APPENDIX G

ELECTRIC AND MAGNETIC FIELDS MANAGEMENT PLAN FOR TALEGA–ESCONDIDO/VALLEY–SERRANO 500 kV INTERCONNECT PROJECT

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The Nevada Hydro Company ("TNHC") is proposing to construct a new 32–mile, 500 kilovolt ("kV") alternating current regional interconnection that would link Southern California Edison's ("SCE's") Valley-Serrano 500-kV transmission line in western Riverside County with San Diego Gas & Electric Company's (SDG&E's) 230-kV Talega-Escondido transmission line in northern San Diego County. Confirmed impact and facility studies on operation of the proposed line would require upgrades be made to some of SCE's and SDG&E's electrical transmission facilities in California. The proposed line and transmission facility upgrades are known as Talega–Escondido/Valley–Serrano 500 kV Interconnect ("TE/VS") Project.

1.0 BACKGROUND

1.1 The California Public Utilities Commission

The Commission's General Order 131–D, Section X, addresses "Potential Exposure to Electric and Magnetic Fields (EMF)" and requires applicants for a CPCN to "describe the measures taken or proposed by the utility to reduce the potential exposure to electric and magnetic fields generated by the proposed facilities."

In the Final Environmental Impact Report ("FEIR") issued for SCE's Devers–Palo Verde No. 2 transmission line project, the FEIR characterizes the issue as follows:[1]

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[1]/ At Section ES–3

Recognizing that there is a great deal of public interest and concern regarding potential health effects from exposure to electric and magnetic fields (EMFs) from power lines, the EIR/EIS provides information regarding EMF associated with electric utility facilities and the potential effects of the Proposed Project related to public health and safety. Potential health effects from exposure to electric fields from power lines (effect produced by the existence of an electric charge, such as an electron, ion, or proton, in the volume of space or medium that surrounds it) are typically not of concern since electric fields are effectively shielded by materials such as trees, walls, etc., therefore, the majority of the following information related to EMF focuses primarily on exposure to magnetic fields (invisible fields created by moving charges) from power lines. However, the EIR/EIS does not consider magnetic fields in the context of CEQA or NEPA and determination of environmental impact. This is because (a) there is no agreement among scientists that EMF does create a potential health risk, and (b) there are no defined or adopted CEQA or NEPA standards for defining health risk from EMF. As a result, EMF information is presented for the benefit of the public and decision-makers.

After several decades of study regarding potential public health risks from exposure to power line EMF, research results remains inconclusive. Several national and international panels have conducted reviews of data from multiple studies and state that there is not sufficient evidence to conclude that EMF causes cancer. Most recently the International Agency for Research on Cancer (IARC) and the California Department of Health Services (DHS) both classified EMF as a possible carcinogen. The information included in EIR quantifies existing EMF exposures within the community — these exposures are widespread and cover a very broad range of field intensities and duration.

Presently there are no applicable regulations related to EMF levels from power lines. However, the California Public Utilities Commission has implemented a decision (D.93-11-013) requiring utilities to incorporate "low-cost" or "no-cost" measures for managing EMF from power lines up to approximately 4 percent of total project cost. Using the 4 percent benchmark, SCE has incorporated low-cost and no-cost measures to reduce magnetic field levels near schools along the proposed route (including deeper burial of underground lines combining several existing 230 kV circuits onto double-circuit transmission line structures and changing phase configuration). There are additional potential measures for reducing magnetic fields, mostly beyond the no-cost/low-cost parameters (including increasing distance from conductors, reducing conductor spacing, converting single-phase to split-phase circuits, or placing proposed transmission lines underground and minimizing current), which are described for the benefit of the public and decision-makers in reviewing the Proposed Project.

Most recently the CPUC issued Decision D.06-01-042, on January 26, 2006, affirming the low-cost/no-cost policy to mitigate EMF exposure from new utility transmission and substation projects. This decision also adopted rules and policies to improve utility design guidelines for reducing EMF. The CPUC stated "at this time we are unable to determine whether there is a significant scientifically verifiable relationship between EMF exposure and negative health consequences." The CPUC has not adopted any specific limits or regulation on EMF levels related to electric power facilities.

