BEFORE THE PUBLIC UTILITIES COMMISSION OF THE STATE OF CALIFORNIA

In the Matter of the Application of SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E) for a Certificate of Public Convenience and Necessity Concerning the Devers-Palo Verde No. 2 Transmission Line Project	)))))))	Application No. __________ (Filed April 5, 2005)

APPLICATION OF SOUTHERN CALIFORNIA EDISON COMPANY (U 338-E) FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY TO CONSTRUCT THE DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

APPENDICES

Dated: April 5, 2005

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Appendix A

PROJECT PLAN FOR

DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

APPENDIX A

PROJECT PLAN
FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

1.0 INTRODUCTION

This document is a part of Southern California Edison Company's ("SCE") Devers-Palo Verde No. 2 Transmission Line Project ("DPV2") application for a Certificate of Public Convenience and Necessity ("CPCN") to the California Public Utilities Commission ("CPUC"). Contained in this document are the materials required by California Public Utilities ("Pub. Util.") Code §1003 or references to where the materials may be found elsewhere in the application.

The "preliminary engineering and design information" required by Pub. Util. Code §1003(a) may be found in the project Proponent's Environmental Assessment ("PEA"), Chapter 3, "Project Description", submitted with the DPV2 project application.

2.0 PROJECT IMPLEMENTATION PLAN

2.1 Introduction

DPV2 will be managed on a Project Management matrix basis. The Project Manger ("PM") will be responsible to the Project Management Director for the completion of work in accordance with this plan. The Project Management Team ("PMT") will be identified early in the project development process to support the preparation and development of documents used in project licensing filings. Because of the large scope and cost of this project and the required construction period, major procurement will not begin until regulatory approval is received. Extensive support will be required at the start of final engineering and will continue through the end of the project. Construction can begin after regulatory approval. In addition, any required permits identified in the regulatory approval process, must be obtained before construction can begin in the affected areas.

2.2 Project Management Team

The PM has the overall responsibility and commensurate authority for successful completion of the project. Responsibilities include: planning, obtaining regulatory approvals, cost, scheduling and the overall quality of the project. Project work will be conducted using a matrix-based Project Management model. All personnel assigned to the project functionally report to the PM.

During the life of the project, the PMT will consist of a number of specialized teams and support personnel with special areas of expertise. Because of the changing nature of the needs as the project progresses through the project development, regulatory approval and construction phases, the PMT will also change to meet the project needs.

For example, during the project development and regulatory approval phase, all of the individuals and organizations listed below are involved. During the project design and construction phase, the PMT consists of: PM, Project Engineer, Construction Superintendent, Project Controls Engineer, Project Analyst, and Project Licensing Engineer. Representatives from other SCE organizations will be utilized as required. The PM is responsible for managing the activities of SCE team members as well as outside contractors.

The PMT is responsible for the successful implementation of DPV2. It is responsible for tracking costs, scope changes, schedules, and construction performance. The PMT will have regular meetings to discuss project status, review performance, and identify any special needs or significant concerns.

Roles and Responsibilities of the individual PMT members or their organizations

- Project Manager-SCE's project representative, and is responsible for the execution of work in accordance with the Project Plan, specifications, purchase orders, third-party contracts, and all codes and regulatory requirements. The PM reviews and evaluates bids and makes awards or award recommendations, reviews and evaluates all major equipment design, purchases and requests for engineering and/or construction field change orders, including schedule changes. The PM also reviews and approves all requests for invoice payments.
- Project Engineer-Reports functionally to the PM and is responsible for providing project design criteria, scope of work, technical specifications and the conduct of all engineering services. The Project Engineer oversees all engineering activities for the Project and provides the technical interface with SCE technical organizations.
- Project Analyst-Reports to the PM and is responsible for: providing administrative support to the PMT; creation and maintenance of a file(s) containing key project documentation; and communicating, implementing, and coordinating acquisition of ministerial permits.
- Project Licensing Engineer-Reports functionally to the PM and is responsible for planning and coordinating all SCE activities necessary to obtain the regulatory approvals required to license the project. Specific responsibilities include identifying the applicable regulatory agency approvals required for a project, overseeing the preparation of the regulatory applications and environmental documentation, coordinating the project's participation in the agency's regulatory processes, and ensuring that necessary licensing and regulatory approvals are obtained in a timely manner.

- Project Controls Engineer-Reports functionally to the PM and is responsible for the administration and reporting for all project controls related to scope, cost, schedule, and change control. Major responsibilities include:
  1. Task authorization administration (opening, monitoring, closure of accounts);
  2. Compliance with reporting standards using: templates, trend system, scheduling systems, and other Project Controls System ("PCS") tools;
  3. Production of periodic cost/schedule (status, variance, and earned value) reports; and
  4. Management of financial/accounting closure of project in accordance with corporate and regulatory requirements.
- Construction Manager-Reports functionally to the PM and provides construction management of all construction, startup, and testing work performed. Specific responsibilities include construction plan and schedule development, constructability review of engineering designs, construction procurement and quality control, construction safety, environmental compliance, and safety and security.

Supporting Organizations

- Environmental Affairs-Responsible for coordinating environmental assessments, including preparation of the PEA, lead responsibility for all project environmental issues and resource agency contacts on environmental matters.
- Corporate Real Estate-Lead responsibility for all property rights acquisitions, providing the project with property data, and providing survey and mapping support to the project. Serves as the primary interface with governmental agencies that manage or own lands over property for which property rights are required for the project.
- Law-Responsible for the preparation of the application for a CPCN to the CPUC, review of the PEA, and all project-related legal documents and issues. CPCN-related activities include testimony and witness preparation for all

regulatory agency hearings. Also takes the lead in the review of property rights and all condemnation proceedings.

- Regulatory Policy and Affairs-Primary regulatory interface with the CPUC, the Federal Energy Regulatory Commission ("FERC"), and Arizona Corporations Commission.
- Transmission and Interconnection Planning-Responsible for system interconnection planning. Serves as the technical interface for: California Independent System Operator ("CAISO"), Western Electricity Coordinating Council ("WECC"), and Western Arizona Transmission system ("WATS").
- Resource Planning and Strategy-The primary interface with the CAISO for economic studies.
- Grid Contracts-Responsible for negotiating and obtaining third-party participation agreements.
- Public Affairs-Responsible for being the SCE "interface" with the general public, local and regional government, and special interest groups. Region Managers are assigned to individual communities and are utilized to identify local issues, needs, and concerns. Public Affairs, in conjunction with the PMT, develop and implement the project Public Involvement Plan.
- Corporate Communications-Responsible for developing and implementing the project communication plan. Responsible for preparing media notices, outreach advertisements, communications, and lead and coordinate interviews with the news media.
- Electric and Magnetic Field ("EMF") Group-Responsible for EMF studies, interfacing with the public on EMF issues, and preparation of the project EMF Field Management Plan.

- Procurement and Material Management-Responsible for engineering, material and equipment procurement, and construction contracts.

2.2 Project Design Management

The design management organization was previously discussed under PMT member roles and responsibilities. The Project Engineer serves as the primary design management control mechanism. By having similar responsibility and authority over project design that the PM has over the entire project, the Project Engineer has the ability to resolve any potential differences among the various supporting engineering and design organizations.

2.3 Project Construction Management Plan

Project construction management for a project of this size and complexity necessitate the use of different construction management options. The construction management option selected will be based on SCE's need to utilize its limited "in-house" resources and expertise in the most effective manner. The two major options are:

1. SCE performs engineering and design and manages construction using SCE and contractor labor; or
2. SCE develops Engineering, Procurement, and Construction ("EPC") specifications, which are the basis for an EPC contractor to perform engineering, design, and construction.

SCE construction management and the PMT will review SCE and contractor costs and progress on a regular basis. Table 3-1, "Construction Schedule", in the PEA identifies the design, construction, completion, and operational dates for each of the major project components.

3.0 Cost Estimate

The Cost Estimate required by Pub. Util. Code §1003(c) is shown in Table 3-9, in the PEA.

4.0 Cost Control Plan

The project Cost Control Plan is a part of the DPV2 Cost and Schedule Controls and Tracking procedure. A Schedule of Values consistent with the Work Breakdown Structure ("WBS") will serve as the basis for progress payments made to the contractor. The Contractor shall submit for SCE's review and approval its payment request, together with all required supporting documentation, for all work performed in the subject period. Included in the required supporting documentation are: resource and cost plots that graph weekly, monthly and cumulative craft labor and a cash-flow plot. The plots shall be based on dates from the Contractor's cost and resource loaded schedule. The specific items to be plotted (e.g., craft labor trades, equipment or material) shall be chosen by SCE.

The Contract Price may only be changed by a Field Change Order or by a Trend approved by the PM. The value of any work covered by a Field Change Order will be determined by one of the following methods:

- Where the work involved is covered by unit prices contained in the Contract Documents-the unit prices will be multiplied by the respective quantities of the items;
- By a mutually agreed lump sum itemized and supported by substantiating data; or
- Actual Cost of the Work plus a Contractor's fee.

Appendix B

FIELD MANAGEMENT PLAN

FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

APPENDIX B

FIELD MANAGEMENT PLAN FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION PROJECT

TABLE OF CONTENTS

I.

EXECUTIVE SUMMARY

Southern California Edison Company ("SCE") is proposing to construct a new 230-mile, high-voltage electric transmission line between California and Arizona known as the Devers-Harquahala 500 kilovolt ("kV") transmission line. Operation of the proposed line would require that upgrades be made to some of SCE's electrical transmission facilities in California. The proposed line and transmission facility upgrades are known as the Devers-Palo Verde No. 2 project ("DPV2").

The purpose of this Field Management Plan ("FMP") is to inform the public, the CPUC, and others about the steps SCE will take to reduce the magnetic fields for the proposed DPV2 project at a reasonable cost. The FMP includes a brief introduction to Electric and Magnetic Field ("EMF") characteristics, scientific research activities related to possible health effects and conclusions from various agencies and organizations about EMF, policy, and the evaluation of "no- and low-cost" magnetic field reduction measures applicable to the project.

The project routes are divided into two main sections (West-of-Devers and Devers-Harquahala) for evaluating "no- and low-cost" magnetic field reduction measures. For West-of-Devers, optimally phasing upgraded 230 kV transmission lines with existing transmission as well as subtransmission lines would result in an overall reduction of magnetic field levels at the edges of the right-of-way. For Devers-Harquahala, introducing a new 500 kV transmission line on a horizontal tower would result in an increased magnetic field at the one side of the right-of-way (*i.e,*. the edge closest to the proposed 500 kV tower). The magnetic field at the other side of the right-of-way would be decreased by optimally phasing the proposed 500 kV transmission line with the existing transmission line ("DPV1").

The "no- and low- cost" magnetic field reduction measures incorporated into the design of the proposed project are:

A. Devers-Harquahala:

- Utilize a typical horizontal 500 kV tower height of 150 feet. (Magnetic field models in this document are based on 140-foot tower heights and the 150-foot towers would result in lower magnetic field strength at the edge of the right-of-way.)
- Install 500 kV transposition towers near the same locations as existing transposition towers for the DPV1 500 kV transmission line. (Transposition towers are used to re-arrange the phase conductors on a transmission line, and they enable magnetic field reduction as well as phase impedance equalization across the line route.)
- Use of existing right-of-way.

B. West-of-Devers:

- Replacing single circuit towers with double-circuit 230 kV towers, which are (comparable to the existing double-circuit towers).
- Utilize a typical double-circuit 230 kV tower height of 150 feet. (Magnetic field models in this document are based on 140-foot tower heights and the 150-foot towers would result in lower magnetic field strength at the edge of the right-of-way.)
- Positioning similarly loaded circuits together on the same towers for enhanced magnetic field cancellation.
- Changing phasing sequences for existing transmission and subtransmission lines to further reduce the magnetic field levels.
- Use of existing right-of-way.

SCE's plan for reducing magnetic fields for the proposed project is consistent with the CPUC's Interim EMF Opinion Decision No. 93-11-013 ("1993 CPUC Decision") and also with recommendations made by the U.S. National Institute of Environmental Health Sciences. Furthermore, the recommendations above meet CPUC-approved EMF Design Guidelines as well as all national and state safety standards for new electric facilities.

II.

PURPOSE OF DOCUMENT

EMF field management plans are prepared for all new and upgraded electric utility transmission, subtransmission and substation facilities in accordance with the 1993 CPUC Decision to implement "no-cost and low-cost"[1] methods to reduce power frequency magnetic fields from new electric utility facilities. This document is intended to provide an overview of the proposed project and the EMF design considerations applied to it. A brief review of the pertinent science, policies, and design considerations is also provided.

III.

INTRODUCTION TO EMF

Electric and magnetic fields occur from a variety of energy sources that are electrical in nature. These energy sources and their associated electric and magnetic fields have been described and categorized within the electromagnetic spectrum.[2] The spectrum is organized by the frequency at which the electrical polarity of an energy source changes or oscillates with respect to time (in seconds). The frequency of an electric or magnetic field is expressed as Hertz ("Hz"). For instance, the earth's magnetic field does not change at any appreciable rate and is considered static. This lies at the extreme low end of the electromagnetic spectrum at zero Hz. At the opposite end of the electromagnetic spectrum are the gamma rays. These fields have an extremely high frequency (10^{21}) and a tremendous amount of energy. This is called ionizing radiation because this energy can ionize

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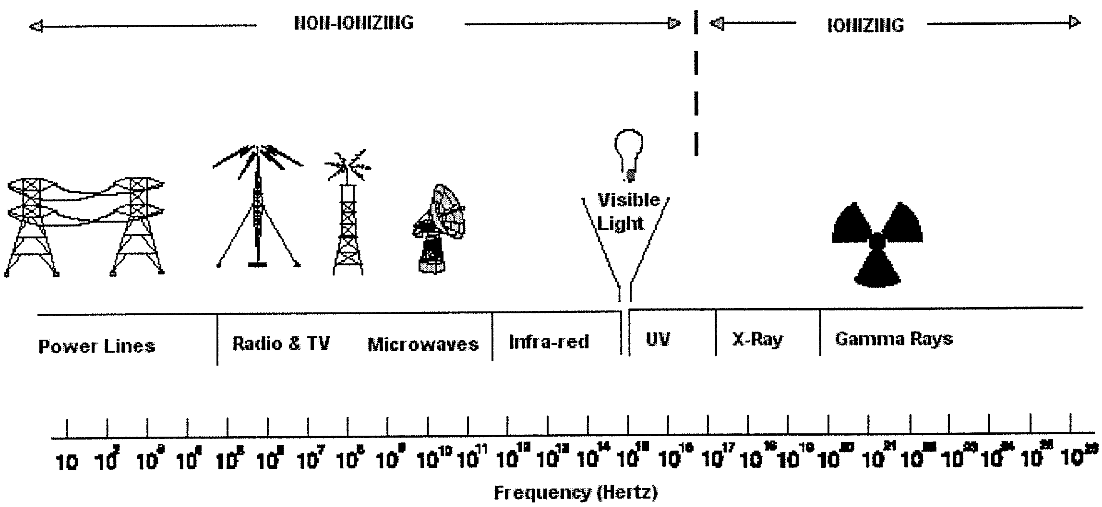
1 California Public Utilities Commission, Interim EMF Opinion Decision No. 93-11-013 defined "low-cost" to be in the range of 4 percent of the total cost of a budgeted project.

2 *Questions and Answers about EMF Associated with the Use of Electric Power*, National Institute of Environmental Health Sciences and U.S. Department of Energy, June 2002.

molecules. The spectrum includes visible light, microwaves, radio waves, and electricity.

Figure III-1
Electromagnetic Spectrum



The electricity we use each day is generated, transmitted, and distributed at a constant frequency of 60 Hz, also referred to as "power frequency". The unit of measure for electrical power is Watts. Watts can be described as a product of electrical voltage and flow of charge (electrical current is measured in Amps). Power-frequency **electric and magnetic fields** are referred to as **EMF**. These fields are the focus of this document.

IV.

EMF CHARACTERISTICS

Voltage or electrical pressure on any energized conductor exerts a force field known as an electric field. This electric field is measured in units of Volts per meter ("V/m") and is dependent on the amount of charge. Therefore, a conductor energized at a higher level will have a higher electric field associated with it. Electric fields interact with other neighboring positive or negative charges to cause attracting or repelling forces. Like fields repel whereas unlike fields attract. The strength of this field rapidly decreases with distance from the source, just like the heat and light of a candle falls off with distance. The electric field can easily be shielded. Trees, fences, buildings, and most other structures can shield electric fields from an overhead power line. The earth will shield the electric field from buried power lines. The strength of the electric field from a power line depends on the voltage level, the distance away from the line, and design of the system.

The use of electricity causes electric charges to flow as electric current. The current on a conductor creates magnetic fields. The unit of measure of magnetic fields is milliGauss ("mG"). The strength of magnetic fields diminishes quickly as you move away from the source, just like the electric field. However, the magnetic field is much more difficult to shield than electric fields. Trees, buildings, or the earth do not shield magnetic fields. Magnetic fields interact with neighboring magnetic fields and the resultant field depends on the magnitude and direction of each magnetic field source, *i.e,*. currents. All SCE facilities contain multiple currents on circuits and, depending on their arrangement, can increase or decrease the strength of the magnetic field. Therefore, consideration of the direction and magnitude of the current and the configuration of conductors on poles or underground can be used to design facilities with reduced magnetic fields.

Power frequency electric fields and magnetic fields from electric utility facilities act independently of one another and are considered separately. Each field can be calculated and/or measured for power line facilities. This document will focus only on power frequency magnetic fields associated with the utility facilities of the proposed project.

V.

SCIENCE, PUBLIC HEALTH, AND POLICY

During recent years, questions have been raised about the possible health effects of power frequency EMF. The scientific community has been unable to determine if EMF causes health effects or to establish any standard level of exposure that is known to be harmful.[3] Current scientific research focuses on exposure to magnetic fields rather than electric fields. This FMP also focuses on the magnetic fields.

Because disease prevention may involve setting standards that limit exposures or emissions, public health brings science into the policy arena. One of the most important principles of public health policy is to make sure that resources are spent where they will do the most good.[4] Typically, when public health and policy makers set exposure standards, they focus on the first health effects identified: the acute effects of high-level exposure. Setting standards for low-level exposures can be difficult and controversial, especially when the risks are uncertain and unproven, and the benefits of the proposed standards are intangible.[5]

So far, there is not sufficient evidence to link EMF exposure to the risk of cancer or other disease in humans. Accordingly, the 1993 CPUC Decision stated, "It is not appropriate to adopt any specific numerical standard in association with EMF until we have a firm scientific basis for adopting any particular value".

