.0 Kcmil Type 7 ACSS HS Steel

Area= .9733 Sq. In Dia= 1.165 In Wt= 1.308 Lb/F RTS= 22100 Lb
Data from Chart No. 3-951
English Units

Span= 700.0 Feet Calif Light Load Zone
Creep is NOT a Factor

Design Points					Final			Initial		
Temp F	Ice In	Wind Psf	K Lb/F	Weight Lb/F	Sag Ft	Tension Lb	RTS %	Sag Ft	Tension Lb	RTS %
25.	.00	8.00	.00	1.521	13.03	7163.	32.4	11.49	8124.	36.8
60.	.00	23.00	.00	2.588	16.99	9357.	42.3	16.99	9357.	42.3
25.	.00	.00	.00	1.308	12.46	6442.	29.1	10.30	7789.	35.2
60.	.00	.00	.00	1.308	14.53	5525.	25.0*	11.11	7223.	32.7
90.	.00	.00	.00	1.308	16.23	4949.	22.4	11.97	6702.	30.3
120.	.00	.00	.00	1.308	17.85	4505.	20.4	13.00	6174.	27.9
167.	.00	.00	.00	1.308	20.20	3983.	18.0	14.88	5396.	24.4
212.	.00	.00	.00	1.308	21.13	3810.	17.2	16.86	4767.	21.6
400.	.00	.00	.00	1.308	24.71	3264.	14.8	24.59	3280.	14.8

* Design Condition

SAG AND TENSION DATA – GENESEE

May 2009
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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 4-4

Source:
Commonwealth Associates, Inc.

ALUMINUM COMPANY OF AMERICA SAG AND TENSION DATA

HEI TRANSMISSION LINE
230KV DOUBLE CIRCUIT TRANSMISSION LINE

Conductor Nominal Diameter 7/16x 7 Strand SteelHS

Area= .1156 Sq. In Dia= .435 In Wt= .399 Lb/F RTS= 14500 Lb
Data from Chart No. 1-1245
English Units

Span= 700.0 Feet Calif Light Load Zone
Creep is NOT a Factor

Design Points					Final			Initial		
Temp F	Ice In	Wind Psf	K Lb/F	Weight Lb/F	Sag Ft	Tension Lb	RTS %	Sag Ft	Tension Lb	RTS %
25.	.00	8.00	.00	.493	11.34	2668.	18.4	11.17	2707.	18.7
60.	.00	23.00	.00	.924	15.31	3708.	25.6	15.31	3708.	25.6
25.	.00	.00	.00	.399	10.43	2347.	16.2	10.19	2402.	16.6
60.	.00	.00	.00	.399	11.62*	2106.	14.5	11.32	2161.	14.9
90.	.00	.00	.00	.399	12.64	1936.	13.4	12.30	1989.	13.7
120.	.00	.00	.00	.399	13.65	1794.	12.4	13.28	1844.	12.7
167.	.00	.00	.00	.399	15.18	1614.	11.1	14.78	1658.	11.4
212.	.00	.00	.00	.399	16.59	1478.	10.2	16.16	1516.	10.5

* Design Condition

Certain information such as the data, opinions or recommendations set forth herein or given by AFL representatives, is intended as a general guide only. Each installation of overhead electrical conductor, underground electrical conductor, and/or conductor accessories involves special conditions creating problems that require individual solutions and, therefore, the recipient of this information has the sole responsibility in connection with the use of the information. AFL does not assume any liability in connection with such information.

SAG AND TENSION DATA – HSS7-16

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Hydrogen Energy California (HECA)
Kern County, California

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FIGURE 4-5

Source:
Commonwealth Associates, Inc.

ALUMINUM COMPANY OF AMERICA SAG AND TENSION DATA

HEI TRANSMISSION LINE
230KV DOUBLE CIRCUIT TRANSMISSION LINE

OPGW Catalog #: GW4810 34/ 52 mm2/ 646

Area= .2208 Sq. In Dia= .646 In Wt= .422 Lb/F RTS= 18053 Lb
Data from Chart No. 1-1439
English Units

Span= 700.0 Feet Calif Light Load Zone
Creep is NOT a Factor

Design Points					Final			Initial		
Temp F	Ice In	Wind Psf	K Lb/F	Weight Lb/F	Sag Ft	Tension Lb	RTS %	Sag Ft	Tension Lb	RTS %
25.	.00	8.00	.00	.603	11.54	3204.	17.7	10.97	3371.	18.7
60.	.00	23.00	.00	1.308	17.03	4720.	26.1	17.03	4720.	26.1
25.	.00	.00	.00	.422	9.86	2624.	14.5	9.00	2874.	15.9
60.	.00	.00	.00	.422	11.62*	2228.	12.3	10.52	2459.	13.6
90.	.00	.00	.00	.422	13.14	1971.	10.9	11.91	2174.	12.0
120.	.00	.00	.00	.422	14.62	1772.	9.8	13.31	1945.	10.8
167.	.00	.00	.00	.422	16.83	1540.	8.5	15.48	1674.	9.3
212.	.00	.00	.00	.422	18.81	1380.	7.6	17.46	1485.	8.2

* Design Condition

Source:
Commonwealth Associates, Inc.