1.2 The FERC's View

In the Final Environmental Impact Statement ("FEIS") for the project,[2] FERC stated the following, relative to EMF:

Some studies, while inconclusive, have purported to find a positive relationship between electromagnetic fields and certain diseases or conditions in animals, including humans (World Health Organization, 2002). However, studies conducted by the National Research Council, Commission on Life Sciences (1997), National Institute of Environmental Health Sciences (NIEHS, 1998) and Department of Health Services (DHS) (2002), among others, had equally inconclusive findings, which led the U.S. Department of the Interior (2003) to state, "~~[~~t~~]~~here is a consensus among the medical and scientific communities that there is insufficient evidence to conclude EMF causes adverse health effects."

Regardless of these findings, which indicate a lack of evident harm not only to people but to animals and plants as well, the World Health Organization (WHO) has stated that there is "sufficient evidence" to apply a "precautionary principle" to both power and high-frequency electromagnetic fields to help protect from uncertain risks. WHO supported its position by stating:

> *'…If the risk is eventually found not to exist, it may be that any measures undertaken will not have protected health and some resources will have been spent unnecessarily. However, this outcome is often more acceptable than one where public health measures were delayed or neglected because a risk was thought not to exist, but was eventually shown to be both real and substantial.'*

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[2]/ Final Environmental Impact Statement for Hydropower License – Lake Elsinore Advanced Pumped Storage Project, FERC Project No. 11858, FERC/EIS-0191F

To provide additional context for our evaluation of potential EMF effects from the co-applicants' proposed and staff transmission lines, we reviewed many documents concerning EMF effects. The following points, summarized from the draft EIR/EIS prepared for Southern California Edison's proposed Antelope-Pardee 500-kV Transmission Project (CPUC/USFS, 2006) provide some useful perspective for our analysis:

• The International Radiation Protection Association, in cooperation with the World Health Organization, has published recommended guidelines for magnetic field exposure that would limit the general public to exposures less that 833 mG.

• A 1999 report to Congress by the National Institute of Environmental Health Sciences suggested the evidence supporting EMF exposure as a health hazard was insufficient to warrant aggressive regulatory action. The report suggested the power industry continue its practice of siting lines to reduce public exposure to EMF and to explore ways to reduce the creation of magnetic fields around lines.

• Florida and New York, the only states that currently limit the intensity of magnetic fields from transmission lines, limit magnetic fields to 200 to 250 mG at the edge of the right-of-way. The magnetic field limits were based on an objective of preventing field levels from increasing beyond levels currently experienced by the public and were not based upon any link between scientific data and health risks (Morgan, 1991, as cited in CPUC/USFS, 2006)

• Several agencies and municipalities have adopted a concept of "prudent avoidance", which has been defined as "…limiting exposures which can be avoided with small investments of money and effort." (Morgan, 1991, as cited in CPUC/USFS, 2006)

• In January 1991, the California Public Utility Commission began an investigation of the potential health effects that their electric utility power lines might cause by generating EMFs. The study considered potential health effects that included childhood cancer and chronic lymphocytic leukemia. The study also explored potential mitigation measures for reducing potential public health impacts. Following input from interested parties, the California Public Utility Commission implemented a decision that requires that utilities use "low-cost" or "no cost" mitigation measures for facilities requiring certification under General Order 131-D. The California Public Utility Commission did not adopt any specific numerical limits or regulation on EMF levels related to electric power facilities.

• In January 2006, the California Public Utility Commission issued Decision D.06 01 042, which affirmed the low-cost/no-cost policy. The

decision stated that "at this time we are unable to determine whether there is a significant scientifically verifiable relationship between EMF exposure and negative health consequences."