The 1993 CPUC Decision also created an EMF research and information program. This program was managed by the California Department of health Services ("CDHS") and funded by utility ratepayers. The purpose of the program was to perform research and policy analysis, and provide education and technical help to benefit Californians. Input to the CDHS was provided by a Stakeholders Advisory Consultant Group ("SAC") with representatives of the public, consumer groups, health and scientific experts, and labor and utility representatives. More

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3 Sahl J.D., Murdo*ck B.S. Electric and Magnetic Fields and Human Health: a Review of the Issue and the Science*; Southern California Edison Company, 1995.

4 *Id.*

5 Nair I., *Scientific Uncertainty, Risk Assessment, and Standard Setting, Electricity and Magnetism in Biology and Medicine,* M Blank (Editor) San Francisco: San Francisco Press 1993.

input also came from state agencies, consultants and special interest groups during the open-forum discussion periods at the SAC meetings.

In 1996, the National Academy of Sciences ("NAS") issued a report finding that there is no clear, convincing evidence to show that residential exposures to EMF are a threat to human health. The NAS is a private, non-profit society of distinguished scholars that advises the federal government on scientific and technical issues.[6]

The federal government has also conducted EMF research as a part of a $45-million research program managed by the National Institute of Environmental Health Sciences. This program, known as the EMF RAPID (Research and Public Information Dissemination) Program, submitted a final report to the U.S. Congress on June 15, 1999.[7] The report concluded that:

- "The scientific evidence suggesting that EMF exposures pose any health risk is weak."
- "EMF exposures cannot be recognized as entirely safe because of weak scientific evidence that exposures may pose a leukemia hazard."
- "The power industry should continue its current practice of siting power lines to reduce exposures and continue emphasis on educating both the public and providers of electricity about ways to reduce exposure."

In 2001, Britain's NRPB (National Radiological Protection Board) arrived at a similar conclusion:[8]

> "After a wide-ranging and thorough review of scientific research, an independent Advisory Group to the Board of NRPB has concluded that the power frequency electromagnetic fields that exist in the vast majority of homes are not a cause of cancer in general. However,

6 National Academy of Sciences (NAS), *Possible Health Effects of Exposure to Residential Electric and Magnetic Fields,* October 1996.

7 *National Institute of Environmental Health Sciences' Report on Health Effects from Exposure to Power-Line Frequency Electric and Magnetic Fields,* NIH Publication No. 99-4493, June 1999.

8 National Radiological Protection Board, Chilton, UK. 2001, *Electromagnetic Fields and the Risk of Cancer,* Report of an Advisory Group on Non-ionizing Radiation.

> some epidemiological studies do indicate a possible small risk of childhood leukemia associated with exposures to unusually high levels of power frequency magnetic fields."

In 2002, three scientists for California Department of Health Services concluded:[9]

- To one degree or another, all three of the DHS scientists are inclined to believe that EMFs can cause some degree of increased risk of childhood leukemia, adult brain cancer, Lou Gehrig's Disease, and miscarriage;
- They strongly believe that EMFs do not increase the risk of birth defects, or low birth weight;
- They strongly believe that EMFs are not universal carcinogens, since there are a number of cancer types that are not associated with EMF exposure;
- To one degree or another they are inclined to believe that EMFs do not cause an increased risk of breast cancer heart disease, Alzheimer's Disease, depression or symptoms attributed by some to sensitivity to EMFs;
- All three scientists had judgments that were "close to the dividing line between believing and not believing" that EMFs cause some degree of increased risk of suicide; and
- For adult leukemia, two of the scientists were "close to the dividing line between believing or not believing" and one was "prone to believe" that EMF causes some degree of increased risk.

Also in 2002, the World Health Organization's International Agency for Research on Cancer concluded:[10]

> "... ELF magnetic fields are possibly carcinogenic to humans, based on consistent statistical associations of high-level residential magnetic fields with a doubling of risk of childhood leukemia. Children who are exposed to

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9 California Department of Health Services, *An Evaluation of the Possible Risks from Electric and Magnetic Fields from Power Lines, Internal Wiring, Electrical Occupations, and Appliances*, June 2002.

10 World Health Organization/International Agency for Research on Cancer, Volume 80, Non-Ionizing Radiation Part 1: STATC and Extremely Low Frequency (ELF) Electric and Magnetic Fields, *"IARC Monographs on the Evaluation of Carcinogenic Risk to Humans"*, 2002.

> residential ELF magnetic fields less than 0.4 microTesla (4.0 milliGauss) have no increased risk for leukemia. … In contrast, no consistent evidence was found that childhood exposures to ELF electric or magnetic fields are associated with brain tumors or any other kinds of solid tumors. No consistent evidence was found that residential or occupational exposures of adults to ELF magnetic fields increase risk for any kind of cancer."

A. SCE's EMF POLICY

SCE 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, SCE recognizes and takes seriously its responsibility to address these EMF concerns. In order to better understand electric and magnetic fields and to respond to the current uncertainty, SCE 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.
- Provide balanced, accurate information to employees, customers, and public agencies, including providing EMF measurements and consultation to customers upon request.
- Take appropriate "no-cost and low-cost" steps to minimize field exposures from new facilities and continue to consult and advise customers with respect to existing facilities, subject to CPUC guidance.
- Support appropriate research programs to resolve the key scientific questions about EMF.
- Research and evaluate occupational health implications and provide employees who work near energized facilities with timely, accurate information about field exposures in their work environment.

VI.

TRANSMISSION AND SUBTRANSMISSION DESIGN WITH MAGNETIC FIELD REDUCTION MEASURES

SCE has identified methods to reduce magnetic fields unique to its facilities and has incorporated these techniques into its "EMF Design Guidelines for New Electrical Facilities: Transmission, Substation, Distribution" manual.[11] 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.

SCE's 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 SCE 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 and under SCE's construction standards. 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.

SCE defines "no-cost and low-cost" magnetic field reduction measures as follows:

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11 *EMF Design Guidelines for New Electrical Facilities; Transmission, Subtransmission, Distribution,* Southern California Edison, December 2003.

- "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. SCE uses a minimum fifteen percent (15%) reduction as the criteria for the application of "low-cost" measures.

SCE utilizes a four-stage process to select and implement "no-cost and low-cost" magnetic field reduction measures. The measures are implemented in the following order:

1. "No-Cost" option(s) that can be uniformly applied to the entire project. "Phasing" will almost always be a selected option.

2. Existing public schools or those under development (if known) should be the next priority for mitigation. Measures should be applied equitably along the project route if multiple schools are involved. It is possible that all the "low-cost" funds available to the project (*i.e.,* below 4% of the sum of the cost of all project elements) will be expended upon measures near schools•leaving no funds available for other "low-cost" measures in other areas.

3. Residential, Public Parks, Commercial, and Industrial developments should be considered for "low-cost" mitigation techniques only if the "low-cost" measures can be applied equitably to ensure fairness.

4. Land that is not expected to be developed need not have any "low cost" measures applied, for example:

a. State Parks,
b. U.S. Forest Service land,
c. U.S. Bureau of Land Management land, and
d. Formally designated "open space".

For a transmission line design, the table included in SCE's EMF Design Guidelines titled "No-Cost and Low-Cost Magnetic Field Reduction Measures for New, Major Upgrade, and Relocation of Electric Power Line Projects 220 kV or 500 kV" will be used to determine EMF reduction measure(s) to be implemented in final design.

The strength of fields at various distances from power line facilities can be calculated and/or measured. The use of computer programs can expedite the performance of calculations needed to estimate the value of the magnetic fields at any given point along the transmission and subtransmission line. For this purpose, SCE has developed the "Fields" program.[12] It can model the magnetic fields from conductors and cables. By utilizing this program, designers can determine the best options for reducing EMF at "no- and low-cost." The Fields program will be used to model the transmission and subtransmission line for purposes of examining various field reduction measures only.

VII.
DPV2 PROJECT

A. Project Description

SCE proposes to construct a new high-voltage electric transmission line between California and Arizona known as the Devers-Harquahala 500 kV transmission line. The proposed line would extend from Devers Substation

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12 Kim C. Fields for Windows XP Version 3.5, Southern California Edison, 2004.

("Devers"), located near Palm Springs, California to Harquahala Generating Station Switchyard ("Harquahala"), west of Phoenix, Arizona. The proposed line would extend for 230 miles, of which 102 miles would be located in Arizona and 128 miles would be located in California. The majority of the proposed route would parallel SCE's existing DPV1 500 kV transmission line.

Operation of the proposed line would require that upgrades be made to certain of SCE's existing electrical transmission facilities, west from Devers to the Vista and San Bernardino substations in the City of Redlands. The upgrades would involve approximately 47 miles of existing 230 kV transmission lines. The 230 kV line upgrades would include replacing single circuit wood H-frame and lattice steel towers (currently supporting portions of the Devers-San Bernardino No. 2 and Devers-Vista No. 1 230 kV transmission lines) with new double-circuit vertical lattice towers between Devers and San Bernardino Junction. (San Bernardino Junction is approximately ¼ mile south of the corner of Mountain View Avenue and Beaumont Avenue in Loma Linda, California) Figure VII-2 and Figure VII-3 are sketches of the existing and proposed appearances of the right-of-way. Furthermore, single 1033 ACSR conductors would be re-conductored with bundled conductors (two conductors per phase) for the Devers-San Bernardino No. 1 and No. 2, and the Devers–Vista No. 1 and No. 2 transmission lines. These activities require the addition of some new structures and modifications to existing towers.

Figure ***VII-2***

Existing Right-of-Way near Beaumont Area (Looking West)

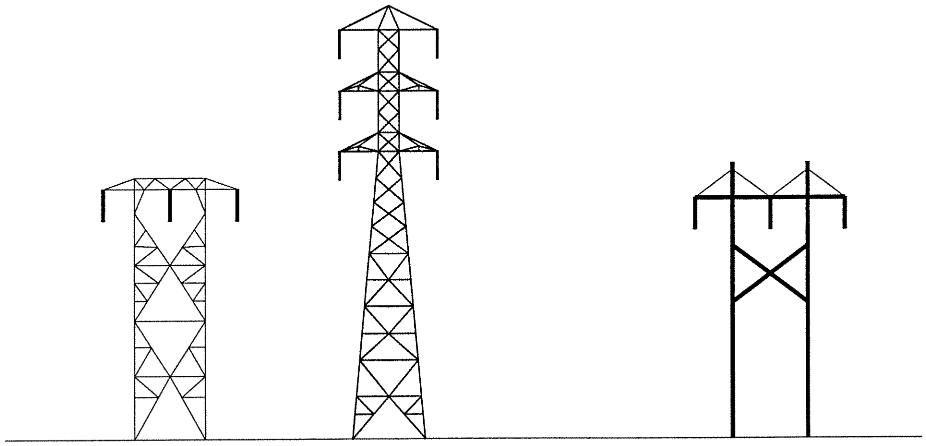
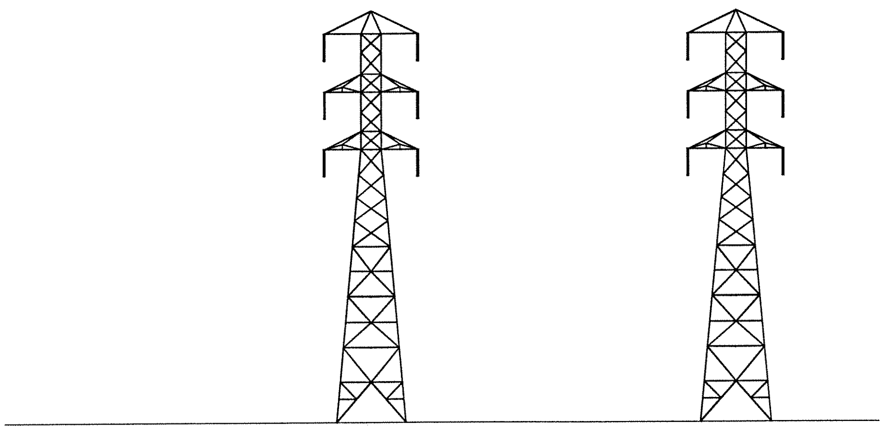


Figure ***VII-3***

Proposed Upgrade near Beaumont Area (Looking West)



The primary goal of this project is to improve the ability to transfer electricity from Arizona to California. This would provide SCE customers with increased access to existing and future resources of cost-effective sources of electricity in Arizona.

1. FMP Base Case

The total cost of this project is approximately $591 million. This estimate is in 2005 dollars and excludes AFUDC. SCE transmission engineers considered magnetic field reduction measures early in the design phase for this project. Field reduction methods for this project include:

- Phasing all proposed transmission lines under this project as well as other selected transmission and subtransmission lines for magnetic field reduction.
- Placing similarly loaded circuits on the same double-circuit structure.
- Installing 500 kV transposition towers at nearly the same locations as the existing transposition towers for DPV1 to enable magnetic field reduction and phase impedance equalization across the Devers-Harquahala line route (Devers-Harquahala).
- Using the existing transmission and subtransmission right-of-way.

Therefore, the total project cost includes "low-cost" field reduction options incorporated in the project design.

2. Alternatives to Proposed Project

Alternative Devers-Harquahala line routes were considered. As an alternative to the termination of the Devers-Harquahala line at the Harquahala Generating Station, and SCE's acquisition of the existing Harquahala-Hassayampa 500 kV transmission line, the Devers-Harquahala line would terminate at the Palo-Verde Nuclear Generating Station Switchyard ("PVNGS"). This would require the construction of a new 500 kV transmission line parallel to the DPV1 transmission line for a total distance of approximately 239.4 miles between Devers and Palo Verde. Compared to the proposed Devers-Harquahala 500 kV route, this alternate route would require the construction of an additional 10 miles of new 500kV transmission line.

Another alternative route considered is that the proposed Devers-Harquahala line would exit the Harquahala Switchyard directly to the west for 12 miles, and then follow the El Paso Natural Gas pipeline corridor northwest for 9 miles to its intersection with the DPV1 corridor and the proposed Devers-Harquahala 500 kV route. This alternative route would be located in a designated BLM Utility Corridor and an additional right-of-way would be acquired across private, state, and BLM lands. This alternate route would be 14 miles shorter than the proposed route (a total distance of 216 miles).

SCE is also considering the option to construct a new 500/230 kV substation west of the Colorado River in the general vicinity of Blythe, California. If any alternative is chosen, a detailed FMP will be prepared for that alternative with a detailed engineering design.

VIII.

FIELD REDUCTION MEASURES FOR THE DPV2 PROJECT

For the purpose of examining "magnetic field reduction" measures, this project is divided into eighteen areas by considering changes in characteristics of transmission line corridors (*i.e.,* changes in the number of transmission lines within the corridor, changes to tower type for the proposed line); *see* Table VIII-1 below for detailed information. These eighteen areas are grouped into two major sections, West-of-Devers and Devers-Harquahala. Accordingly, this FMP is presented in two sections.

Table VIII-1
Eighteen Areas Selected for Evaluating Magnetic Field Reduction Measures

Area No.	Section ID	Nearest Crossing Streets	City, County or State	Circuit IDs[13] within the corridor
1	West of Devers	Grand Terrace & Mt. Vernon	Grand Terrace	13, 14, 21, 22, 24
2		Washington & RV Center	Colton	10, 11, 23, 25
3		Pardo & S. Chase Canyon	Colton	10, 11, 13, 14, 20, 21
4		San Bernardino & Mtn. View	Redlands	8, 9, 13, 14, 22, 26, 27, 28, 29, 30
5		Redlands & Enterprise	Loma Linda	8, 9, 13, 14, 27, 28, 29, 30
6		Mission & Pepper	Loma Linda	8, 9, 13, 14, 27, 28
7		Lawton & Nelson	Loma Linda	8, 9, 13, 14
8		Highland Springs & 14th Street	Beaumont	8, 9, 10, 11
9		Millard Pass & Martin Rd	Banning	8, 9, 10, 11, 15
10	Devers-Harquahala	Dillon & Indian	N. Palm Springs	1, 2[14], 4, 5, 16, 17, 18
11		Varner & Edison	Riverside Co. (Near Cathedral City)	1, 2, 4, 5, 16, 19
12		Vista Chino & Rio Del Sol Rd	Riverside Co. (Near 1000 Palms)	1, 2, 4, 5, 18, 3
13		Shadow Mountain & Tchoupitoulas	Riverside Co. (Near Palm Desert)	1, 2, 4, 6, 7
14		Dillon & Landfill	Indio	1, 2, 6
15		Neighbors & 22nd Ave	Coachella	1, 2
16		Blythe Area	Blythe	1, 2
17		Copper Bottom Pass of Dome Rock Mt.	Arizona	1, 2
18		All Alternative Routes in Arizona	Arizona	2

Note: Field Modeling Assumptions

The "Fields" program is used to evaluate the magnetic field characteristics of the proposed construction, and various magnetic field reduction alternatives. The models applicable to this project are found in the Appendix A.

The magnetic field strength is calculated at a height of three feet above ground. The assumption is extended to flat terrain, average sagging (average sagging is approximately equal to 1/3 of sagging plus minimum clearance to the ground), all towers and structures that are located next to each other, and conductors that are straight and infinitely long. Calculations of resultant magnetic fields are expressed in units of milliGauss (mG), and represent the results of two-dimensional magnetic fields.

13 *See* Appendix B for the list of transmission and subtransmission lines.

14 Devers-Harquahala (Circuit ID No. 2) is the only circuit that is new. All other circuits are existing.

The results in the magnetic field models are for purposes of comparison in evaluating magnetic field reduction measures only and cannot be assumed to represent actual mG levels that will be found at any particular point along the line route. In addition, because of the numerous and complex variables that affect magnetic field strength, SCE makes no guarantee or representation that magnetic field levels presented in this document will in any way reflect the actual measured values once construction of the proposed line is completed. For modeling the year 2008, forecasting loadings are used; *see* Appendix B for circuit names and forecasted loading conditions. Typical minimum clearance of 45 feet for 500 kV transmission lines and 40 feet for 230 kV, 115 kV, and 66 kV transmission and subtransmission lines were used.