SAG AND TENSION DATA – GW4810

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Hydrogen Energy California (HECA)
Kern County, California

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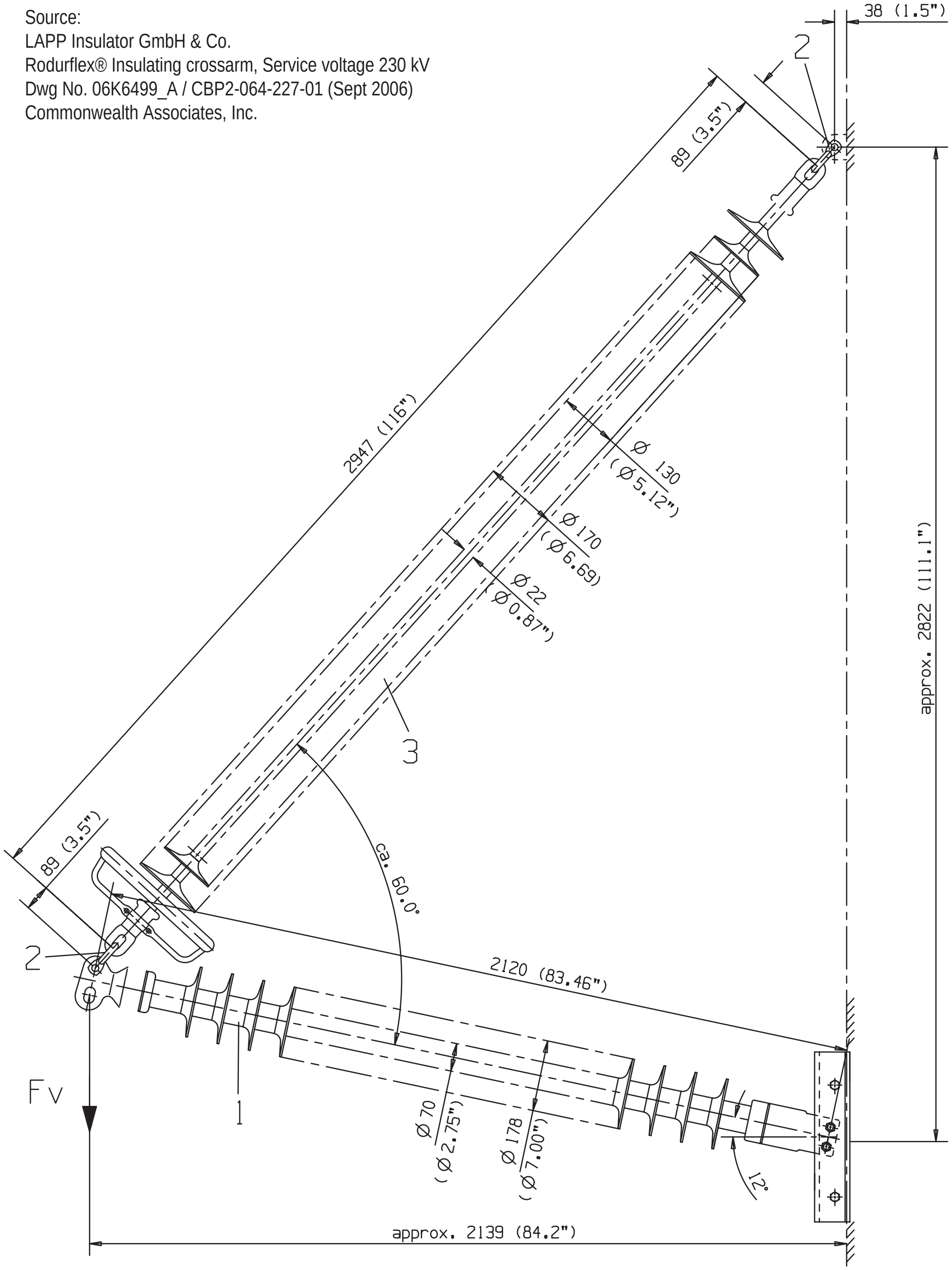
FIGURE 4-6

Source:
LAPP Insulator GmbH & Co.
Rodurflex® Insulating crossarm, Service voltage 230 kV
Dwg No. 06K6499_A / CBP2-064-227-01 (Sept 2006)
Commonwealth Associates, Inc.



Min. creepage distance		5770	mm (227.16 inch)
Min. mech. failing load, vertical Fv		90	kN (20250 lbs)
Maximum working load, vertical Fv (SF = 2.0)		45	kN (10125 lbs)
50% Lightning impulse flashover voltage, pos.	>	990	kV
50% Lightning impulse flashover voltage, neg.	>	1080	kV
Power frequency flashover voltage, wet	>	560	kV
Power frequency flashover voltage, dry	>	630	kV
Radio interference voltage measured at 141.45 kV at 1 MHz over 300 Ω resistor	≤	100	μV
Corona extinction voltage	>	163	kV
Weight approx.		57.7	kg (127.2 lbs)

Electrical tests in acc. with ANSI C29.1

This is a preliminary drawing.
Subject to change!