• Research on ambient magnetic fields in homes and buildings found average magnetic field levels within most rooms of about 1mG, while in rooms with appliances present, the measured values ranged from 9 to 20 mG (Severson et al. 1988 and Silva, 1988, as cited in CPUC/USFS, 2006). Typical magnetic fields measured within 12 inches of household appliances range from less than 1mG to 250 mG, with maximum strengths of up to 20,000 mG from common appliances such as can openers and hair dryers (Gauger, 1985, in CPUC/USFS, 2006).

• Measurements of ambient magnetic field strengths associated with the proposed Antelope-Pardee 500-kV line found pre-project field strengths at the edge of the right-of-way to be 0 to 12.5 mG, while model estimates of post-project field strengths ranged from about 2 to 23 mG. In undeveloped areas with no existing transmission or electrical distribution lines, the increase associated with the project was generally in the range of 14 to 18 mG. In more developed areas where the proposed line would share right-of-way with existing lines, the change ranged from 0.2 mG to -11.7 mG.

Based on the foregoing information and analysis, the California Public Utility Commission and USFS determined that EMFs from the proposed Antelope-Pardee 500-kV transmission line would have no effect.[3]

2.0 TNHC's EMF POLICY

TNHC is aware of the public's concerns about the potential health effects of power-frequency electric and magnetic fields. Notwithstanding the health, safety, and economic benefits of electricity, TNHC recognizes and takes seriously its responsibility to address these EMF concerns. In order to understand fully electric and magnetic fields and to respond to the current uncertainty, TNHC will continue to:

- Assist the CPUC and other appropriate local, state, and federal governmental agencies in the development and implementation of reasonable, uniform regulatory guidance.

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[3]/ Ibid., at page 3–204 et. seq.

- Provide balanced, accurate information to employees, and public agencies, including providing EMF measurements and consultation as required.
- Take appropriate "no-cost and low-cost" steps to minimize field exposures from facilities.

2.1 Transmission and Subtransmission Design with Magnetic Reduction

TNHC and its contractor, Siemens Power, Transmission and Distribution have adopted as "best accepted practices", the methods and techniques used by SCE in their "EMF Design Guidelines for New Electrical Facilities: Transmission, Substation, Distribution" manual.[4] Using these guidelines, "no-and low-cost" measures to reduce fields will be implemented wherever available and practical in accordance with the 1993 CPUC Decision. The criteria will be based on the following processes, recommendations and assumptions.

Priority in the design of any electrical facility is public and employee safety. Without exception, design and construction of an electric power system must comply with all federal, state, and local regulations, applicable safety codes, and state utility construction standards. Furthermore, power lines and substations must be constructed so that they can operate reliably at their design capacity. Their design must be compatible with other facilities in the area. The cost to operate and maintain the facilities must be reasonable. These, and other requirements, are included in the existing CPUC regulations. As a supplement to this, the CPUC directed all investor-owned utilities in the state to take "no-cost and low-cost" magnetic field reduction measures for new and upgraded electrical facilities (1993 CPUC Decision). Any possible "no-cost and low-cost" magnetic field measures, therefore, must meet these requirements.

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[4]/ *EMF Design Guidelines for New Electrical Facilities; Transmission, Subtransmission, Distribution,* Southern California Edison, December 2003.

TNHC defines “no-cost and low-cost” magnetic field reduction measures as follows:

- “No-cost” measures include any design changes that reduce the magnetic field in public areas without increasing the overall project cost; and
- “Low-cost” measures are those steps taken to reduce magnetic field levels at reasonable cost. The 1993 CPUC Decision states:

> *"We direct the utilities to use 4 percent as a benchmark in developing their EMF mitigation guidelines. We will not establish 4 percent as an absolute cap at this time because we do not want to arbitrarily eliminate a potential measure that might be available but costs more than the 4 percent figure. Conversely, the utilities are encouraged to use effective measures that cost less than 4 percent.”*

The CPUC agreed that a “low-cost” measure should achieve some noticeable reduction, but declined to specify any numeric value.

TNHC’s transmission line, utilizing Siemens state-of-the-art technology will be used to engineer, design and construct the TE/VS Interconnect project which will ultimately take into account all EMF reduction measures as well as other safety and operational concerns to be implemented in final design.