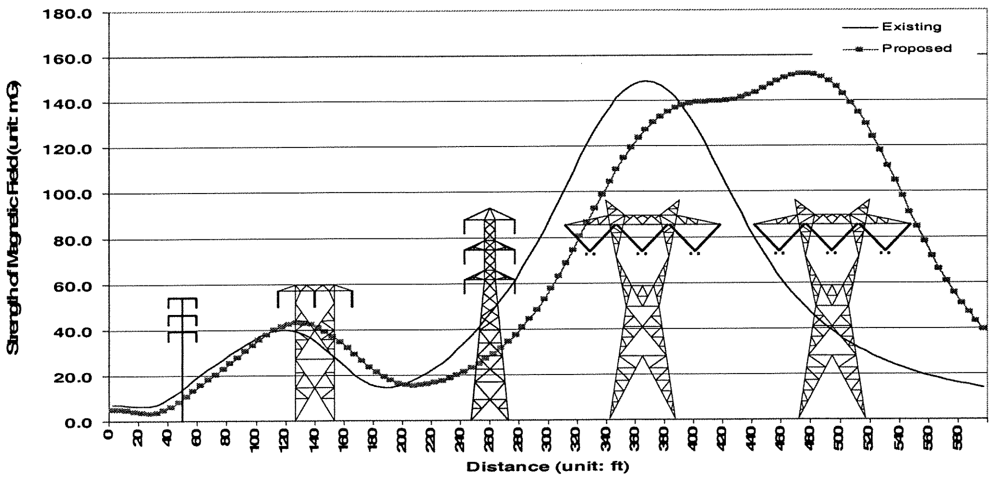
A. Devers-Harquahala: Constructing a new Devers–Harquahala 500 kV Transmission Line (Areas 10 to 18)

For Devers-Harquahala, the proposed 500 kV transmission line goes through mostly unpopulated areas or lightly populated areas (such as the Palm Springs and Blythe areas). In these lightly populated areas, the proposed line is either more than 500 feet away from populated areas or runs adjacent to a few scattered homes at a minimum of 100 feet away. The following magnetic field reduction measures are considered:

1. Optimally phasing proposed replace Devers-Harquahala line with DPV1 500 kV transmission line,
2. Using taller 500 kV structures, and
3. Using double-circuit 500 kV structures.

The proposed 500 kV structure is a "single-circuit horizontal structure". Using this structure and phasing the proposed Devers-Harquahala line with the existing DPV1, a noticeable magnetic field reduction is observed at one-side of right-of-way (*i.e.,* the edge of the right-of-way closest to the existing DPV1). Introducing the Devers-Harquahala line at the other-side of the right-of-way, produces a noticeable magnetic field increase. Figure VIII-4 below shows, as an example, the result of introducing the Devers-Harquahala line, which is optimally phased with existing DPV1, in the existing corridor.

Figure VIII-4
Strength of Magnetic Field Near Dillon & Indian, N. Palm Springs



In addition to optimal phasing, using a taller structure was also considered. In order to reduce the strength of the magnetic field further (*i.e.,* an additional 15% reduction) at both edges of right-of-way, the proposed tower needs to be at least 50 feet taller. This is not a "low-cost" option. The proposed typical structure height is about 140 to 150 feet. The double-circuit 500 kV structure is also found not to be a "low-cost" option compared to the proposed single-circuit horizontal structure. The proposed magnetic field mitigation option for the Devers-Harquahala line route is optimally phasing Devers-Harquahala with DPV1. When Devers-Harquahala is constructed with identified magnetic field reduction measure, there will be an overall increased magnetic field level; *see* Table VIII-2 below for magnetic field levels at the edges of right-of-way.

B. West-of-Devers - Upgrading Existing 230 kV Transmission Lines (Areas 1 to 9)

The proposed West-of-Devers 230 kV system upgrade involves four 230 kV transmission lines: Devers-San Bernardino No. 1 and No. 2, and Devers-Vista No. 1 and No. 2. In addition to these transmission lines, there are two more 230 kV transmission lines in the area: the San Bernardino–Vista and San Bernardino–Etiwanda. From Devers Substation to San Bernardino Junction, there are three types of 230 kV towers; single-circuit wooden horizontal H-frames, single-circuit horizontal steel lattice towers, and double-circuit vertical steel lattice towers. SCE plans to consolidate the two single-circuit tower lines onto a single double circuit vertical steel lattice tower line. The typical tower height is 140 to 150 feet. Unlike Devers-Harquahala these four existing 230 kV lines are located adjacent to homes and commercial areas.

Due to the numerous 66 kV and 115 kV subtransmission lines paralleling existing 230 kV lines in the area, the following steps were taken for evaluating magnetic field reduction measures:

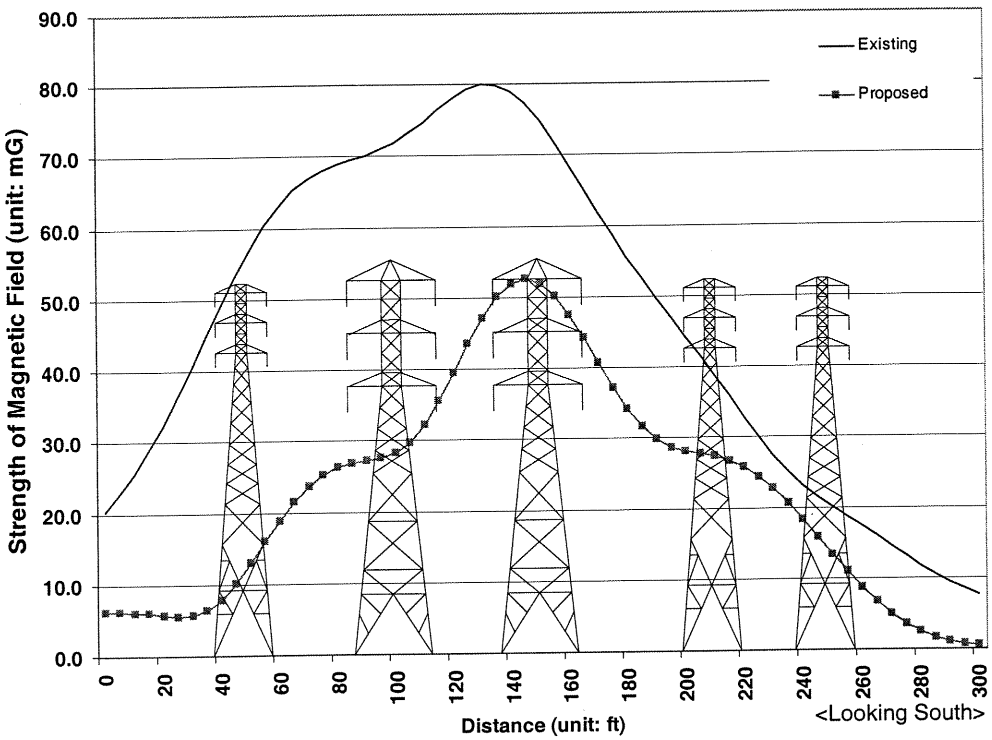
1. Group similarly loaded 230 kV transmission lines on a single structure.
2. Find the phasing of all six 230 kV transmission lines that gives the lowest magnetic field level in the West-of-Devers area.
3. Based on the results of Step 2, optimally phase circuits that go on the same double-circuit towers. This step is necessary to accommodate variations in the center of structure-to-structure distances.
4. For Area 1 through 9, identify circuits rated 50 kV and above and check if phasings found in Steps 2 and 3 above would increase or decrease the magnetic field at the edges of the right-of-way. If the magnetic field increases, find the phasings for circuits rated 50 kV and above that gives lower magnetic field levels within the corridor. Because modifications of existing lines are limited to optimal phasing, any circuits at a distance greater than 200 feet from the existing 230 kV lines were not considered.
5. Evaluate whether using taller structures would achieve a noticeable magnetic field reduction after Steps 1 through 4 have been incorporated into the designs.

From Steps 1 through 4, the following phasing sequences were found to lower magnetic field levels (compared to existing levels) in the West-of-Devers area except in the area from San Bernardino Substation to San Bernardino Junction.

- Devers-Vista No. 1: A-B-C (top-to-bottom)
- Devers-Vista No. 2: C-B-A (top-to-bottom)
- Devers-San Bernardino No. 1: B-A-C (top-to-bottom)
- Devers-San Bernardino No. 2: C-A-B (top-to-bottom)
- San Bernardino-Vista: C-A-B (top-to-bottom)
- San Bernardino-Etiwanda: B-A-C (top-to-bottom, same as existing)

For the San Bernardino Substation to San Bernardino Junction Area, there are six existing 66 kV subtransmission lines. To reduce the magnetic field levels, SCE will change, as a "low-cost" option, the phasings for those 66 kV circuits. As a result, there will be a significant reduction in the magnetic field level (lower than existing conditions) for this area as well. Figure VIII-5 clearly shows a significant reduction of magnetic field levels as a result of optimally phasing ten circuits.

Figure VIII-5
Effects of Optimal Phasing
(Near San Bernardino & Mt. View, Redlands)



For all other areas in the West-of-Devers segment, optimally phasing six 230 kV transmission lines would result in an overall reduction in magnetic field levels compared to existing levels. Table VIII-2 shows a comparison of magnetic field levels by existing designs vs. proposed designs for both West-of-Devers and Devers-Harquahala.

Table VIII-2
Comparison of Magnetic Field Levels (Existing vs. Proposed Design)

Section ID	Area ID	Left Side of R-O-W		Right Side of R-O-W		Changes in MF
		Existing	Proposed	Existing	Proposed	
West of Devers	1	28.2	20.9	4.1	3.1	Decrease
	2	17.6	11.5	23.0	18.3	Decrease
	3	14.1	6.3	7.3	3.0	Decrease
	4	20.2	6.2	7.6	0.5	Decrease
	5	20.0	6.2	17.8	11.4	Decrease
	6	29.6	20.4	38.5	20.4	Decrease
	7	27.5	18.0	31.3	15.4	Decrease
	8	8.8	1.0	23.7	15.1	Decrease
	9	32.4	15.6	9.0	2.6	Decrease
Devers-Harquahala	10	7.2	5.1	14.0	39.6	Increase
	11	11.1	7.5	14.0	39.6	Increase
	12	8.3	7.3	13.5	39.6	Increase
	13	11.0	10.2	13.6	39.3	Increase
	14	24.6	11.9	13.5	39.3	Increase
	15	56.1	33.6	13.6	39.3	Increase
	16	64.8	39.1	15.6	45.6	Increase
	17	72.9	35.0	41.4	41.5	Decrease
	18	0.0	46.5	0.0	11.3	Increase

For detailed magnetic field calculation results as well as input data for the "Fields" program, *see* Appendix A.

Currently, SCE has identified three schools within the California Department of Education's "EMF Setback Distance" for new schools; 350 feet for 500 kV transmission lines and 150 feet for 230 kV transmission lines. They are: (1) Terrace View Elementary School in the City of Grand Terrace, (2) Christian Center Academy in the City of Colton, and (3) Beaumont High School in the City of Beaumont.

First, Terrace View Elementary School is located at the left-side of Area 1. In addition to the circuits listed for Area 1, there are two more 66 kV subtransmission lines adjacent to the school property. They are the San Bernardino-Cardiff-Unimed-Vista 66 kV line and an idle 66 kV line. The year 2008 forecasted loading shows the line loading for San Bernardino–Cardiff–Unimed–Vista 66 kV is zero (this is the same as current operating condition). This line is normally opened at the Vista Substation. It is used during emergency conditions. Furthermore, the existing 230 kV right-of-way adjacent to the school property is outside of the Devers-Harquahala project scope. SCE, however, gave the highest priority for this school, as well as the other two schools, and decided to phase existing 230 kV transmission lines optimally. Optimally phased existing 230 kV transmission lines for the school will also benefit (in terms of lowering magnetic field levels) the West-of-Devers.

Secondly, Christian Center Academy is located at the left-side of Area 2. SCE's proposed activity near the school only involves re-conductoring (*i.e.,* replacing old conductors with new and upgraded conductors) two existing 230 kV transmission lines. These 230 kV transmission lines will also be phased optimally to lower the magnetic field at the school site as well as other areas.

Finally, Beaumont High School is located at the right-side of Area 8. The south-east corner of the school property line is about 250 feet away while the south-west corner of the school property line is about 120 feet away from the existing 230 kV transmission line right-of-way. Once again, SCE gave the highest priority to this school site. To reduce the magnetic field, two less-loaded 230 kV transmission lines will be located at the side closer to the school. All four 230 kV transmission lines will be phased optimally to reduce the magnetic field. Lowering magnetic field levels at these school sites will also benefit adjacent areas as well.

IX.

FINAL RECOMMENDATIONS FOR REDUCING MAGNETIC FIELDS

The following "no- and low-cost" measures will be implemented for this project.

Devers-Harquahala:

- Using 140 to 150-foot tall 500 kV towers (comparable to the existing towers).

- Installing 500 kV transposition towers at relatively the same locations as the existing transposition towers for DPV1. The transposition towers would ensure optimally phasing for the entire route.
- Optimally phase proposed 500 kV transmission line with the existing 500 kV transmission line. The proposed phasing near the Devers Substation is as follows:
  - Devers-Palo Verde No. 1: A-C-B (from left-to-right looking west)
  - Devers-Harquahala: B-C-A (from left-to-right looking west)
- Using the existing right-of-way.

West-of-Devers:

- Replacing single circuit towers with double-circuit 140 to 150-foot tall 230 kV towers (comparable to the existing double-circuit towers).
- Positioning likely loaded circuits together on the same towers for maximum magnetic field cancellation effects.
- Change phasings for six 230 kV transmission lines as follows:
  - Devers-Vista No. 1: A-B-C (top-to-bottom)
  - Devers-Vista No. 2: C-B-A (top-to-bottom)
  - Devers-San Bernardino No. 1: B-A-C (top-to-bottom)
  - Devers-San Bernardino No. 2: C-A-B (top-to-bottom)
  - San Bernardino-Vista: C-A-B (top-to-bottom)
  - San Bernardino-Etiwanda: B-A-C (top-to-bottom)
- Change phasings as indicated for the following existing 66 kV transmission lines. These phasing identifications should be applicable to the existing corridor from San Bernardino Substation to San Bernardino Junction areas:
  - San Bernardino-Vista-Cardiff-Unimed: A-B-C (top-to-bottom)
  - San Bernardino-Vista-Del Rosa: C-B-A (top-to-bottom)
  - San Bernardino-Redlands-Timoteo: A-B-C (top-to-bottom)
  - San Bernardino-Redlands-Tennessee-Yucaipa: C-B-A (top-to-bottom)
  - San Bernardino-Timoteo: B-A-C (top-to-bottom)
  - Bernardino-Redlands: C-A-B (top-to-bottom)
- Using the existing right-of-way.

Other magnetic fields reduction measures were not for one or more of the following reasons:

- The measure does not reduce the magnetic fields from the proposed line more than 15%;
- The measure is not a "no- and low-cost" option; and
- The measure does not meet SCE's engineering and safety requirements.

SCE's plan for reducing magnetic fields for the proposed project is consistent with the 1993 CPUC Decision and also with recommendations made by the U.S. National Institute of Environmental Health Sciences. Furthermore, the recommendations above meet CPUC-approved EMF Design Guidelines as well as all national and state safety standards for new electric facilities.

A. Appendix A: Field Model for the Proposed Design of "Area 1[15]"

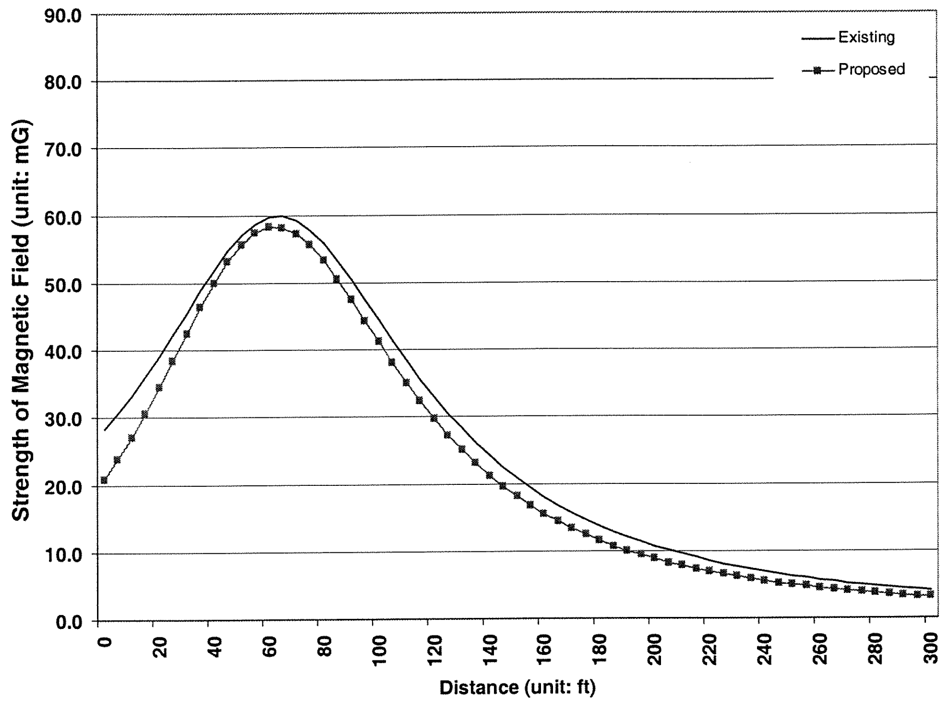
Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
14	36.0	92.0	692.0	120.0
14	36.0	73.5	692.0	0.0
14	36.0	55.0	692.0	240.0
13	64.0	92.0	1356.0	240.0
13	64.0	73.5	1356.0	120.0
13	64.0	55.0	1356.0	0.0
21	264.0	81.0	0.0	120.0
21	264.0	68.0	0.0	240.0
21	264.0	55.0	0.0	0.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
14	36.0	92.0	938.0	120.0
14	36.0	73.5	938.0	0.0
14	36.0	55.0	938.0	240.0
13	64.0	92.0	1659.0	240.0
13	64.0	73.5	1659.0	0.0
13	64.0	55.0	1659.0	120.0
21	264.0	81.0	0.0	120.0
21	264.0	68.0	0.0	240.0
21	264.0	55.0	0.0	0.0

15 *See* Table 1 for more information about the area.

Output Graph (Edges of *right*-of-way are located at the endpoints of "Distance" axis.)