RODURFLEX INSULATING CROSSARM

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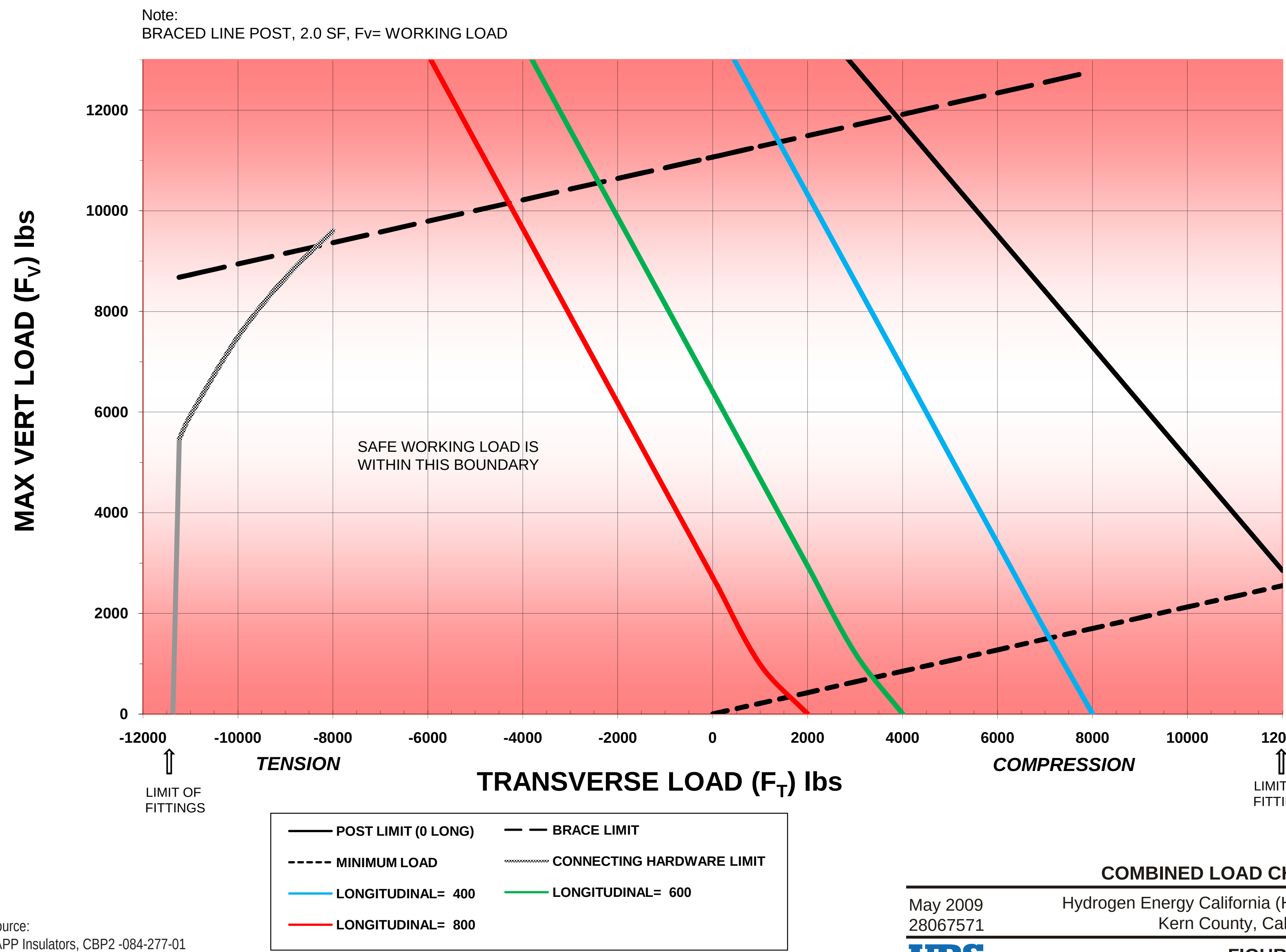
Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 4-7

5/22/09 vsa..T:\HECA\GRAPHICS\4.0 Elec Trans\4-7_rodurflex.ai



Source:
LAPP Insulators, CBP2 -084-277-01
Commonwealth Associates, Inc.