TNHC is using state-of-the-art technology called Gas – Insulated Switchgear (“GIS”) and Gas – Insulated Transmission Line (“GIL”) coupled with Siemens concept of Flexible AC Transmission Systems (“FACTS”) to engineer, design, install and construct “world class” transmission line with a truly remarkable performance. FACTS provides fast voltage regulation, increased power transfer over long AC lines, dampening of active power oscillations and load flow control in meshed systems. The TE/VS Project will be the first transmission line in the United States to run GIL for approximately 2 - 3 miles underground. GIL results in much smaller electromagnetic fields than with conventional power transmission systems. In fact, this technology can be used close to

telecommunications equipment, hospitals, residential areas or flight monitoring systems and similar as it meets the most stringent magnetic flux density requirements, for example the Swiss limit of 1 microtesla.

3.0 TE/VS INTERCONNECT PROJECT

3.1 Project Description

The TE/VS Interconnect is a proposed approximately 30–mile, 500 kilovolt ("kV") alternating current regional interconnection that would link Southern California Edison's (SCE's) Valley-Serrano 500-kV transmission line in western Riverside County with San Diego Gas & Electric Company's (SDG&E's) 230-kV Talega-Escondido transmission line in northern San Diego County. The TE/VS Interconnect would connect between SCE's existing Valley and Serrano substations at a new substation to be constructed at Lee Lake, with a new substation to be constructed between SDG&E's existing Talega and Escondido line near Camp Pendleton, California, located approximately 9 miles west of the location of the proposed Valley-Rainbow project proposed by SDG&E. For most of its route alignment, the TE/VS Interconnect would be located within the Trabuco Ranger District of the Cleveland National Forest. The estimated cost of constructing the TE/VS Interconnect for an operating date of late 2009, including the upgrades and other project elements described in this application, is $350 million (2007 dollars and excluding Allowance for Funds Used During Construction) ("AFUDC")). This cost-estimate may change due to permitting and environmental requirements, final design criteria, and changes in the project start date, inflation and deflation factors, and unforeseen events.

TNHC and SPTD engineers considered magnetic field reduction measures early in the design phase for this project. Therefore, the total project cost includes "low-cost" field reduction options incorporated in the project design.

3.2 Alternatives to Proposed Project

Alternatives to the TE/VS Interconnect were considered as part of the Federal licensing process. The USFS required consideration of the use of “non–public lands” before accepting an application. The main private routes under consideration at that time were those routing alternatives associated with SDG&E’s proposed Valley–Rainbow project. In addition, a number of alternative routings were considered by the USFS before selecting the current route. Because one of the purposes for the project is to connect the LEAPS project to the grid, the TE/VS interconnect needed to be adjacent to that facility’s proposed site.

In addition, TNHC proposed to the FERC number of alternative end points and routings. These included different locations for the northern and southern substations, and different routes through the Cleveland National Forest. After extensive analysis and public input, FERC and the USFS selected the current project routing.

TNHC is also working with SCE to provide a number of 115 kV connections at the northern (Lee Lake) substation as SCE firmly believes this will save it both time and money to enhance the local distribution system.

4.0 EFFECTS OF TE/VS INTERCONNECT OPERATION ON EMF

The project proposes to place some sections of the transmission line underground, which has the effect of reducing EMF exposure in those areas because of magnetic field cancellation. Also, the very fact that TNHC is utilizing Siemens FACTS, as noted above,

results in better technology for deterring EMF fields and ultimately exposure due to operations.

Operation of the proposed project would contain several elements that would generate EMFs, including the substation at the Santa Rosa site, the transmission line along the northern and southern segments of the proposed transmission alignment, and the proposed substations along the proposed transmission alignment. The EMF strengths that would be generated would be typical for similar generation and transmission facilities.

However, because the literature to date provides little evidence supporting the contention that EMFs from high-voltage transmission lines have adverse effects on wildlife, plants, or humans, TNHC and the FERC[5] expect that there would be no adverse effects associated with the EMF intensities at the proposed transmission alignment.

[5]/ Project FEIS at page 3–207.