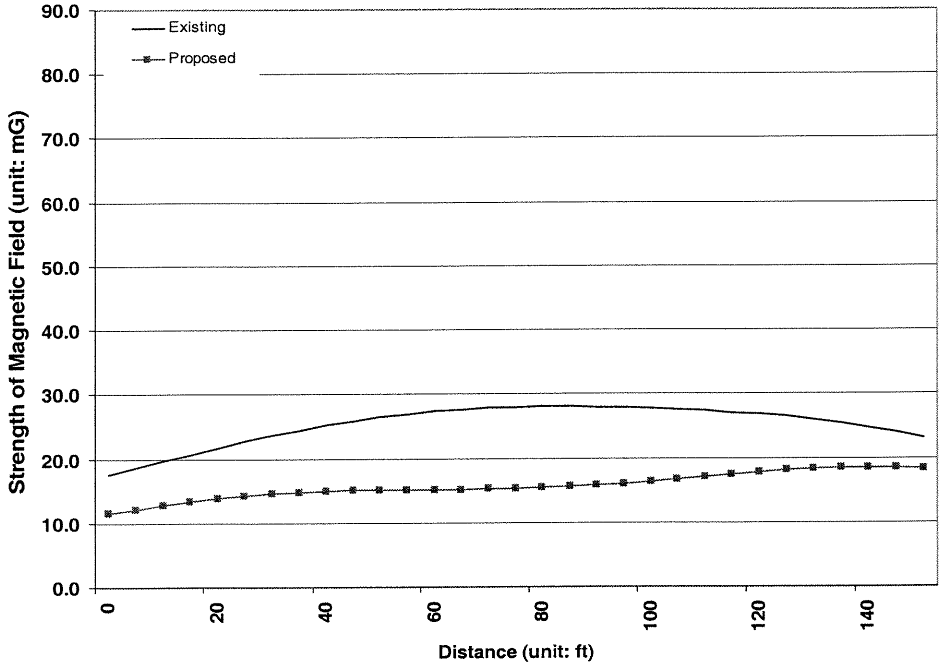
B. Appendix A: Field Model for the Proposed Design of "Area 2"

Input Data (*Left Table: Existing Design, Right Table: Proposed* Design)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
10	36.0	102.0	479.0	240.0
10	36.0	83.5	479.0	120.0
10	36.0	65.0	479.0	0.0
11	64.0	102.0	484.0	240.0
11	64.0	83.5	484.0	0.0
11	64.0	65.0	484.0	120.0
25	121.0	91.0	0.0	120.0
25	121.0	78.0	0.0	240.0
25	121.0	65.0	0.0	0.0
23	149.0	91.0	-723.0	240.0
23	149.0	78.0	-723.0	0.0
23	149.0	65.0	-723.0	120.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
10	36.0	102.0	855.0	0.0
10	36.0	83.5	855.0	120.0
10	36.0	65.0	855.0	240.0
11	64.0	102.0	855.0	240.0
11	64.0	83.5	855.0	120.0
11	64.0	65.0	855.0	0.0
25	121.0	91.0	0.0	120.0
25	121.0	78.0	0.0	240.0
25	121.0	65.0	0.0	0.0
23	149.0	91.0	-723.0	240.0
23	149.0	78.0	-723.0	120.0
23	149.0	65.0	-723.0	0.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



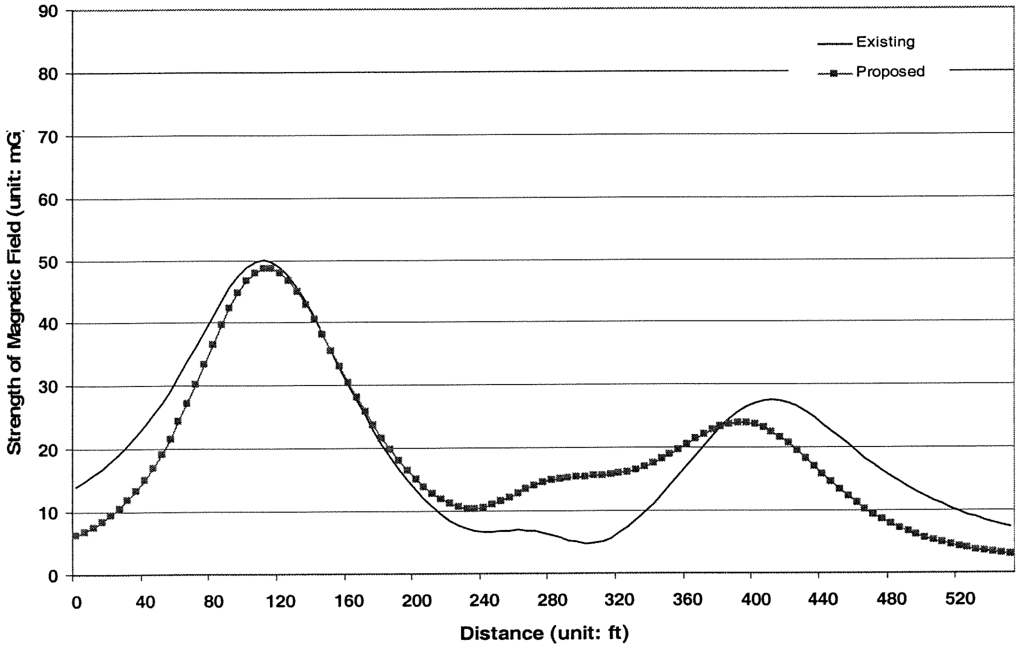
C. Appendix A: Field Model for the Proposed Design of "Area 3"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
14	86.0	97.0	692.0	120.0
14	86.0	78.5	692.0	0.0
14	86.0	60.0	692.0	240.0
13	114.0	97.0	1356.0	240.0
13	114.0	78.5	1356.0	120.0
13	114.0	60.0	1356.0	0.0
20	266.0	86.0	-383.0	0.0
20	266.0	73.0	-383.0	120.0
20	266.0	60.0	-383.0	240.0
21	294.0	86.0	0.0	120.0
21	294.0	73.0	0.0	240.0
21	294.0	60.0	0.0	0.0
10	386.0	97.0	479.0	240.0
10	386.0	78.5	479.0	120.0
10	386.0	60.0	479.0	0.0
11	414.0	97.0	484.0	240.0
11	414.0	78.5	484.0	0.0
11	414.0	60.0	484.0	120.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
14	86.0	97.0	938.0	120.0
14	86.0	78.5	938.0	0.0
14	86.0	60.0	938.0	240.0
13	114.0	97.0	1659.0	240.0
13	114.0	78.5	1659.0	0.0
13	114.0	60.0	1659.0	120.0
20	266.0	86.0	-383.0	0.0
20	266.0	73.0	-383.0	120.0
20	266.0	60.0	-383.0	240.0
21	294.0	86.0	8.0	120.0
21	294.0	73.0	8.0	240.0
21	294.0	60.0	8.0	0.0
10	386.0	97.0	855.0	0.0
10	386.0	78.5	855.0	120.0
10	386.0	60.0	855.0	240.0
11	414.0	97.0	855.0	240.0
11	414.0	78.5	855.0	120.0
11	414.0	60.0	855.0	0.0

Output Graph (Edges of right-of-way are located at the ***endpoints*** of "Distance" axis.)



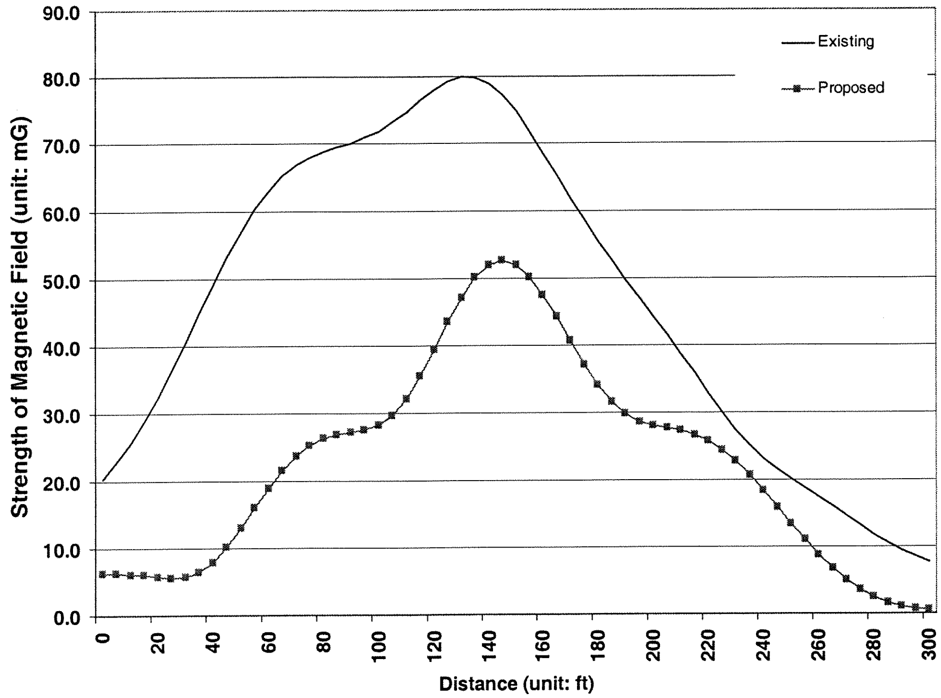
D. Appendix A: Field Model for the Proposed Design of "Area 4"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
30	43.0	64.0	565.0	30.0
30	43.0	56.0	565.0	270.0
30	43.0	48.0	565.0	150.0
29	57.0	64.0	901.0	30.0
29	57.0	56.0	901.0	270.0
29	57.0	48.0	901.0	150.0
8	89.0	86.0	-298.0	240.0
8	89.0	67.5	-298.0	0.0
8	89.0	49.0	-298.0	120.0
14	117.0	86.0	692.0	120.0
14	117.0	67.5	692.0	0.0
14	117.0	49.0	692.0	240.0
13	139.0	86.0	1356.0	240.0
13	139.0	67.5	1356.0	120.0
13	139.0	49.0	1356.0	0.0
9	167.0	86.0	-309.0	240.0
9	167.0	67.5	-309.0	0.0
9	167.0	49.0	-309.0	120.0
28	201.0	69.0	465.0	30.0
28	201.0	59.0	465.0	150.0
28	201.0	49.0	465.0	270.0
27	221.0	69.0	544.0	270.0
27	221.0	59.0	544.0	30.0
27	221.0	49.0	544.0	150.0
22	239.0	64.0	390.0	150.0
22	239.0	56.0	390.0	30.0
22	239.0	48.0	390.0	270.0
26	253.0	64.0	366.0	30.0
26	253.0	56.0	366.0	270.0
26	253.0	48.0	366.0	150.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
30	43.0	64.0	565.0	270.0
30	43.0	56.0	565.0	30.0
30	43.0	48.0	565.0	150.0
29	57.0	64.0	901.0	150.0
29	57.0	56.0	901.0	30.0
29	57.0	48.0	901.0	270.0
8	89.0	86.0	-578.0	120.0
8	89.0	67.5	-578.0	0.0
8	89.0	49.0	-578.0	240.0
14	117.0	86.0	938.0	120.0
14	117.0	67.5	938.0	0.0
14	117.0	49.0	938.0	240.0
13	139.0	86.0	1659.0	240.0
13	139.0	67.5	1659.0	0.0
13	139.0	49.0	1659.0	120.0
9	167.0	86.0	-578.0	240.0
9	167.0	67.5	-578.0	0.0
9	167.0	49.0	-578.0	120.0
28	201.0	69.0	465.0	270.0
28	201.0	59.0	465.0	150.0
28	201.0	49.0	465.0	30.0
27	221.0	69.0	544.0	30.0
27	221.0	59.0	544.0	150.0
27	221.0	49.0	544.0	270.0
22	239.0	64.0	390.0	30.0
22	239.0	56.0	390.0	150.0
22	239.0	48.0	390.0	270.0
26	253.0	64.0	366.0	270.0
26	253.0	56.0	366.0	150.0
26	253.0	48.0	366.0	30.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



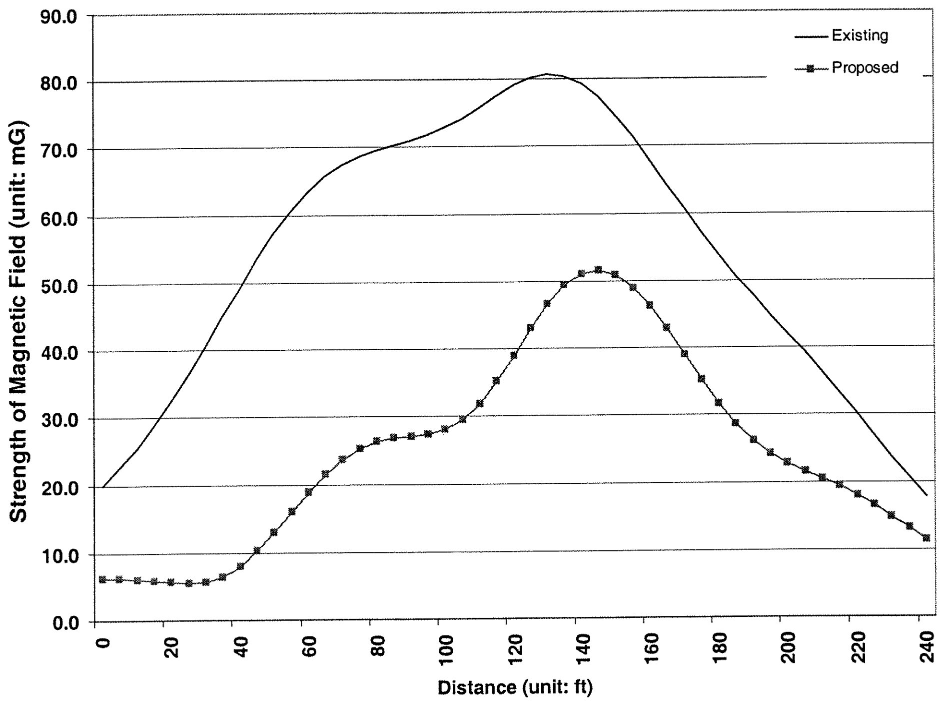
E. Appendix A: Field Model for the Proposed Design of "Area 5"

Input Data (*Left* Table: *Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
30	43.0	64.0	565.0	30.0
30	43.0	56.0	565.0	270.0
30	43.0	48.0	565.0	150.0
29	57.0	64.0	901.0	30.0
29	57.0	56.0	901.0	270.0
29	57.0	48.0	901.0	150.0
8	89.0	86.0	-298.0	240.0
8	89.0	67.5	-298.0	0.0
8	89.0	49.0	-298.0	120.0
14	117.0	86.0	692.0	120.0
14	117.0	67.5	692.0	0.0
14	117.0	49.0	692.0	240.0
13	139.0	86.0	1356.0	240.0
13	139.0	67.5	1356.0	120.0
13	139.0	49.0	1356.0	0.0
9	167.0	86.0	-309.0	240.0
9	167.0	67.5	-309.0	0.0
9	167.0	49.0	-309.0	120.0
28	204.0	65.0	465.0	30.0
28	204.0	57.0	465.0	150.0
28	204.0	49.0	465.0	270.0
27	218.0	65.0	544.0	270.0
27	218.0	57.0	544.0	30.0
27	218.0	49.0	544.0	150.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
30	43.0	64.0	565.0	270.0
30	43.0	56.0	565.0	30.0
30	43.0	48.0	565.0	150.0
29	57.0	64.0	901.0	150.0
29	57.0	56.0	901.0	30.0
29	57.0	48.0	901.0	270.0
8	89.0	86.0	-578.0	120.0
8	89.0	67.5	-578.0	0.0
8	89.0	49.0	-578.0	240.0
14	117.0	86.0	938.0	120.0
14	117.0	67.5	938.0	0.0
14	117.0	49.0	938.0	240.0
13	139.0	86.0	1659.0	240.0
13	139.0	67.5	1659.0	0.0
13	139.0	49.0	1659.0	120.0
9	167.0	86.0	-578.0	240.0
9	167.0	67.5	-578.0	0.0
9	167.0	49.0	-578.0	120.0
28	204.0	65.0	465.0	270.0
28	204.0	57.0	465.0	150.0
28	204.0	49.0	465.0	30.0
27	218.0	65.0	544.0	30.0
27	218.0	57.0	544.0	150.0
27	218.0	49.0	544.0	270.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



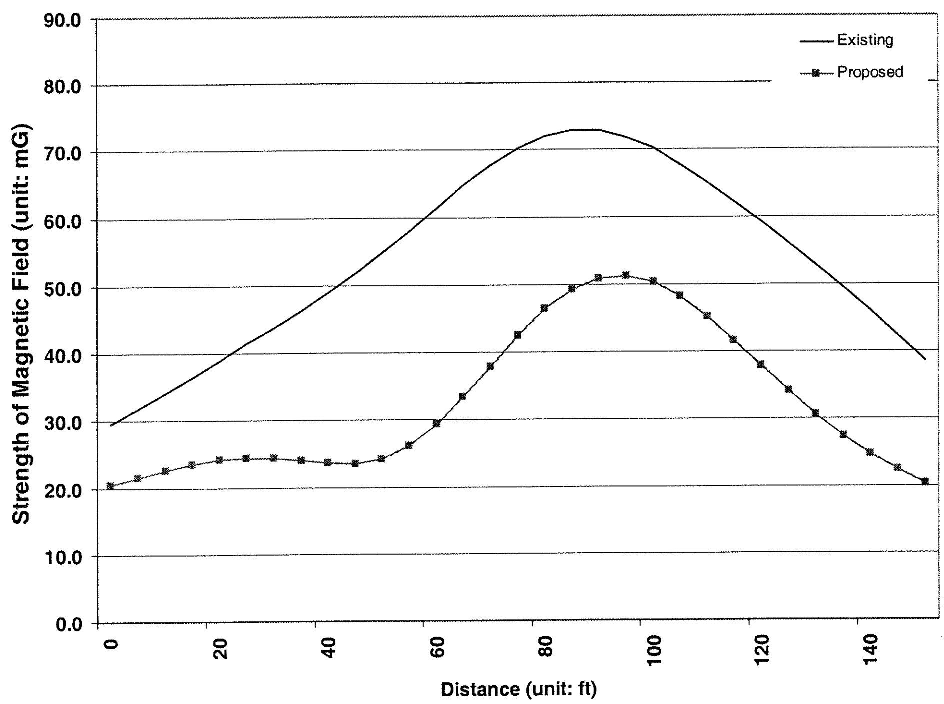
F. Appendix A: Field Model for the Proposed Design of "Area 6"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
8	36.0	86.0	-298.0	240.0
8	36.0	67.5	-298.0	0.0
8	36.0	49.0	-298.0	120.0
14	64.0	86.0	692.0	120.0
14	64.0	67.5	692.0	0.0
14	64.0	49.0	692.0	240.0
13	86.0	86.0	1356.0	240.0
13	86.0	67.5	1356.0	120.0
13	86.0	49.0	1356.0	0.0
9	114.0	86.0	-309.0	240.0
9	114.0	67.5	-309.0	0.0
9	114.0	49.0	-309.0	120.0
28	146.2	54.1	465.0	30.0
28	146.2	49.2	465.0	150.0
28	146.2	45.0	465.0	270.0
27	153.8	54.1	544.0	270.0
27	153.8	49.2	544.0	30.0
27	153.8	45.0	544.0	150.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
8	36.0	86.0	-578.0	120.0
8	36.0	67.5	-578.0	0.0
8	36.0	49.0	-578.0	240.0
14	64.0	86.0	938.0	120.0
14	64.0	67.5	938.0	0.0
14	64.0	49.0	938.0	240.0
13	86.0	86.0	1659.0	240.0
13	86.0	67.5	1659.0	0.0
13	86.0	49.0	1659.0	120.0
9	114.0	86.0	-578.0	240.0
9	114.0	67.5	-578.0	0.0
9	114.0	49.0	-578.0	120.0
28	146.2	54.1	465.0	270.0
28	146.2	49.2	465.0	150.0
28	146.2	45.0	465.0	30.0
27	153.8	54.1	544.0	30.0
27	153.8	49.2	544.0	150.0
27	153.8	45.0	544.0	270.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