COMBINED LOAD CHART

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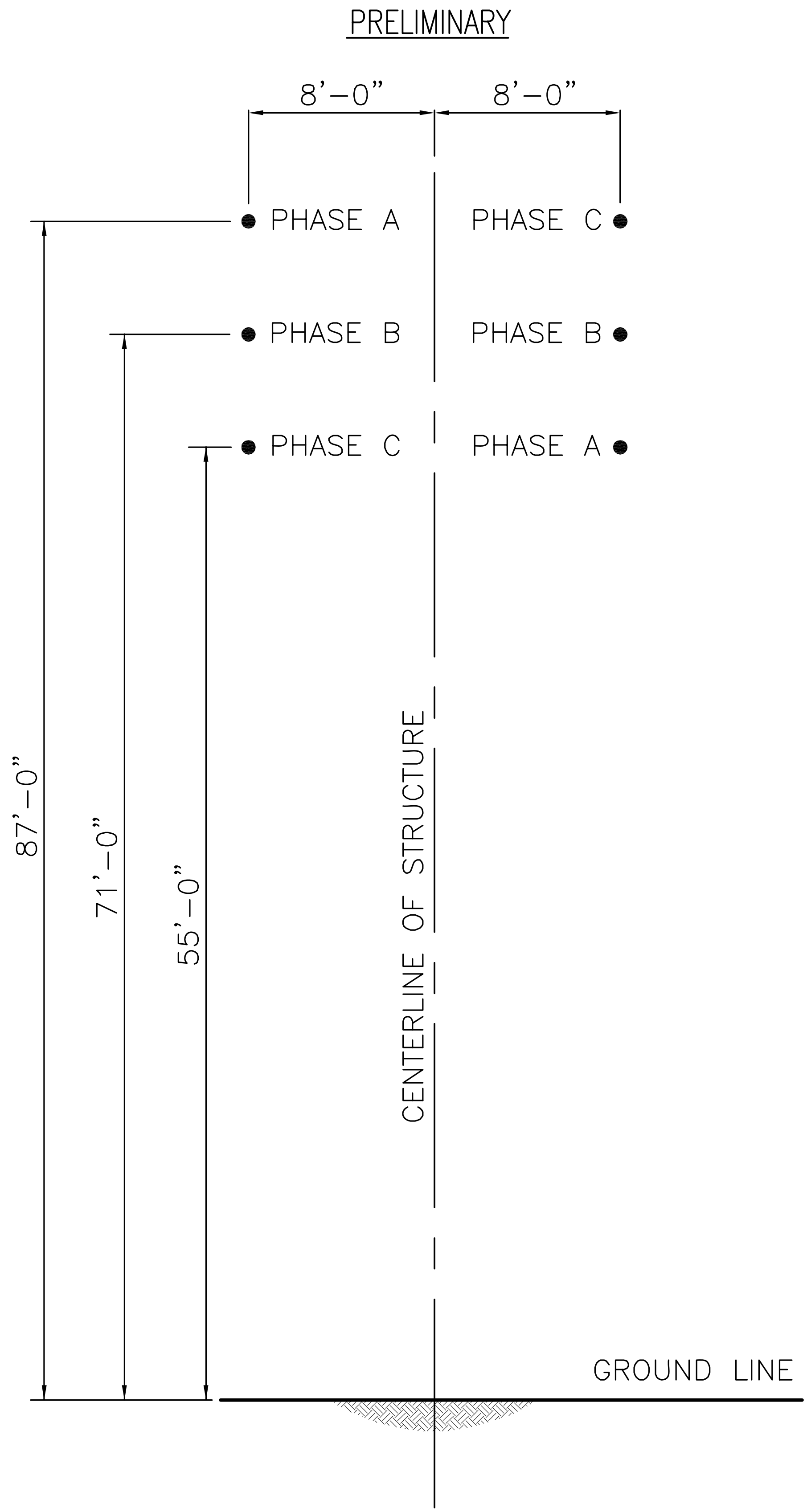
Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 4-8

5/15/09 vsa/hk..T:\HECA\GRAPHICS\4.0 Elec Trans\4-8_combined load.ai



Source:
Commonwealth Associates, Inc. (CAI);
Hydrogen Energy International, HECA Project, 230kV Transmission Line;
Conductor Location Diagram (Sh. 1), May 2008

CONDUCTOR LOCATION DIAGRAM

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Hydrogen Energy California (HECA)
Kern County, California

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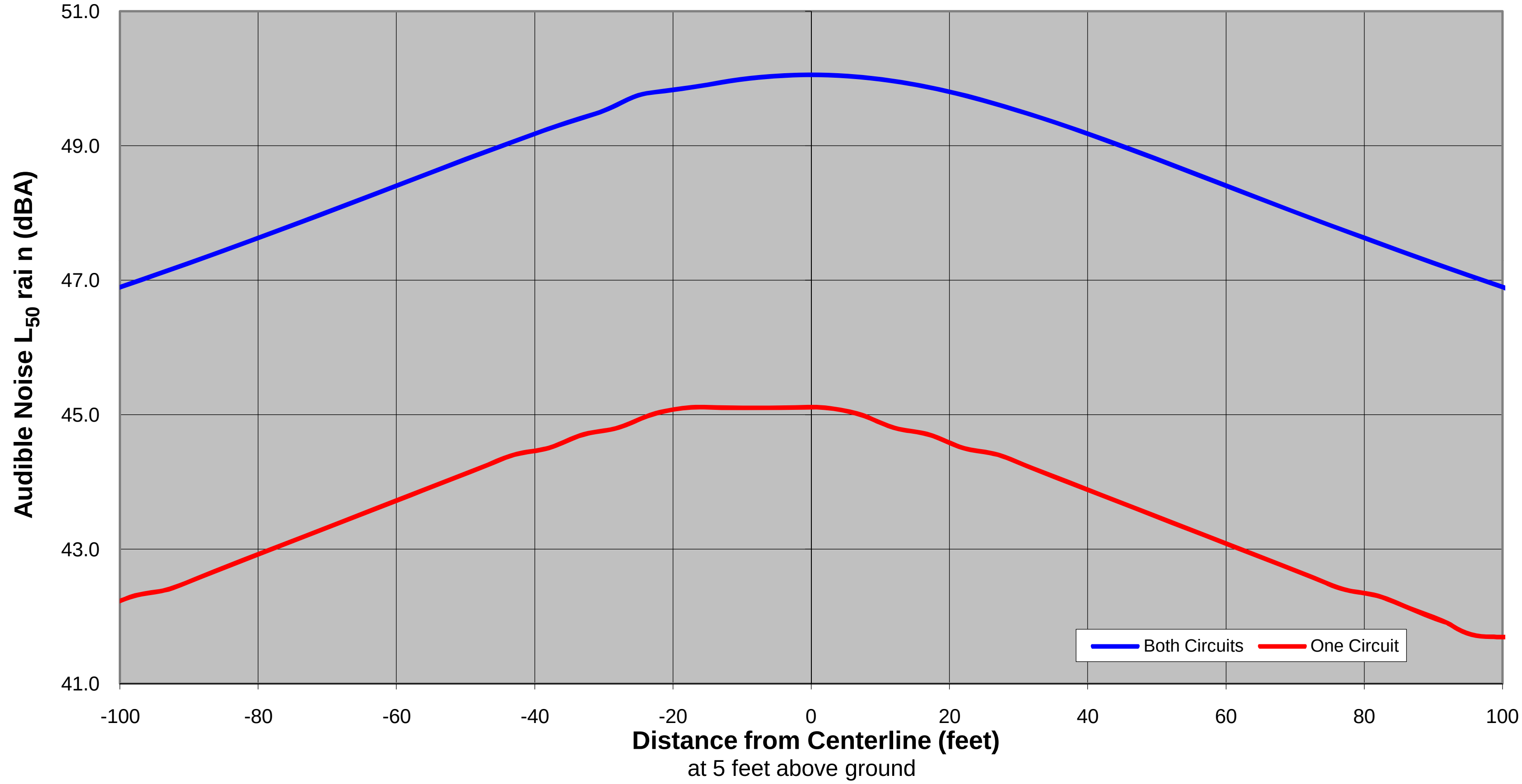
FIGURE 4-9