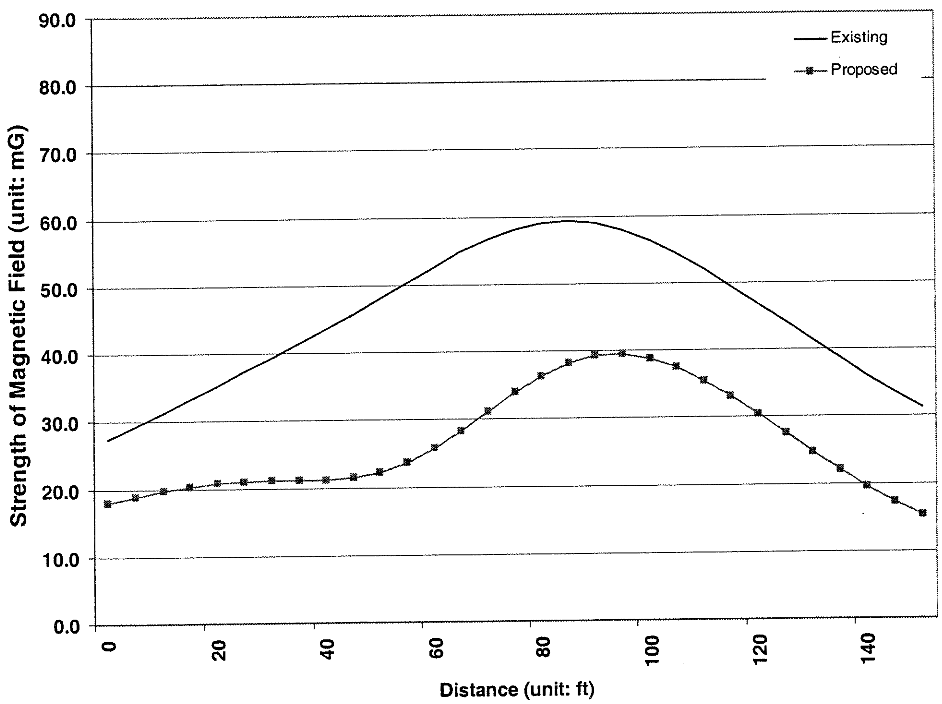
G. Appendix A: Field Model for the Proposed Design of "Area 7"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
8	36.0	92.0	-298.0	240.0
8	36.0	73.5	-298.0	0.0
8	36.0	55.0	-298.0	120.0
14	64.0	92.0	692.0	120.0
14	64.0	73.5	692.0	0.0
14	64.0	55.0	692.0	240.0
13	86.0	92.0	1356.0	240.0
13	86.0	73.5	1356.0	120.0
13	86.0	55.0	1356.0	0.0
9	114.0	92.0	-309.0	240.0
9	114.0	73.5	-309.0	0.0
9	114.0	55.0	-309.0	120.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
8	36.0	92.0	-578.0	120.0
8	36.0	73.5	-578.0	0.0
8	36.0	55.0	-578.0	240.0
14	64.0	92.0	938.0	120.0
14	64.0	73.5	938.0	0.0
14	64.0	55.0	938.0	240.0
13	86.0	92.0	1659.0	240.0
13	86.0	73.5	1659.0	0.0
13	86.0	55.0	1659.0	120.0
9	114.0	92.0	-578.0	240.0
9	114.0	73.5	-578.0	0.0
9	114.0	55.0	-578.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



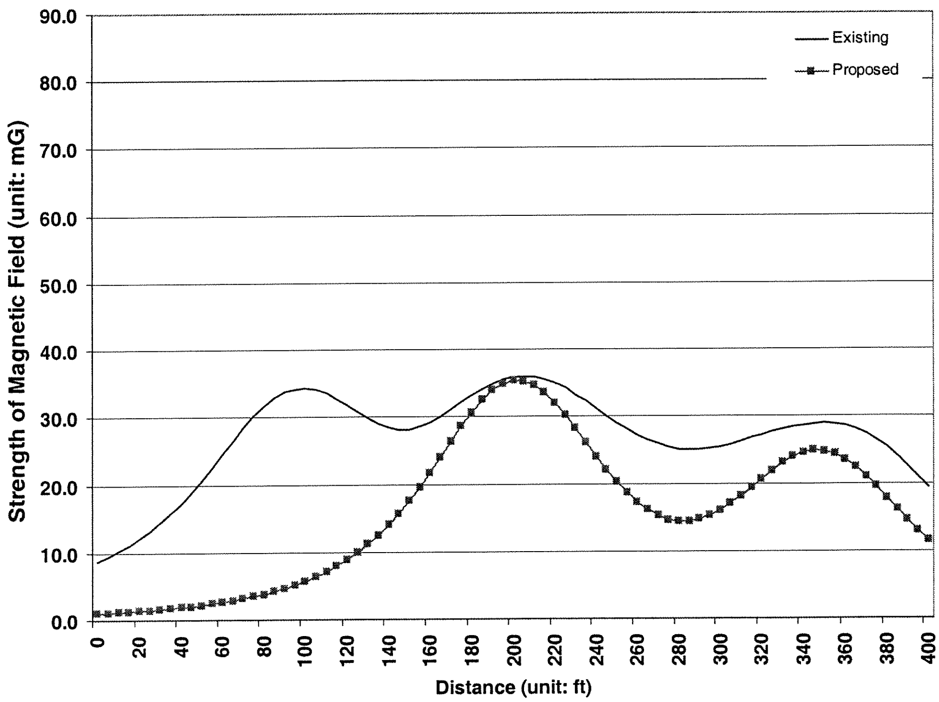
H. Appendix A: Field Model for the Proposed Design of "Area 8"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
8	77.0	53.0	298.0	240.0
8	100.0	53.0	298.0	0.0
8	123.0	53.0	298.0	120.0
10	186.0	90.0	479.0	240.0
10	186.0	71.5	479.0	120.0
10	186.0	53.0	479.0	0.0
11	214.0	90.0	484.0	240.0
11	214.0	71.5	484.0	0.0
11	214.0	53.0	484.0	120.0
9	322.0	50.0	309.0	240.0
9	350.0	50.0	309.0	0.0
9	378.0	50.0	309.0	120.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
8	186.0	90.0	855.0	0.0
8	186.0	71.5	855.0	120.0
8	186.0	53.0	855.0	240.0
10	214.0	90.0	855.0	240.0
10	214.0	71.5	855.0	120.0
10	214.0	53.0	855.0	0.0
11	336.0	90.0	578.0	240.0
11	336.0	71.5	578.0	0.0
11	336.0	53.0	578.0	120.0
9	364.0	90.0	578.0	120.0
9	364.0	71.5	578.0	0.0
9	364.0	53.0	578.0	240.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



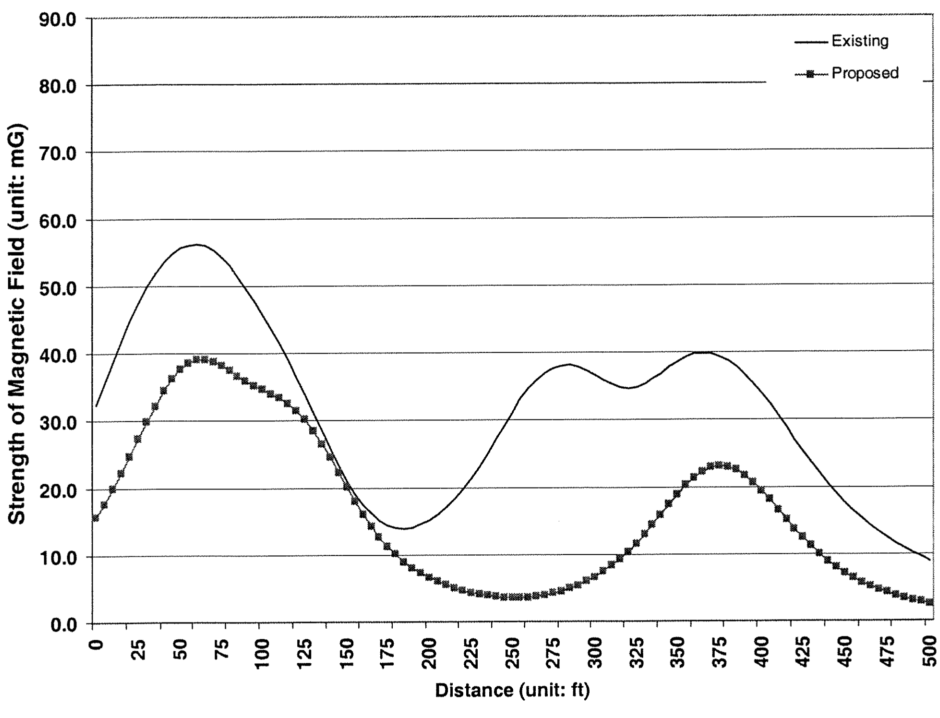
I. Appendix A: Field Model for the Proposed Design of "Area 9"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
10	22.0	50.0	479.0	240.0
10	50.0	50.0	479.0	120.0
10	78.0	50.0	479.0	0.0
15	113.0	50.0	369.0	0.0
15	125.0	50.0	369.0	120.0
15	137.0	50.0	369.0	240.0
8	252.0	53.0	298.0	240.0
8	275.0	53.0	298.0	0.0
8	298.0	53.0	298.0	120.0
11	361.0	90.0	484.0	240.0
11	361.0	71.5	484.0	0.0
11	361.0	53.0	484.0	120.0
9	389.0	90.0	309.0	240.0
9	389.0	71.5	309.0	0.0
9	389.0	53.0	309.0	120.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
10	36.0	90.0	855.0	0.0
10	36.0	71.5	855.0	120.0
10	36.0	53.0	855.0	240.0
15	64.0	90.0	855.0	240.0
15	64.0	71.5	855.0	120.0
15	64.0	53.0	855.0	0.0
8	113.0	50.0	369.0	0.0
8	125.0	50.0	369.0	120.0
8	137.0	50.0	369.0	240.0
11	361.0	90.0	578.0	240.0
11	361.0	71.5	578.0	0.0
11	361.0	53.0	578.0	120.0
9	389.0	90.0	578.0	120.0
9	389.0	71.5	578.0	0.0
9	389.0	53.0	578.0	240.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



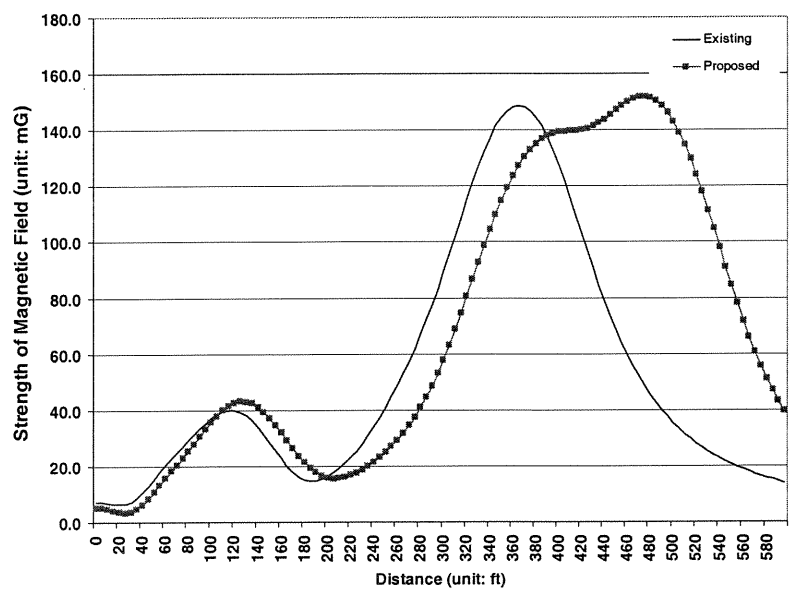
J. Appendix A: Field Model for the Proposed Design of "Area 10"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
17	44.0	61.0	-248.0	0.0
17	44.0	53.0	-248.0	240.0
17	44.0	45.0	-248.0	120.0
18	56.0	61.0	0.0	240.0
18	56.0	53.0	0.0	120.0
18	56.0	45.0	0.0	0.0
16	112.0	50.0	-431.0	0.0
16	135.0	50.0	-431.0	240.0
16	158.0	50.0	-431.0	120.0
5	236.0	97.0	272.0	120.0
5	236.0	78.5	272.0	240.0
5	236.0	60.0	272.0	0.0
4	264.0	97.0	-436.0	0.0
4	264.0	78.5	-436.0	120.0
4	264.0	60.0	-436.0	240.0
1	333.0	67.0	2089.0	120.0
1	365.0	67.0	2089.0	240.0
1	397.0	67.0	2089.0	0.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
17	44.0	61.0	-248.0	0.0
17	44.0	53.0	-248.0	240.0
17	44.0	45.0	-248.0	120.0
18	56.0	61.0	0.0	240.0
18	56.0	53.0	0.0	120.0
18	56.0	45.0	0.0	0.0
16	112.0	50.0	-431.0	0.0
16	135.0	50.0	-431.0	240.0
16	158.0	50.0	-431.0	120.0
5	236.0	97.0	270.0	120.0
5	236.0	78.5	270.0	240.0
5	236.0	60.0	270.0	0.0
4	264.0	97.0	-402.0	0.0
4	264.0	78.5	-402.0	120.0
4	264.0	60.0	-402.0	240.0
1	333.0	67.0	1548.0	120.0
1	365.0	67.0	1548.0	240.0
1	397.0	67.0	1548.0	0.0
2	463.0	67.0	1732.0	0.0
2	495.0	67.0	1732.0	240.0
2	527.0	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



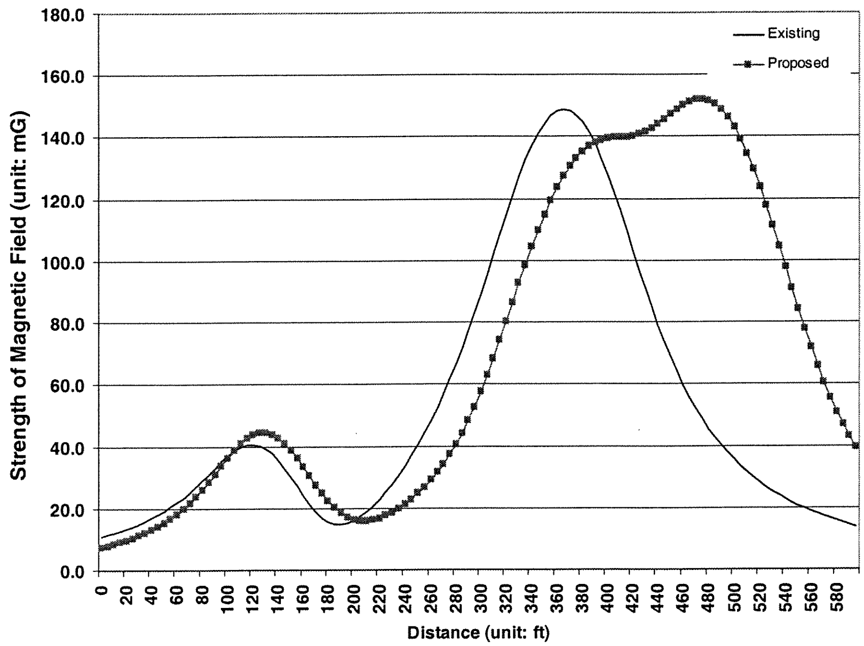
K. Appendix A: Field Model for the Proposed Design of "Area 11"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
19	42.2	52.9	0.0	0.0
19	42.2	45.0	0.0	120.0
19	57.8	45.0	0.0	240.0
16	112.0	50.0	-431.0	0.0
16	135.0	50.0	-431.0	240.0
16	158.0	50.0	-431.0	120.0
5	236.0	97.0	272.0	120.0
5	236.0	78.5	272.0	240.0
5	236.0	60.0	272.0	0.0
4	264.0	97.0	-436.0	0.0
4	264.0	78.5	-436.0	120.0
4	264.0	60.0	-436.0	240.0
1	333.0	67.0	2089.0	120.0
1	365.0	67.0	2089.0	240.0
1	397.0	67.0	2089.0	0.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
19	42.2	52.9	0.0	0.0
19	42.2	45.0	0.0	120.0
19	57.8	45.0	0.0	240.0
16	112.0	50.0	-431.0	0.0
16	135.0	50.0	-431.0	240.0
16	158.0	50.0	-431.0	120.0
5	236.0	97.0	270.0	120.0
5	236.0	78.5	270.0	240.0
5	236.0	60.0	270.0	0.0
4	264.0	97.0	-402.0	0.0
4	264.0	78.5	-402.0	120.0
4	264.0	60.0	-402.0	240.0
1	333.0	67.0	1548.0	120.0
1	365.0	67.0	1548.0	240.0
1	397.0	67.0	1548.0	0.0
2	463.0	67.0	1732.0	0.0
2	495.0	67.0	1732.0	240.0
2	527.0	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



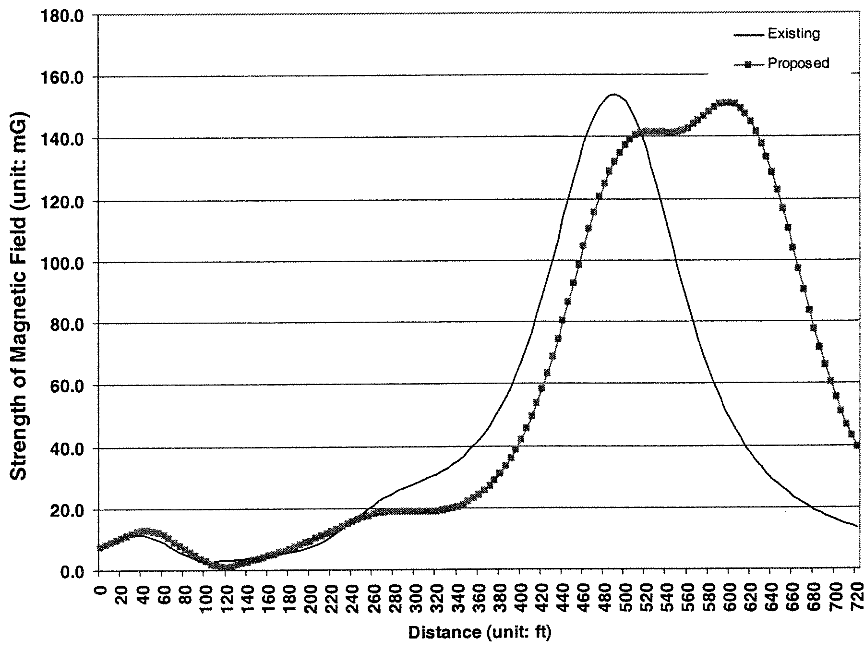
L. Appendix A: Field Model for the Proposed Design of "Area 12"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
18	42.2	54.9	228.0	240.0
18	42.2	47.0	228.0	120.0
18	57.8	47.0	228.0	0.0
31	117.0	60.0	3.1	0.0
31	140.0	60.0	3.1	120.0
31	163.0	60.0	3.1	240.0
5	246.0	102.0	272.0	120.0
5	246.0	83.5	272.0	240.0
5	246.0	65.0	272.0	0.0
4	274.0	102.0	-436.0	0.0
4	274.0	83.5	-436.0	120.0
4	274.0	65.0	-436.0	240.0
1	458.0	67.0	2089.0	120.0
1	490.0	67.0	2089.0	240.0
1	522.0	67.0	2089.0	0.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
18	42.2	54.9	228.0	240.0
18	42.2	47.0	228.0	120.0
18	57.8	47.0	228.0	0.0
31	117.0	60.0	3.1	0.0
31	140.0	60.0	3.1	120.0
31	163.0	60.0	3.1	240.0
5	246.0	102.0	270.0	120.0
5	246.0	83.5	270.0	240.0
5	246.0	65.0	270.0	0.0
4	274.0	102.0	-402.0	0.0
4	274.0	83.5	-402.0	120.0
4	274.0	65.0	-402.0	240.0
1	458.0	67.0	1548.0	120.0
1	490.0	67.0	1548.0	240.0
1	522.0	67.0	1548.0	0.0
2	588.0	67.0	1732.0	0.0
2	620.0	67.0	1732.0	240.0
2	652.0	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