Source:
Commonwealth Associates, Inc.

AUDIBLE NOISE

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Hydrogen Energy California (HECA)
Kern County, California

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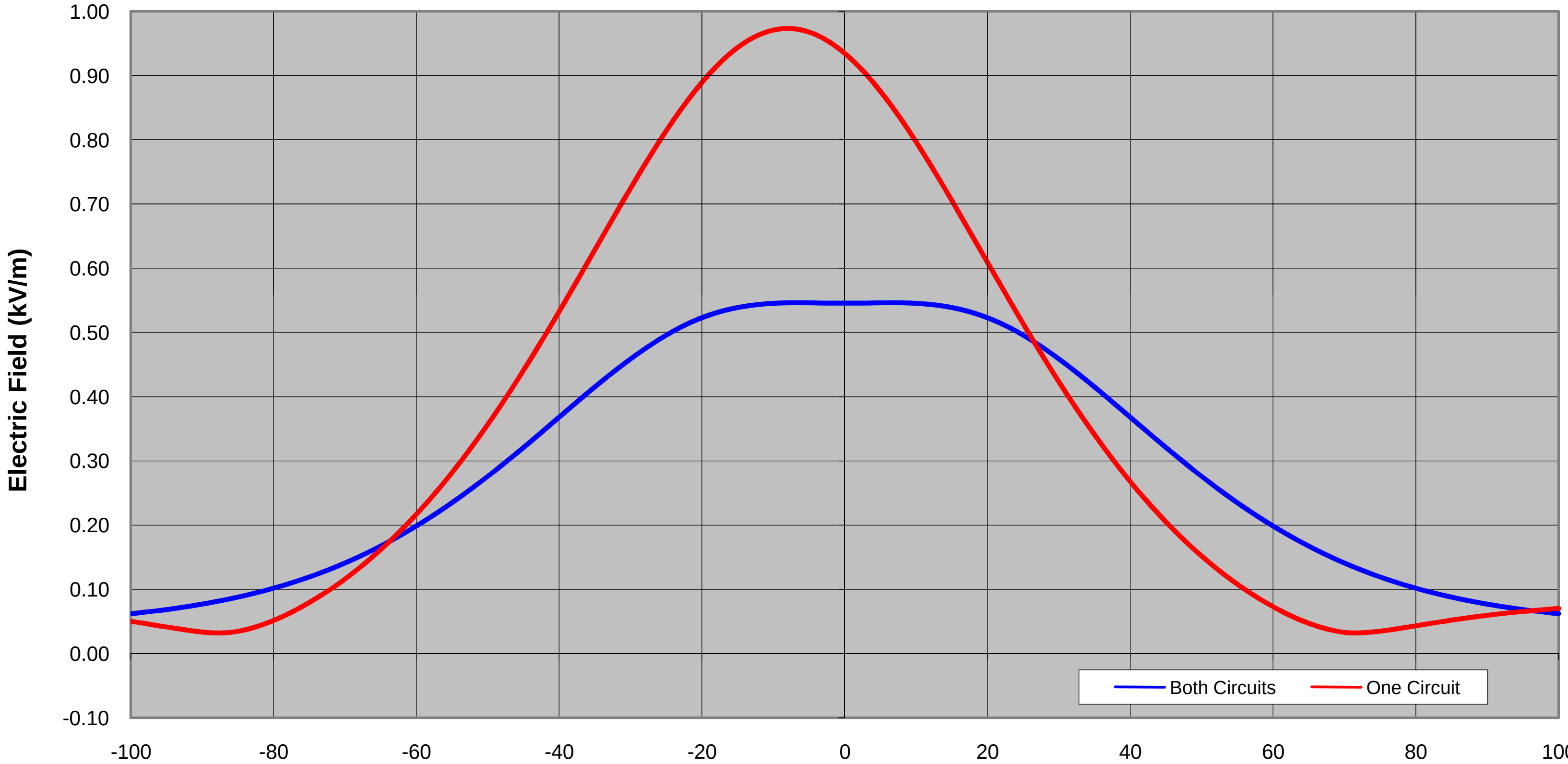
FIGURE 4-10

5/15/09 vsa/hk..T:\HECA\GRAPHICS\4.0 Elec Trans\4-10_audible.ai



Distance from Centerline (feet)
at one meter above ground

ELECTRIC FIELD

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Hydrogen Energy California (HECA)
Kern County, California

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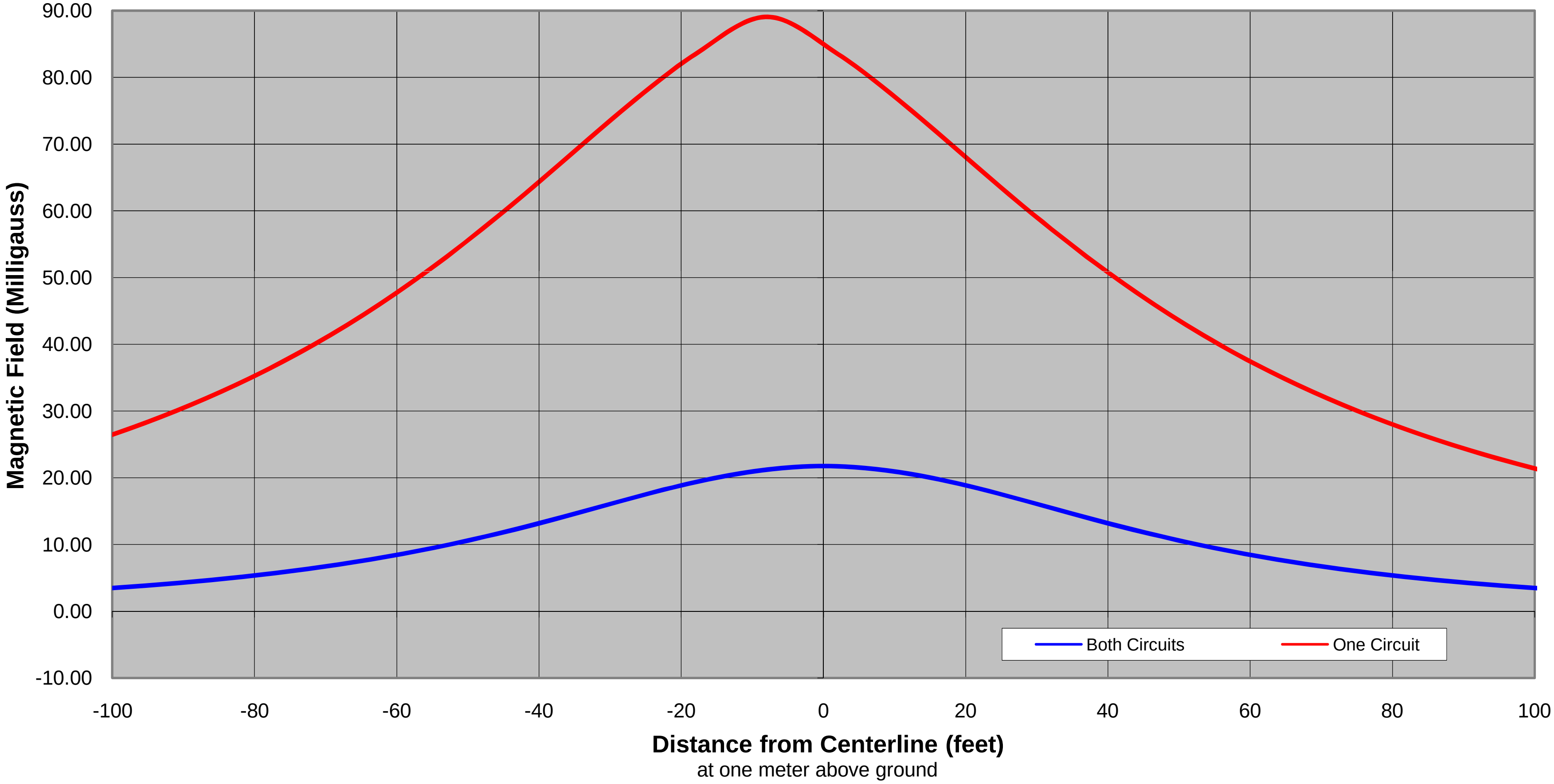
FIGURE 4-11

Source:
Commonwealth Associates, Inc.

5/15/09 vsa/hk..T:\HECA\GRAPHICS\4.0 Elec Trans\4-11_electric.ai



Source:
Commonwealth Associates, Inc.