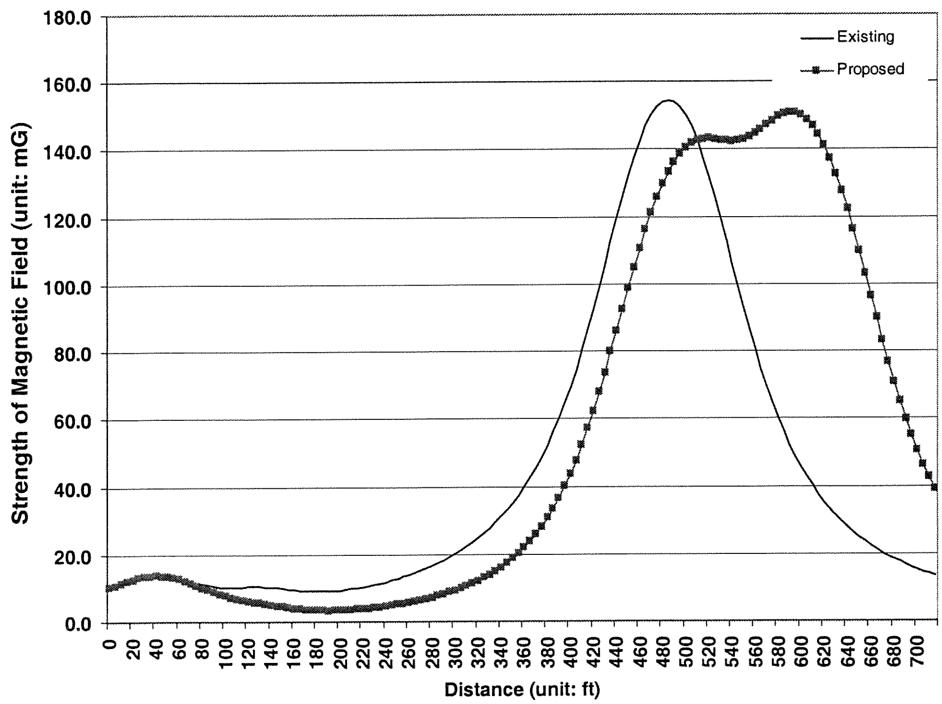
M. Appendix A: Field Model for the Proposed Design of "Area 13"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
7	36.0	102.0	639.0	0.0
7	36.0	83.5	639.0	120.0
7	36.0	65.0	639.0	240.0
4	64.0	102.0	-436.0	0.0
4	64.0	83.5	-436.0	120.0
4	64.0	65.0	-436.0	240.0
6	112.0	63.0	95.0	0.0
6	135.0	63.0	95.0	120.0
6	158.0	63.0	95.0	240.0
1	453.0	67.0	2089.0	120.0
1	485.0	67.0	2089.0	240.0
1	517.0	67.0	2089.0	0.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
7	36.0	102.0	612.0	0.0
7	36.0	83.5	612.0	120.0
7	36.0	65.0	612.0	240.0
4	64.0	102.0	-402.0	0.0
4	64.0	83.5	-402.0	120.0
4	64.0	65.0	-402.0	240.0
6	112.0	63.0	64.0	0.0
6	135.0	63.0	64.0	120.0
6	158.0	63.0	64.0	240.0
1	453.0	67.0	1548.0	120.0
1	485.0	67.0	1548.0	240.0
1	517.0	67.0	1548.0	0.0
2	583.0	67.0	1732.0	0.0
2	615.0	67.0	1732.0	240.0
2	647.0	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



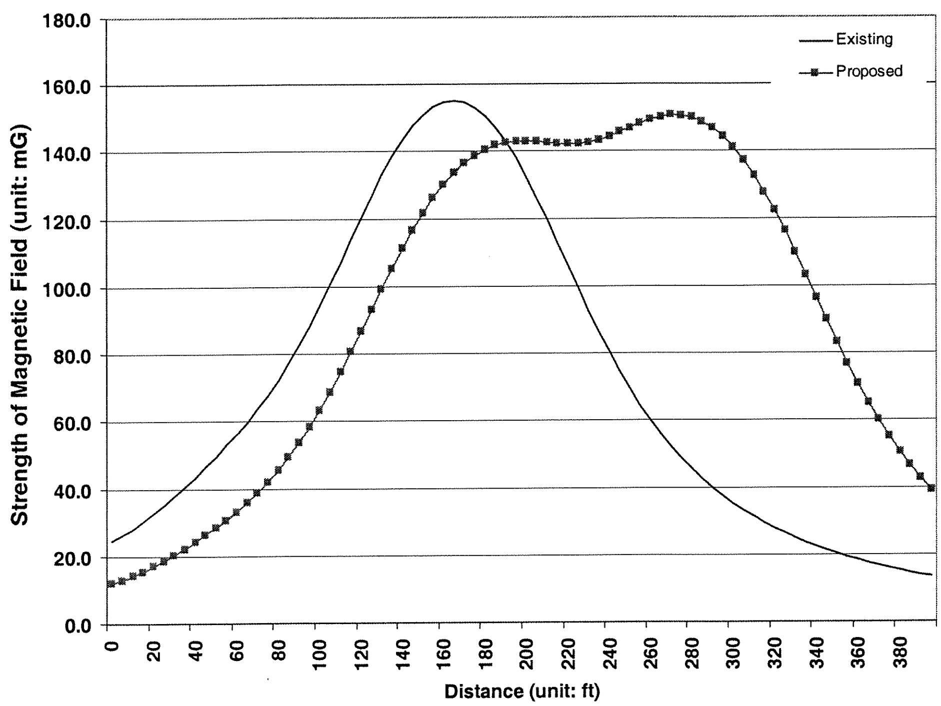
N. Appendix A: Field Model for the Proposed Design of "Area 14"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
6	27.0	55.0	95.0	0.0
6	50.0	55.0	95.0	120.0
6	73.0	55.0	95.0	240.0
1	133.0	67.0	2089.0	120.0
1	165.0	67.0	2089.0	240.0
1	197.0	67.0	2089.0	0.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
6	27.0	55.0	64.0	0.0
6	50.0	55.0	64.0	120.0
6	73.0	55.0	64.0	240.0
1	133.0	67.0	1548.0	120.0
1	165.0	67.0	1548.0	240.0
1	197.0	67.0	1548.0	0.0
2	263.0	67.0	1732.0	0.0
2	295.0	67.0	1732.0	240.0
2	327.0	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



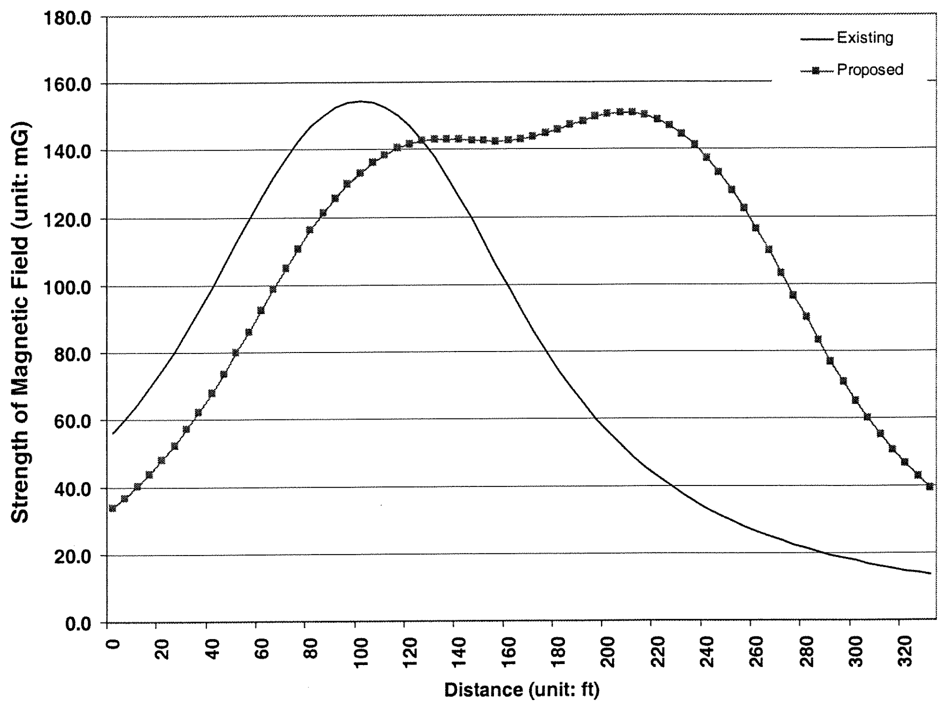
O. Appendix A: Field Model for the Proposed Design of "Area 15"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
1	68.0	67.0	2089.0	120.0
1	100.0	67.0	2089.0	240.0
1	132.0	67.0	2089.0	0.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
1	68.0	67.0	1548.0	120.0
1	100.0	67.0	1548.0	240.0
1	132.0	67.0	1548.0	0.0
2	198.0	67.0	1732.0	0.0
2	230.0	67.0	1732.0	240.0
2	262.0	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



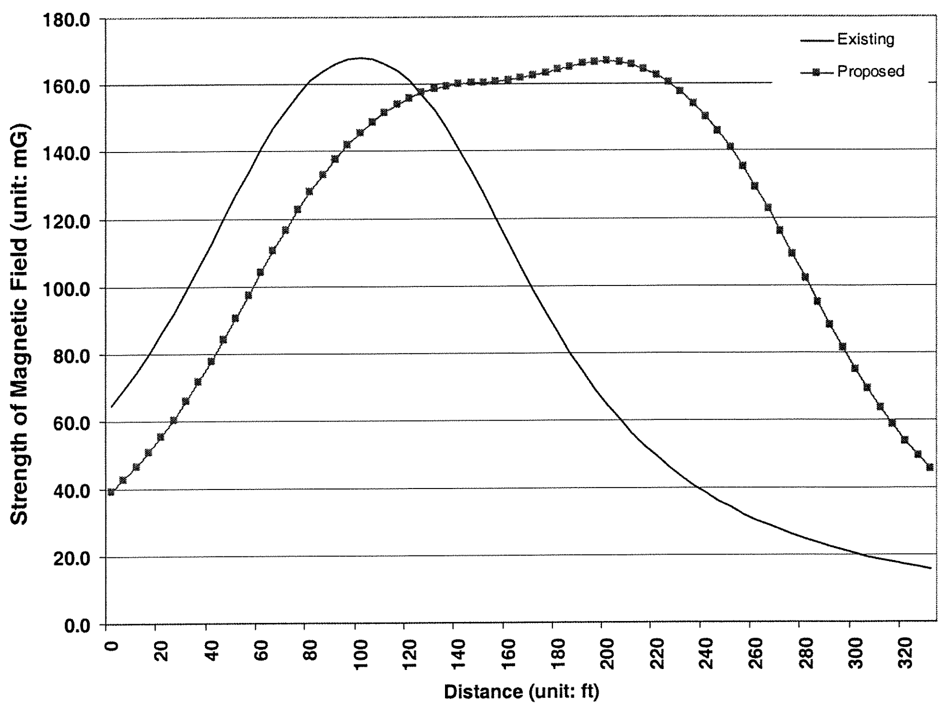
P. Appendix A: Field Model for the Proposed Design of "Area 16"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Curren t (Amp)	Curren t Ang (Deg)
1	63.5	67.0	2089.0	120.0
1	100.0	67.0	2089.0	240.0
1	136.5	67.0	2089.0	0.0

Circuit ID	x(ft)	y(ft)	Curren t (Amp)	Curren t Ang (Deg)
1	63.5	67.0	1548.0	120.0
1	100.0	67.0	1548.0	240.0
1	136.5	67.0	1548.0	0.0
2	193.5	67.0	1732.0	0.0
2	230.0	67.0	1732.0	240.0
2	266.5	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



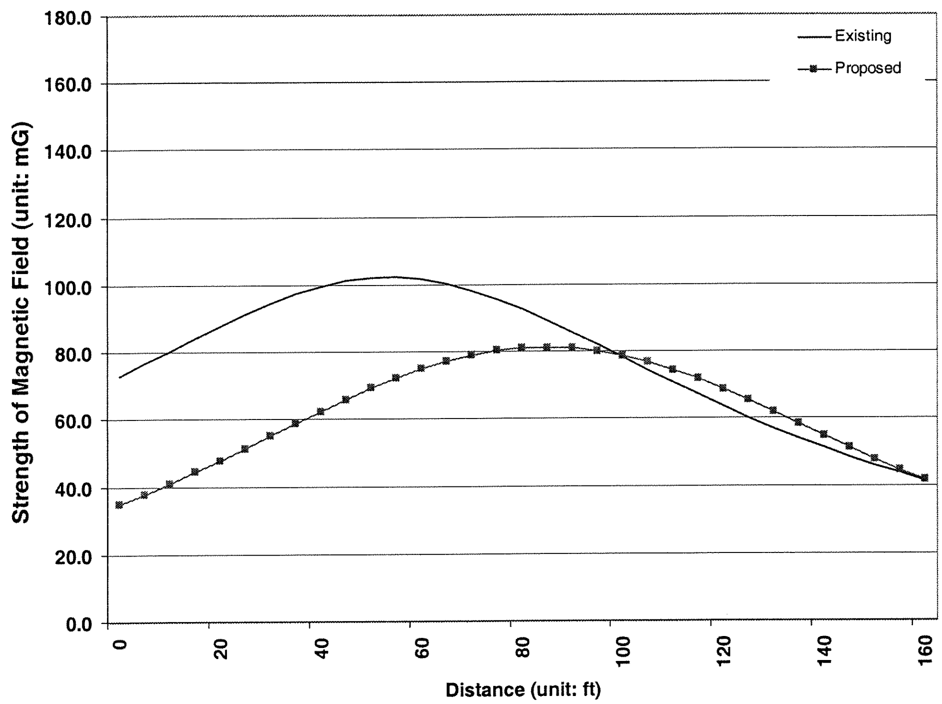
Q. Appendix A: Field Model for the Proposed Design of "Area 17"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
1	53.5	142.0	2089.0	120.0
1	53.5	104.5	2089.0	240.0
1	53.5	67.0	2089.0	0.0

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
1	53.5	142.0	1548.0	120.0
1	53.5	104.5	1548.0	240.0
1	53.5	67.0	1548.0	0.0
2	106.5	142.0	1732.0	0.0
2	106.5	104.5	1732.0	240.0
2	106.5	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



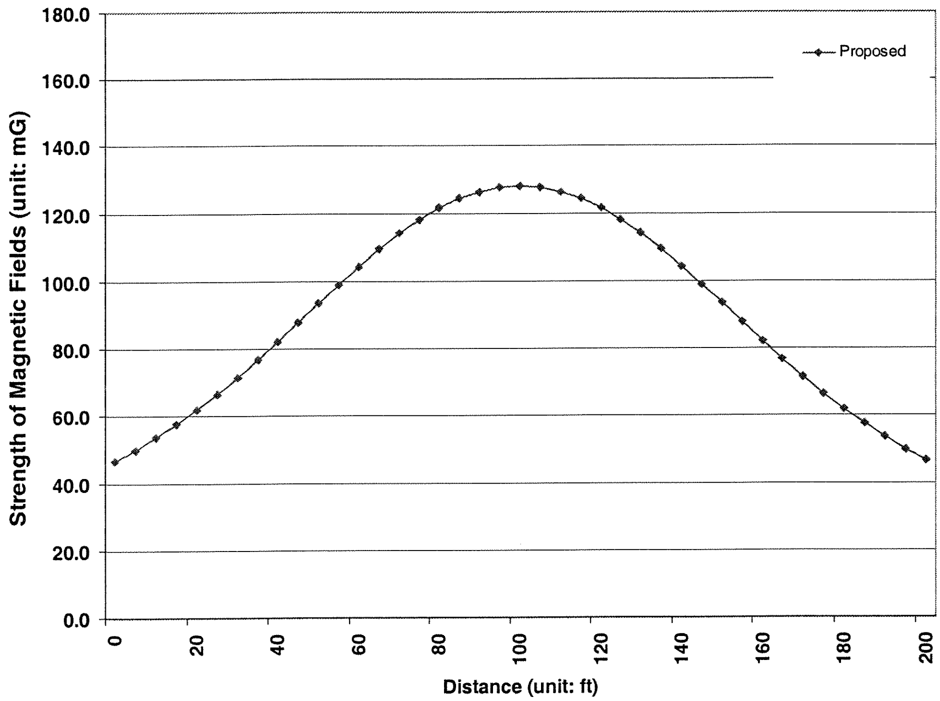
R. Appendix A: Field Model for the Proposed Design of "Area 18"

Input Data (*Left Table: Existing Design, Right Table: Proposed Design*)

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
No Existing Circuits				

Circuit ID	x(ft)	y(ft)	Current (Amp)	Current Ang (Deg)
2	68.0	67.0	1732.0	0.0
2	100.0	67.0	1732.0	240.0
2	132.0	67.0	1732.0	120.0

Output Graph (Edges of right-of-way are located at the endpoints of "Distance" axis.)