MAGNETIC FIELD

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Kern County, California

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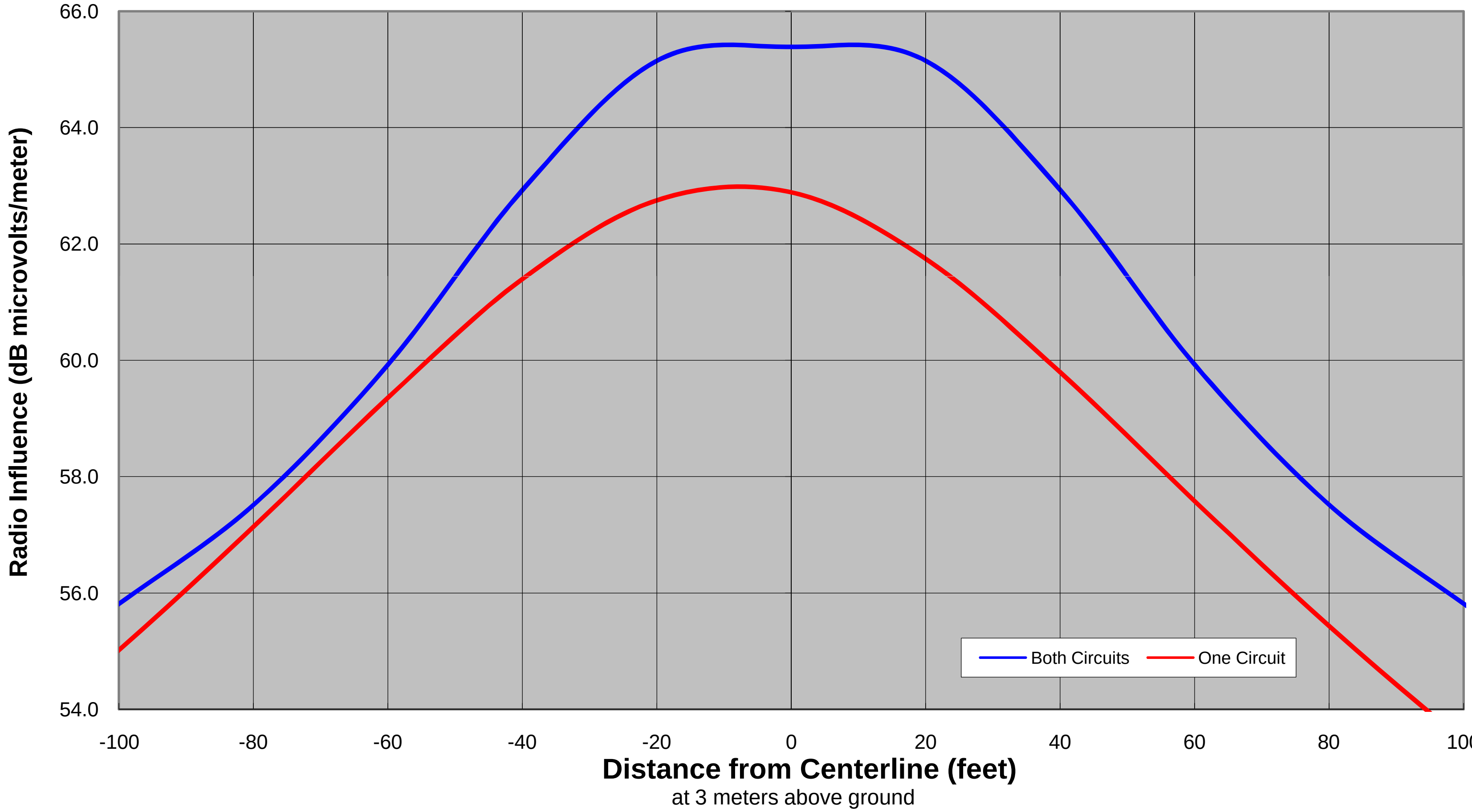
FIGURE 4-12



RADIO INFLUENCE AT 1,000 kHz

May 2009
28067571

Hydrogen Energy California (HECA)
Kern County, California

URS

FIGURE 4-13

Source:
Commonwealth Associates, Inc.

Adequacy Issue:	Adequate ____	Inadequate ____	DATA ADEQUACY WORKSHEET	Revision No. 0	Date ____
Technical Area:	**Trans Line Safety & Nuisance**		Project: ____	Technical Staff: ____	
Project Manager:	____		Docket: ____	Technical Senior: ____	

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (g) (1)	...provide a discussion of the existing site conditions, the expected direct, indirect and cumulative impacts due to the construction, operation and maintenance of the project, the measures proposed to mitigate adverse environmental impacts of the project, the effectiveness of the proposed measures, and any monitoring plans proposed to verify the effectiveness of the mitigation.	Section 4.0, p. 4-1		
Appendix B (g) (18) (A)	The locations and a description of the existing switchyards and overhead and underground transmission lines that would be affected by the proposed project.	Section 4.1, p. 4-1 Section 4.3, p. 4-1		
Appendix B (g) (18) (B)	An estimate of the existing electric and magnetic fields from the facilities listed in (A) above and the future electric and magnetic fields that would be created by the proposed project, calculated at the property boundary of the site and at the edge of the rights of way for any transmission line. Also provide an estimate of the radio and television interference that could result from the project.	Section 4.9, p. 4-8		
Appendix B (g) (18) (C)	Specific measures proposed to mitigate identified impacts, including a description of measures proposed to eliminate or reduce radio and television interference, and all measures taken to reduce electric and magnetic field levels.	Section 4.9.2, p. 4-10		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Trans Line Safety & Nuisance** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

SITING REGULATIONS	INFORMATION	AFC PAGE NUMBER AND SECTION NUMBER	ADEQUATE YES OR NO	INFORMATION REQUIRED TO MAKE AFC CONFORM WITH REGULATIONS
Appendix B (i) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed; and	Section 4.12, p. 4-14 Table 4-12, p. 4-14 Table 4-13, p. 4-15 Table 4-14, p. 4-16 Table 4-15, p. 4-16 Table 4-16, p. 4-17 Table 4-17, p. 4-17		
Appendix B (i) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	Table 4-18, p. 4-18		
Appendix B (i) (2)	The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.	Table 4-18, p. 4-18		
Appendix B (i) (3)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.	N/A		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Transmission System Design** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