S. Appendix B: Circuit Names, ID, and Year 2008 Forecasted Loading Conditions Before and After the Project

	Circuit Name	Before DPV2 Project (Amp)	After DPV2 Project (Amp)
1	Devers–(Palo Verde) 500 kV No. 1	2089	1548
2	Devers–(Palo Verde) 500 kV No. 2	N/A	1732
3	(Devers)–Hinds 230 kV --- Idle	0	0
4	(Devers)–Coachella 230 kV	436	402
5	Devers–(Mirage) 230 kV	272	270
6	Mirage–(Hinds) 230 kV	95	64
7	(Coachella)–Ramon 230 kV	639	612
8	(Devers)–San Bernardino No. 1 230 kV	298	578
9	(Devers)–San Bernardino No. 2 230 kV	309	578
10	(Devers)–Vista No. 1 230 kV	479	855
11	(Devers)–Vista No. 2 230 kV	484	855
12	(Blythe)–Eagle Mountain 161 kV	285	308
13	(San Bernardino)–Vista 230 kV	1356	1659
14	(San Bernardino)–Etiwanda 230 kV	692	938
15	(Devers)–Banning–Wind Park–Zanja 115 kV	369, 369, 0, 0	
16	(Devers)–Eisenhower 115 kV	431	
17	(Devers)–High Desert–Terawind–Yucca 115 kV	248, 248, 0, 0	
18	Devers–Capwind–Concho–(Mirage) 115 kV	0, 0, 698, 228	
19	Garnet–Santa Rosa 115 kV (idle by year 2008)	0	

	Circuit Name	Before DPV2 Project (Amp)	After DPV2 Project (Amp)
20	(San Bernardino)–Maraschino 115 kV	383, 383	
21	(Valley)–Mayberry–Moreno–Vista 115 kV	687, 681, 8, 0	
22	(San Bernardino)–Vista–(Cardiff)–Unimed 66 kV	390, 273, 97, 0	
23	(Vista)–Calectric 115 kV	723, 723	
24	Out of Service (former Vista–Redlands–Tennessee–Yucaipa 66 kV)	0	
25	(Valley)–Moreno–Vista 115 kV	260, 260, 0	
26	(San Bernardino)–Vista–Del Rosa 66 kV	366, 0, 366	
27	(San Bernardino)–Redlands–Timoteo 66 kV	544, 510, 38	
28	(San Bernardino)–(Redlands)–Tennessee–Yucaipa 66 kV	465, 166, 294, 336	
29	(San Bernardino)–Timoteo 66 kV	901	
30	(San Bernardino)–Redlands 66 kV	565	

Note:

1. Names in parenthesis indicate that the power is flowing from them to others (names without parenthesis).
2. "Before DPV2 Project" indicates the year 2008 forecasted loading conditions without having DPV2 project.
3. Circuit 1 through 14, DPV2 project changes loading conditions while DPV2 does not change loading conditions for Circuit 15 through 30.
4. If a circuit is connected to more than two substations, it has more than one loading information; applicable to Circuit 15 through 30. The Circuit 28, for example, San Bernardino delivers 465 Amp., Redlands delivers 166 Amp., while Tennessee receives 294 Amp. And Yucaipa receives 336 Amp.
5. Forecasting data is based upon scenarios representing 2003 load forecasts (SCE and neighboring utilities) for the year 2008. The forecasting data is subject change depending upon availability of generations, load increase, changes in load demand and by many other factors.

T. Appendix C: Proposed Structure Configurations

Figure IX-6
Typical 500 kV Single Circuit Structure

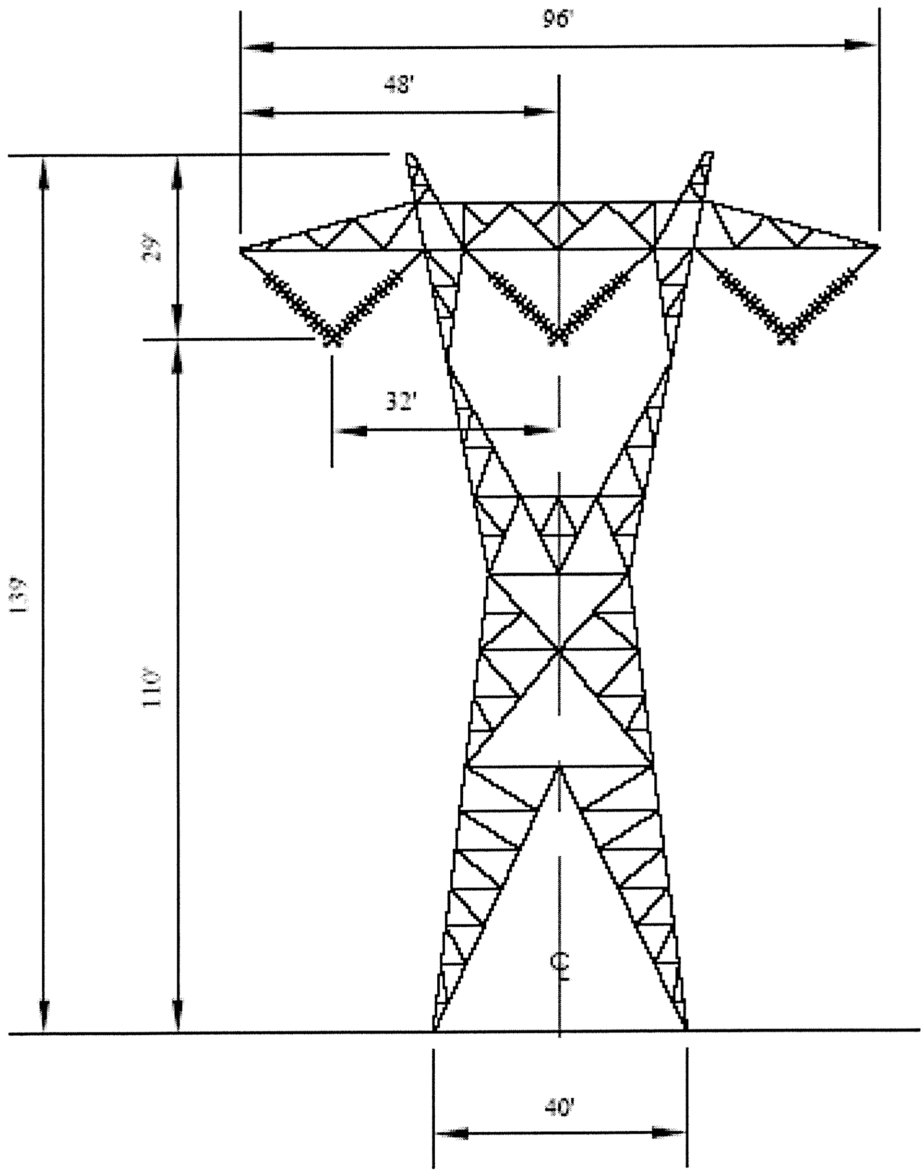


Figure IX-7
Typical 500 kV Double-Circuit Structure

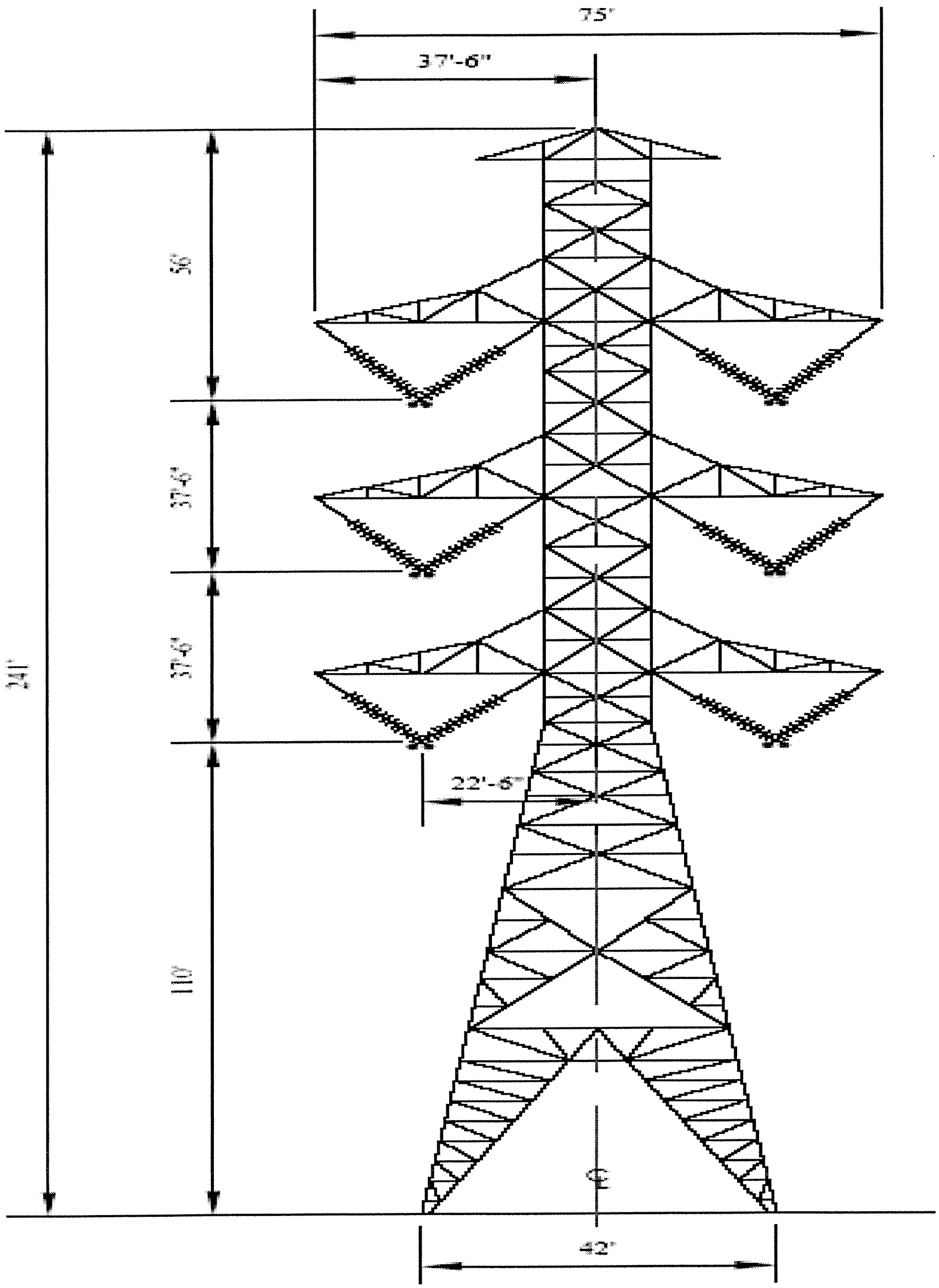


Figure IX-8
Typical 500 kV Single-Circuit Two-Legged Structure

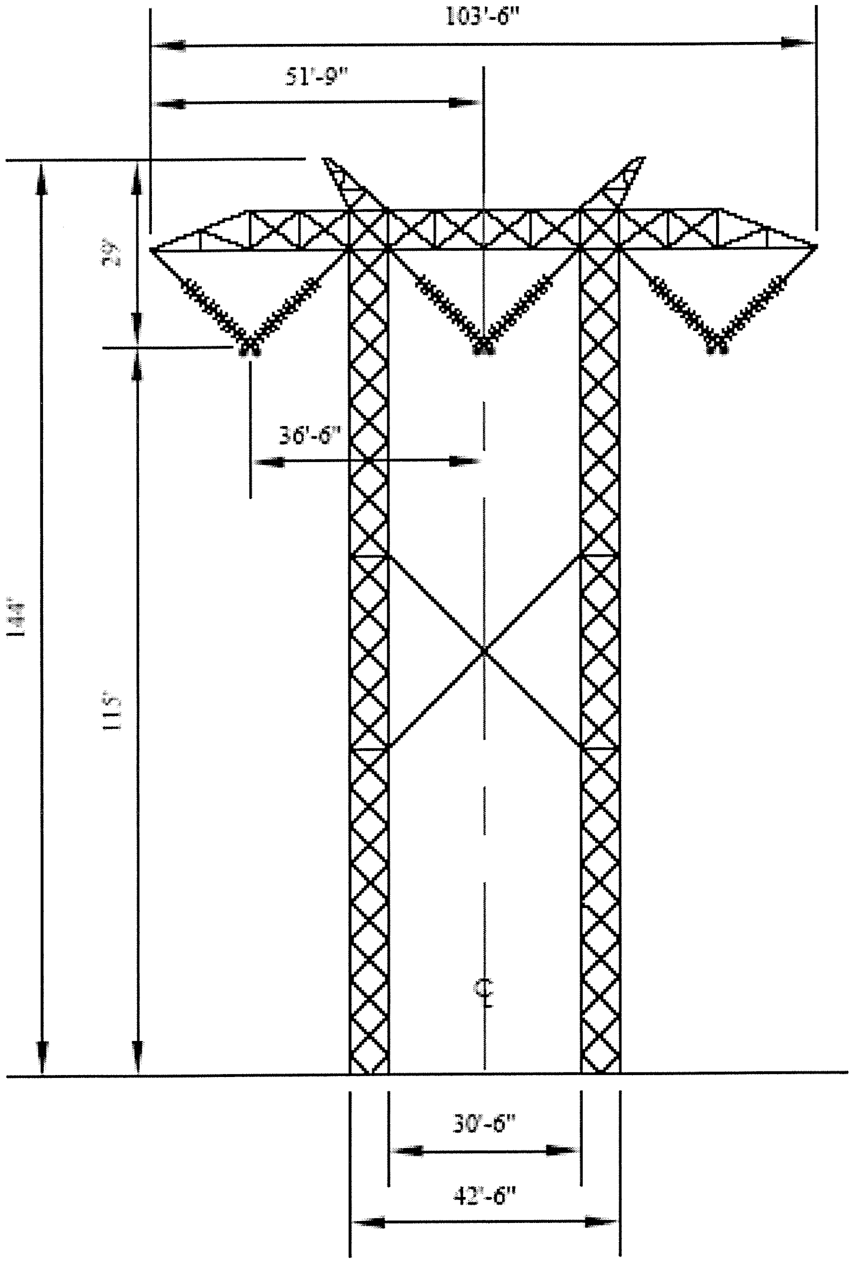
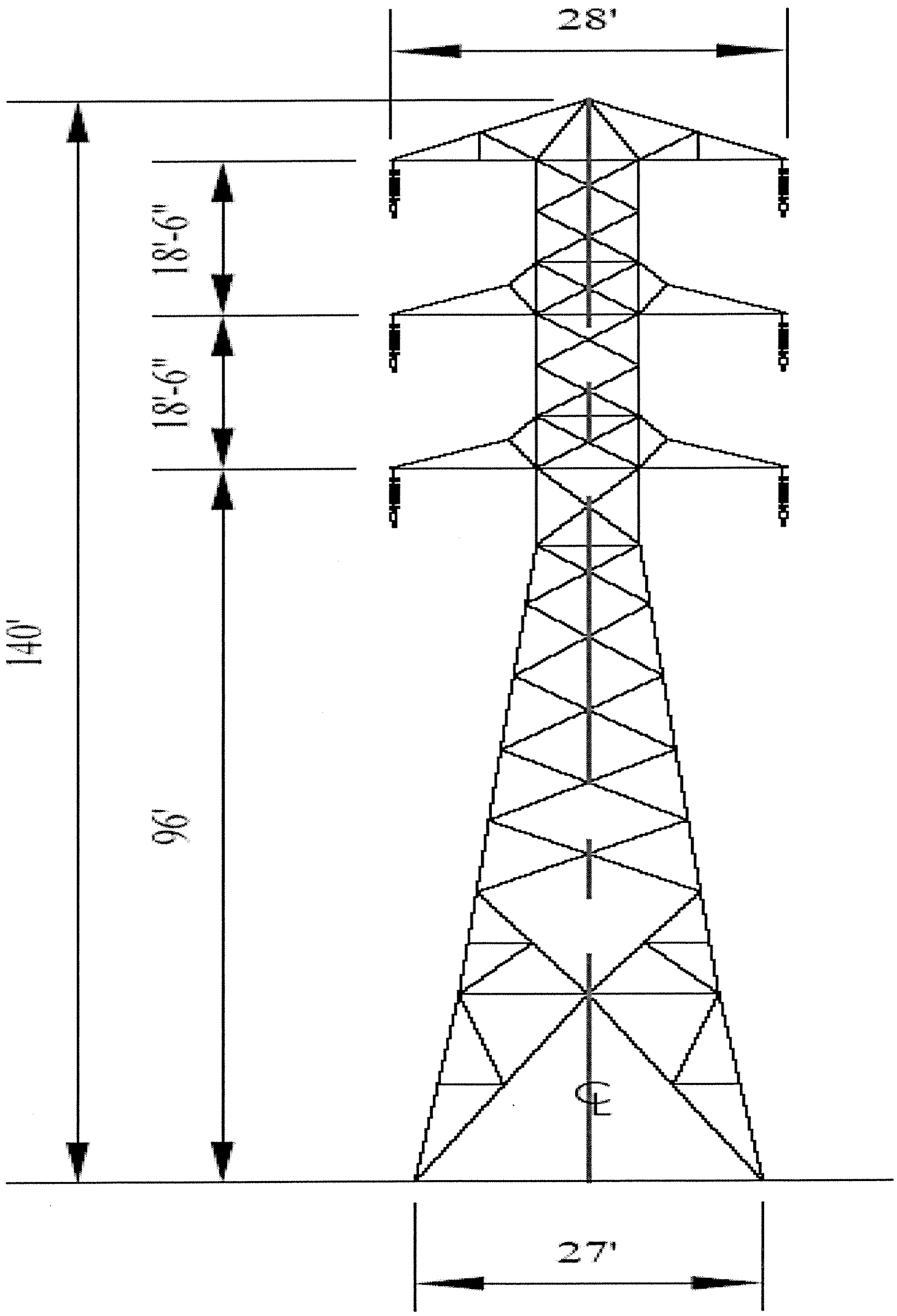