Siting Regulations	**Information**	**AFC Page Number And Section Number**	**Adequate Yes Or No**	**Information Required To Make AFC Conform With Regulations**
Appendix B (h) (2) (A)	A discussion of the need for the additional electric transmission lines, substations, or other equipment, the basis for selecting principal points of junction with the existing electric transmission system, and the capacity and voltage levels of the proposed lines, along with the basis for selection of the capacity and voltage levels.	Section 2.1, p. 2-1 Section 4.1, p. 4-1 Section 4.2, p. 4-1		
Appendix B (h) (2) (B)	A discussion of the extent to which the proposed electric transmission facilities have been designed, planned, and routed to meet the transmission requirements created by additional generating facilities planned by the applicant or any other entity.	Section 4.1, p. 4-1 Section 4.2, p. 4-1		

Adequacy Issue:	Adequate ____	Inadequate ____	DATA ADEQUACY WORKSHEET	Revision No. 0	Date ____
Technical Area:	**Transmission System Design**		Project: ____	Technical Staff:	____
Project Manager:	____		Docket: ____	Technical Senior:	____

Siting Regulations	Information	AFC Page Number And Section Number	Adequate Yes Or No	Information Required To Make AFC Conform With Regulations
Appendix B (b) (2) (C)	A detailed description of the design, construction, and operation of any electric transmission facilities, such as power lines, substations, switchyards, or other transmission equipment, which will be constructed or modified to transmit electrical power from the proposed power plant to the load centers to be served by the facility. Such description shall include the width of rights of way and the physical and electrical characteristics of electrical transmission facilities such as towers, conductors, and insulators. This description shall include power load flow diagrams which demonstrate conformance or nonconformance with utility reliability and planning criteria at the time the facility is expected to be placed in operation and five years thereafter; and	Section 4.3, p. 4-2 Section 4.4, p. 4-3 Section 4.5, p. 4-4 Section 4.6, p. 4-5 Section 4.7, p. 4-6 Section 4.8, p. 4-6 Appendix A Figures 4.4-1, 4.5-1, 4.5-2, 2-19, 2-20, 2-21, 2-22		
Appendix B (b) (2) (D)	A description of how the route and additional transmission facilities were selected, and the consideration given to engineering constraints, environmental impacts, resource conveyance constraints, and electric transmission constraints.	Section 4.2, p. 4-1 Figure 4.2-1		

Adequacy Issue:	Adequate ____	Inadequate ____	DATA ADEQUACY WORKSHEET	Revision No. 0	Date ____
Technical Area:	**Transmission System Design**		Project: ____	Technical Staff: ____	
Project Manager: ____			Docket: ____	Technical Senior: ____	

Siting Regulations	Information	AFC Page Number And Section Number	Adequate Yes Or No	Information Required To Make AFC Conform With Regulations
Appendix B (b) (2) (E)	A completed System Impact Study or signed System Impact Study Agreement with the California Independent System Operator and proof of payment. When not connecting to the California Independent System Operator controlled grid, provide the executed System Impact Study agreement and proof of payment to the interconnecting utility. If the interconnection and operation of the proposed project will likely impact an transmission system that is not controlled by the interconnecting utility (or California Independent System Operator), provide evidence of a System Impact Study or agreement and proof of payment (when applicable) with/to the impacted transmission owner or provide evidence that there are no system impacts requiring mitigation.	Appendix A		
Appendix B (i) (1) (A)	Tables which identify laws, regulations, ordinances, standards, adopted local, regional, state, and federal land use plans, leases, and permits applicable to the proposed project, and a discussion of the applicability of, and conformance with each. The table or matrix shall explicitly reference pages in the application wherein conformance, with each law or standard during both construction and operation of the facility is discussed; and	Section 4.12, p. 4-14		

Adequacy Issue: Adequate ____ Inadequate ____

DATA ADEQUACY WORKSHEET

Revision No. 0 Date ____

Technical Area: **Transmission System Design** Project: ____ Technical Staff: ____

Project Manager: ____ Docket: ____ Technical Senior: ____

Siting Regulations	Information	AFC Page Number And Section Number	Adequate Yes Or No	Information Required To Make AFC Conform With Regulations
Appendix B (i) (1) (B)	Tables which identify each agency with jurisdiction to issue applicable permits, leases, and approvals or to enforce identified laws, regulations, standards, and adopted local, regional, state and federal land use plans, and agencies which would have permit approval or enforcement authority, but for the exclusive authority of the commission to certify sites and related facilities.	Table 4-12, p. 4-14 Table 4-13, p. 4-15 Table 4-14, p. 4-16 Table 4-15, p. 4-17 Table 4-16, p. 4-17 Table 4-17, p. 4-17		
Appendix B (i) (2)	The name, title, phone number, address (required), and email address (if known), of an official who was contacted within each agency, and also provide the name of the official who will serve as a contact person for Commission staff.	Table 4-18, p. 4-18		
Appendix B (i) (3)	A schedule indicating when permits outside the authority of the commission will be obtained and the steps the applicant has taken or plans to take to obtain such permits.	N/A		