Figure IX-9
Typical 230 kV Double-Circuit Structure



U. Appendix D: Maps Showing Proposed and Alternative Line Routes

Figure IX-10
Devers-Harquahala Project Area and Line Routes

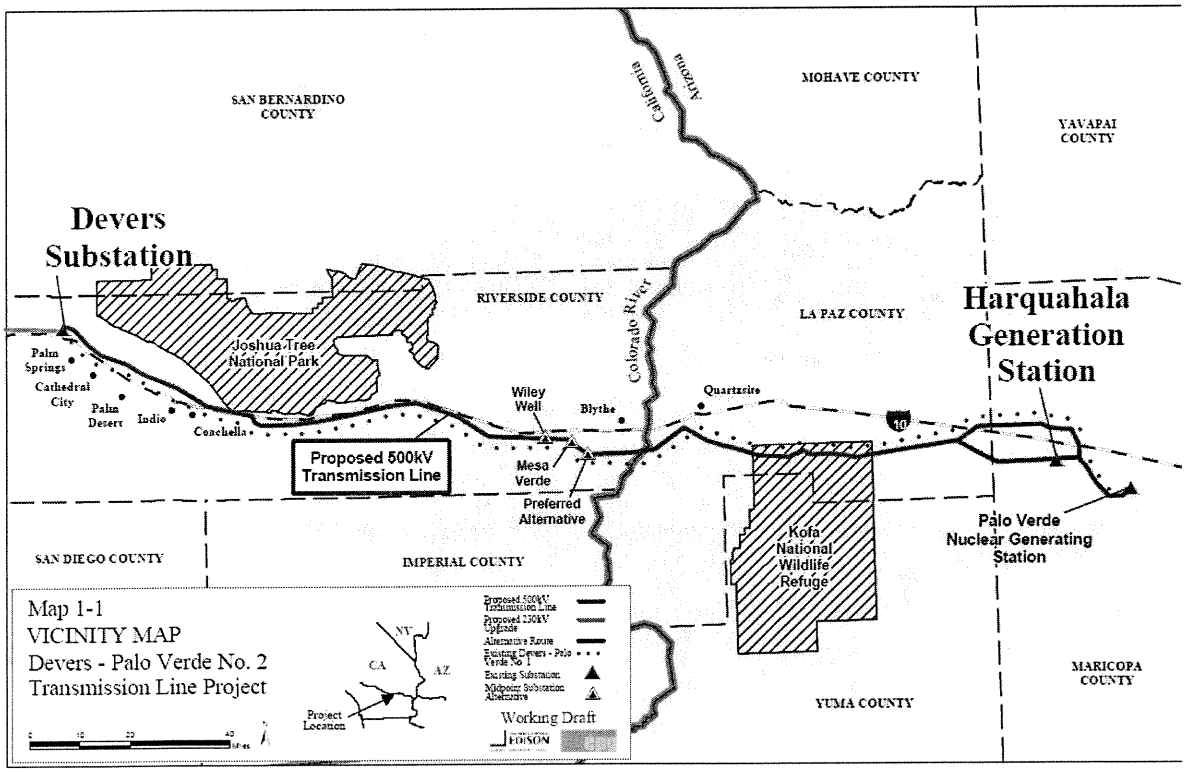
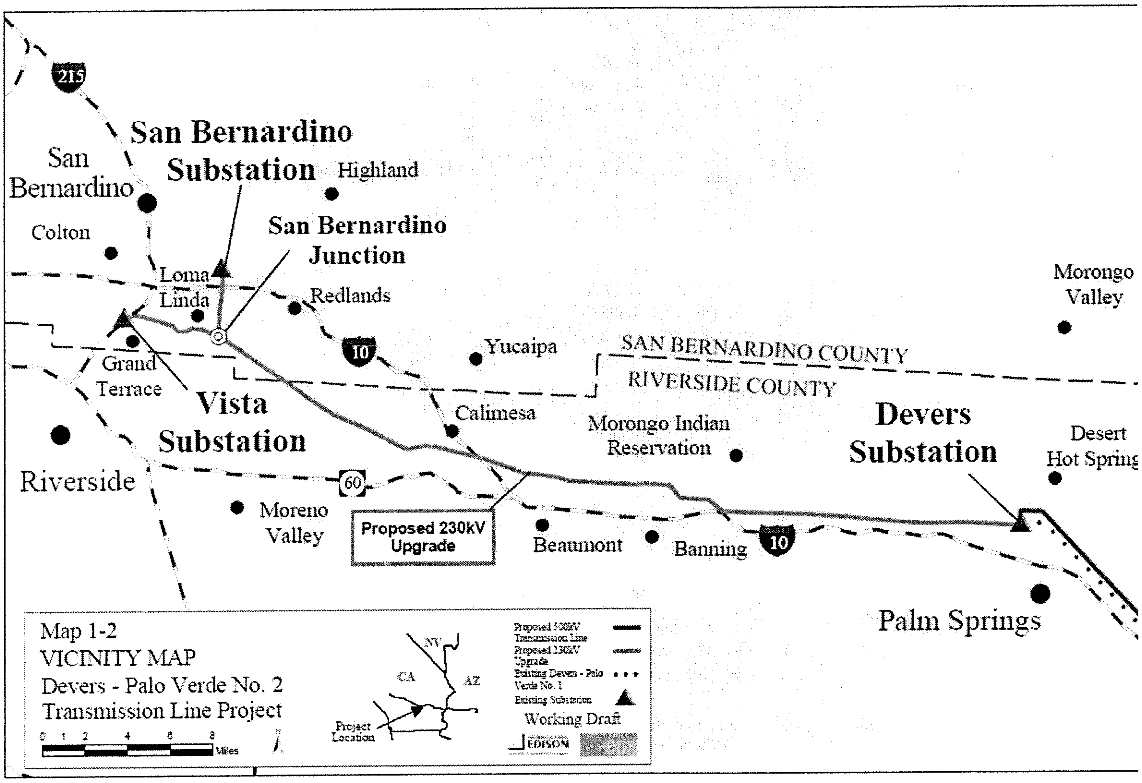


Figure IX-11
West-of-Devers Project Area and Proposed & Alternative Line Routes



Appendix C

NOTICE OF APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

APPENDIX C

NOTICE OF APPLICATION FOR A CERTIFICATE OF PUBLIC CONVENIENCE AND NECESSITY

DEVERS-PALO VERDE NO. 2 PROJECT

Reference: CPUC Application No. 05-04-XXX

Date:

Proposed Project: Southern California Edison Company (SCE) proposes to construct a new 230-mile, high-voltage electric transmission line between California and Arizona known as the Devers - Harquahala 500 kilovolt (kV) transmission line. Operation of the proposed line would require that upgrades be made to some of SCE's existing electrical transmission facilities in California. The proposed line and transmission facility upgrades are known as the Devers - Palo Verde No. 2 project (DPV2). DPV2 would be constructed within existing SCE rights-of-way and those to be acquired. Construction of DPV2 would add transmission facilities necessary to import additional lower-cost electricity into California.

Devers - Arizona

The proposed Devers - Harquahala 500 kV transmission line would be constructed from SCE's Devers Substation (Devers) located near Palm Springs, California to the Harquahala Generating Station Switchyard (Harquahala), located near the Palo Verde Nuclear Generating Station (PVNGS) west of Phoenix, Arizona. The proposed line would be 230 miles of which 102 miles would be located in Arizona and 128 miles would be located in California. The preferred route would parallel SCE's existing Devers-Palo Verde No. 1 500 kV transmission line.

The proposed Devers - Harquahala 500 kV transmission line would be constructed on approximately 784 single- and double-circuit structures. Four types of 500 kV structures would be utilized for the proposed 500 kV transmission line:

- Approximately 709, four-legged, single-circuit lattice steel towers (typically 150 feet tall)
- Approximately 39, two-legged (or H-frame) single-circuit towers in the Palo Verde Valley (typically 144 feet tall)
- Thirteen existing double-circuit lattice steel towers in the Copper Bottom Pass of the Dome Rock Mountains in Arizona (typically 241 feet tall)
- Approximately 23 tubular steel poles parallel to the existing Harquahala - Hassayampa 500 kV pole line east of Harquahala (typically 140 feet tall)

The proposed 500 kV transmission line would be strung with two-conductor bundled 2156 kcmil conductor (approximately 1 3/4" in diameter) with nonspecular finish.

At Harquahala, a new 145-foot-high by 100-foot-wide dead-end structure, circuit breakers, and disconnect switches would be installed in the existing switchyard. Equipment necessary to provide substation control and data acquisition would be installed.

At Devers, a new 133-foot-high by 90-foot-wide dead-end structure, circuit breakers and disconnect switches would be installed in the existing switchyard. A 500 kV Static VAR Compensator would be installed north of the 500 kV switchyard on approximately two acres within the existing Devers property.

A new 500 kV shunt reactor bank and associated disconnect switches would be installed on approximately two acres of property adjacent to the proposed Devers-Harquahala 500 kV transmission line right-of-way immediately north of Harquahala.

A new 500 kV series capacitor bank would be installed within the transmission line right-of-way on a two acre site approximately 55 miles west of Harquahala in Arizona.

A new 500 kV series capacitor bank on a two acre site would be installed within the transmission line right-of-way approximately 64 miles east of Devers in California.

Installation of optical fiber on new transmission line structures, construction of a new microwave communications facility at an existing microwave site at Harquahala Mountain in Arizona, and construction of an optical repeater facility approximately 5 miles west of Blythe, California would be required for the DPV2 project. Approximately 3 miles of existing groundwire would be replaced with a single optical fiber ground wire on the double-circuit tower line through Copper Bottom Pass. In addition, microwave and synchronous optical network equipment would be installed at the following existing SCE and Arizona Public Service (APS) communication facilities: Devers, DPV2 California series capacitor station, Cunningham Communication Site (APS), Smith Peak Communication Site (APS), DPV2 Arizona series capacitor station, and Harquahala.

West-of-Devers

Upgrades to SCE's existing 230 kV transmission system between Devers and SCE's Vista and San Bernardino substations in San Bernardino County would include the following:

- Removal of an existing 40-mile, single-circuit wood H-frame 230 kV line between Devers and San Bernardino Junction. San Bernardino Junction is the intersection of 230 kV transmission line corridors located 3.4 miles south of the San Bernardino Substation.

- Removal of an existing 40-mile, single-circuit lattice steel 230 kV line between Devers and San Bernardino Junction.
- Construction of a new 40-mile, double-circuit 230 kV line between Devers and San Bernardino Junction on approximately 152 lattice steel towers (typically 150 feet tall) within the existing right-of-way.
- Reconductoring of and modification to the existing 40-mile, double-circuit lattice steel 230 kV tower line between Devers and San Bernardino Junction. A number of existing towers may be raised and/or reinforced. Additional structures may be interset between existing structures at some locations.
- Reconductoring both circuits on an existing 4.8-mile, double-circuit 230 kV lattice steel tower line between Vista Substation and San Bernardino Junction. A number of structures may be interset between existing structures. Some structures will be replaced. Some structures may be raised.
- Reconductoring one circuit on each of the two existing 3.4-mile, double-circuit 230 kV lattice steel tower lines between San Bernardino Substation and San Bernardino Junction.

The proposed west of Devers 230 kV transmission line upgrades would utilize two-conductor bundled 1033 kcmil conductors (approximately 1 1/4 " in diameter) with nonspecular finish.

Environmental Assessment: SCE has prepared a Proponent's Environmental Assessment (PEA) which includes analysis of potential environmental impacts that could be created by the construction and operation of the proposed project. The PEA concludes that all potential environmental impacts associated with the proposed project would be mitigated to less than significant levels through the implementation of mitigation measures.

EMF Compliance: The California Public Utilities Commission (CPUC) requires utilities to employ "no cost" and "low cost" measures to reduce public exposure to electric and magnetic fields (EMF). In accordance with SCE's "EMF Design Guidelines for New Electrical Facilities: Transmission Substation and Distribution", filed with the CPUC in compliance with CPUC Decision No. 93-11-013, SCE will implement the following measure(s) for this project:

Devers-Harquahala

- Utilize a typical horizontal 500 kV tower height of 150 feet.
- Install 500 kV transposition towers near the same locations as existing transposition towers for the Devers–Palo Verde No. 1 500 kV transmission line. The transposition towers are special towers used to physically rearrange the phases of conductors on a transmission line, and they enable magnetic field reduction in addition to phase impedance equalization across the line route.
- Utilize the existing right-of-way.

West-of-Devers

- Replace single-circuit towers with double-circuit 230 kV towers.
- Utilize a typical double-circuit 230 kV tower height of 150 feet.
- Position equally loaded circuits on the same towers for maximum magnetic field cancellation effects.
- Change phasing sequences for existing transmission lines to further reduce the magnetic field levels.
- Utilize the existing right-of-way.

Public Review Process: SCE has applied to the CPUC for a Certificate of Public Convenience and Necessity for this project. Pursuant to the CPUC Rules of Practice and Procedure, any affected party may, within 30 days of the date on this notice, i.e. no later than *[30 calendar days after the CPCN Notice date],* protest and request that the CPUC hold hearings on the application. If the CPUC as a result of its investigation determines that public hearings should be held, notice shall be sent to each person or entity who is entitled to notice or who has requested a hearing.

All protests must be mailed to the CPUC and SCE concurrently and should include the following:

1. Your name, mailing address and day-time telephone number.
2. Reference to the CPUC Application Number and Project Name identified above.
3. A clear and concise description of the reason for the protest.

Protests for this Application must be mailed WITHIN 30 CALENDAR DAYS to:

California Public Utilities Commission Docket Office, Room 2001 505 Van Ness Avenue San Francisco, CA 94102	**AND**	Southern California Edison Co. Law Dept. - Exception Mail 2244 Walnut Grove Avenue Rosemead, CA 91770 Attention: Ms. R. Sweet	**AND**	California Public Utilities Commission Director, Energy Division 505 Van Ness Avenue, 4th Floor San Francisco, CA 94102

For assistance in filing a protest, please call the CPUC Public Advisor in San Francisco at (415) 703-2074, or in Los Angeles at (213) 576-7057.

To review a copy of SCE's Application, or to request further information, please contact:

Coachella, Indian Wells, Indio,
La Quinta, Palm Desert,
Rancho Mirage
Kathleen DeRosa
(760) 202-4211
SCE Palm Springs Service Center
36100 Cathedral Canyon Drive
Cathedral City, CA 92234

Banning, Beaumont, Cathedral City, Desert Hot Springs, Palm Springs
Lin Juniper
(760) 202-4231
SCE Palm Springs Service Center
36100 Cathedral Canyon Drive
Cathedral City, CA 92234

City of San Bernardino, San Bernardino County, Colton
Ray Gonzalez
(909) 307-6726
SCE Redlands Service Center
287 Tennessee Street
Redlands, CA 92373

Quartzsite, La Paz County,
Maricopa County
Vincent Haydel
(602) 499-9888
DPV2 Arizona Office
4350 East Camelback Road, Suite G200
Phoenix, AZ 85018 Riverside County,

Blythe
David Ramirez
(760) 922-9158
Blythe Service Center
505 W. 14th
Blythe, CA 92225

Grand Terrace, Calimesa, Loma Linda, Redlands, Yucaipa
Beverly Powell
(909) 307-6742
SCE Redlands Service Center
287 Tennessee Street
Redlands, CA 92373

DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

NEWSPAPERS OF GENERAL CIRCULATION

Newspaper	Area
Palo Verde Times	Blythe
Redlands Facts	Redlands
Yucaipa/Calimesa News	Yucaipa / Calimesa
Valley Messenger	
Record Gazette	
Riverside Press Enterprise	Riverside County
Desert Sun	Palm Springs / Palm Desert

Appendix D

ARTICLES OF INCORPORATION

FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

APPENDIX D

ARTICLES OF INCORPORATION FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

A certified copy of SCE's Restated Articles of Incorporation, effective April 12, 2004, was filed with the Commission on May 3, 2004 with SCE's Application No. 04-05-005. These Articles are incorporated herein by reference.

SCE intends to own 100 percent (100%) of the assets comprising the project, and to recover the cost of those assets in its transmission rates. The assets will be financed with the same ratio of debt and equity by which SCE finances its other transmission assets, in keeping with the capital structure approved for SCE by the Commission. SCE would intend to finance the project through retained earnings, available case, and debt financing as necessary. A copy of SCE's proxy statement sent to SCE's shareholders, dated March 17, 2004, was filed with the Commission on November 9, 2004, in A.04-11-008, and is incorporated herein by reference.

Appendix E

FINANCIAL STATEMENT

FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

APPENDIX E

FINANCIAL STATEMENT
FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

SOUTHERN CALIFORNIA EDISON COMPANY
BALANCE SHEET
SEPTEMBER 30, 2004

ASSETS
(Unaudited)
(Millions of Dollars)

UTILITY PLANT:	
Utility plant, at original cost	$16,763
Less - Accumulated depreciation and decommissioning	(4,588)
	12,175
Construction work in progress	737
Nuclear fuel, at amortized cost	153
	13,065
OTHER PROPERTY AND INVESTMENTS:	
Nonutility property, at cost - less accumulated provision for depreciation of $543	519
Property of variable interest entities - net	384
Nuclear decommissioning trusts, at cost	2,609
Other Investments	181
	3,693
CURRENT ASSETS:	
Cash and equivalents	188
Restricted cash	70
Receivables, including unbilled revenues, less reserves of $32 for uncollectible accounts	1,464
Fuel inventory	7
Materials and supplies, at average cost	192
Accumulated deferred income taxes - net	224
Prepayments and other current assets	94
	2,239
DEFERRED CHARGES:	
Regulatory assets - net	265
Other deferred charges	537
	802
	$19,799

SOUTHERN CALIFORNIA EDISON COMPANY
BALANCE SHEET
SEPTEMBER 30, 2004

CAPITALIZATION AND LIABILITIES

(Unaudited)
(Millions of Dollars)

CAPITALIZATION:	
Common stock	$2,168
Additional paid-in capital	347
Accumulated other comprehensive loss	(16)
Retained Earnings	1,864
Common shareholder's equity	4,363
Preferred stock without mandatory redemption requirements	129
Preferred stock with mandatory redemption requirements	139
Long-term debt	5,133
	9,764
CURRENT LIABILITIES:	
Preferred stock to be redeemed within one year	9
Long-term debt due within one year	247
Accounts payable	1,105
Accrued taxes	608
Regulatory liabilities - net	9
Other current liabilities	1,236
	3,214
DEFERRED CREDITS:	
Accumulated deferred income taxes - net	2,748
Accumulated deferred investment tax credits	128
Customer advances and other deferred credits	524
Power purchase contracts	154
Accumulated provision for pensions and benefits	386
Asset retirement obligations	2,153
Other long-term liabilities	251
	6,344
MINORITY INTEREST	477
	$19,799

SOUTHERN CALIFORNIA EDISON COMPANY

STATEMENT OF INCOME

9 MONTHS ENDED SEPTEMBER 30, 2004

(Unaudited)

(Millions of Dollars)

OPERATING REVENUE	$6,527
OPERATING EXPENSES:	
Fuel	550
Purchased power	2,022
Provisions for regulatory adjustment clauses - net	(85)
Other operation and maintenance expenses	1,752
Depreciation, decommissioning and amortization	628
Property and other taxes	134
Total operating expenses	5,001
OPERATING INCOME	1,526
Interest and dividend income	14
Other nonoperating income	50
Interest expense - net of amounts capitalized	(310)
Other nonoperating deductions	(42)
Minority interest	(236)
NET INCOME BEFORE TAX	1,002
INCOME TAX	398
NET INCOME	604
DIVIDENDS ON PREFERRED STOCK	4
EARNINGS AVAILABLE FOR COMMON STOCK	$600

Appendix F

COMPETING ENTITIES

FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

APPENDIX F

COMPETING ENTITIES
FOR DEVERS-PALO VERDE NO. 2 TRANSMISSION LINE PROJECT

Within California, the proposed construction lies entirely within the boundaries of SCE's existing service territory, and as such, it will not compete with any other utility, corporation or person.

In Arizona, the proposed construction will not compete with any other utility, corporation or person.