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**I. Executive Summary**

[REDACTED] has applied for the interconnection of 323.6MW of generation from their [REDACTED] Project to the Vista 115kV System under the terms of SCE Wholesale Distribution Access Tariff (WDAT).

The Project consists of [REDACTED] 108.2MW gas turbine generators with a combined auxiliary load of 1MW for a total net Generation of 323.6MW interconnected to the existing SCE Highgrove Generating Station 115kV Switchyard via three generator – owned 115/33kV transformers. The [REDACTED] existing Highgrove – Vista Nos. 1 and 2 115kV Lines will connect the generation to the Vista 115kV Switchyard and ultimately to the CAISO Grid at the Vista 220kV Bus.

[REDACTED] requested an interconnection date of May 1, 2007.

A Sub-Transmission System Impact Study was prepared to address the impact of the new generation to the Vista 115kV System. The Executive Summary of the Study dated April 18, 2005 is attached as Exhibit A for reference.

A Transmission System Impact Study was prepared to address the impact of the new generation to the 500kV and 220kV Transmission Systems. The Executive Summary of the Study dated April 7, 2005 is attached as Exhibit B for reference.

**II. System Impact Studies Results**

**II.a Sub-Transmission S.I.S.**

The Sub-Transmission S.I.S. concluded the existing 115kV Lines are adequate to support the resulting load flow after the new generation is interconnected to the system.

The S.I.S. identified 115kV Buses at the following ten locations where the new generation will increase the Three-Phase Short Circuit Duty by 0.1kA or more:

- Altwind                      Callectic                      Devil Canyon                      Highgrove                      Homart
- Mohave Siphon    Pepper                      San Bernardino                      Shandin                      Vista

The S.I.S. identified 115kV Buses at the following five locations where the new generation will increase the Single Phase to Ground Short Circuit Duty by 0.1kA or more:

- Callectic                      Highgrove                      San Bernardino                      Shandin                      Vista

**II.b Transmission S.I.S.**

The Transmission S.I.S. concluded that the system is not adequate to support the new generation.

The S.I.S. analyzed the System under the following conditions:

1. Existing Devers – Harquahala (DPV2) 500kV Transmission Line in service
2. West-of-Devers upgrades in service
3. The West of Devers upgrades include the upgrades of the Devers – San Bernardino Nos. 1 & 2 and Devers – Vista Nos. 1 & 2 220kV T/L's by re-conductoring the lines with new 2-1033KCMIL ACSR Conductors rated at 2480A and any required upgrades of the substations terminal equipment to maintain the line ratings

The S.I.S. concluded that the new generation would cause the following overloads on the existing 500kV and 220kV Transmission Lines:

**Base Case:**

Devers – Valley 500kV T/L Normal Rating 3000A Loaded to 3414A (114%)  
 Solution: Upgrade the Line to 3950A (Normal Rating of existing 2-2156KCMIL ACSR Line Conductors) and 4000A Emergency Rating to eliminate Base Case and all Contingency over-loads

This upgrade also eliminates all single and double contingency overloads.

**Single (N-1) Contingencies:**

The S.I.S. determined that the following six transmission lines are overloaded beyond their long term emergency ratings under nine single – element outages:

- |  |   |
|--|---|
| 1. Devers – Valley 500kV T/L           | Base Case upgrade eliminates N – 1 overload     |
| 2. Etiwanda – Vista 220kV T/L          | Overload triggered by the Project               |
| 3. Etiwanda – San Bernardino 220kV T/L | Pre-existing overload aggravated by the Project |
| 4. Mira Loma – Walnut 220kV T/L        | Pre-existing overload aggravated by the Project |
| 5. Mira Loma – Vista No.1 220kV T/L    | Pre-existing overload aggravated by the Project |
| 6. Barre – Lewis 220kV T/L             | Pre-existing overload aggravated by the Project |

Solution: Upgrade line terminations on lines 2 – 5 above to eliminate all N-1 over-loads.

**Double (N-2) Contingencies:**

The S.I.S. determined that the following five transmission lines are overloaded beyond their short term emergency ratings under a combination of ten double – element outages:

- |                                     |   |
|-------------------------------------|---|
| 1. Devers – Valley 500kV T/L        | Base Case upgrade eliminates N – 1 overload     |
| 2. Etiwanda – Vista 220kV T/L       | N – 1 upgrade eliminates N – 2 overload         |
| 3. Mira Loma – Vista No.1 220kV T/L | N – 1 upgrade eliminates N – 2 overload         |
| 4. Serrano – Valley 500kV T/L       | Pre-existing overload aggravated by the Project |
| 5. San Bernardino – Vista 220kV T/L | Pre-existing overload aggravated by the Project |

Additional investigations during the preparation of the Facilities Study concluded that upgrades required to eliminate Base Case and single contingencies overloads would also eliminate double contingencies overloads on all but [REDACTED] lines.

Solution: Upgrade line terminations to eliminate all but [REDACTED] N-2 over-loads and install Special Protection Scheme to eliminate the following remaining over-loads:

- |   |                              |
|---|------------------------------|
| 1. Serrano – Valley 500kV T/L   | N – 2 Rating 3000A           |
| Loaded to 3017A (101%) under the simultaneous outages of both Devers – Vista No.1 and No.2 220kV Transmission Lines | Trip-off 108.2MW (One unit)  |
| 2. San Bernardino – Vista 220kV T/L   | N – 2 Rating 3350A           |
| Loaded to 4020A (120%) under the simultaneous outages of both Devers – Vista No.1 and No.2 220kV Transmission Lines | Trip-off 323.6MW (Two units) |

Detailed descriptions of the overloaded elements, the outages descriptions and the proposed upgrades are shown on Power Flow Results Tables 1 through 5 attached as Exhibit C.

The S.I.S. identified the following 500kV Buses at four locations and 220kV Buses at sixteen locations where the new generation will increase the Three-Phase Short Circuit Duty by 0.1kA or more:

**500kV:**

- Devers                      Lugo                      Mira Loma                      Serrano

**220kV:**

- Barre                      Chino                      Del Amo                      Devers                      Etiwanda
- Hunt. Beach              La Fresa                      Lugo                      Mira Loma                      Olinda
- Padua                      San Onofre                      San Bernardino                      Serrano                      Villa Park                      Vista

The S.I.S. did not calculate Single Phase to Ground Short Duties.

The Facilities Study evaluated the Single Phase to Ground Short Circuit Duties, identified all locations where values have increased by 0.1kA or more as a result of the new generation and evaluated the circuit breakers accordingly.

Both the Sub-Transmission and Transmission System Impact Studies concluded that a Facilities Study would be required to determine the scope of work and cost estimates for all the necessary system upgrades.

**III. Facilities Study Assumptions**

- A. All required ISO metering equipment will be installed at the [REDACTED] and is not included in the Facilities Study.
- B. The required two SEL-2595 Contact Transfer Modules, six lock-out relays and associated telecommunication terminal equipment, to be installed at the [REDACTED] Facility to support the SPS, will be installed by [REDACTED] and are not included in the Facilities Study.
- C. The RTU, to be installed at the [REDACTED] Facility, will be owned, operated and maintained by SCE and it is included in the Facilities Study.

**IV. Facilities Study Scope**

The Facilities Study shows the scope and cost of interconnection facilities and system upgrades separated in two cases as follows:

- CASE A:**      Addresses Interconnection Facilities and any System Upgrades required due to overloads triggered by the Copper Mountain Project.
- CASE B:**      Addresses additional System Upgrades required due to overloads that have been triggered by earlier Projects placed ahead of the Copper Mountain Project in the application queue.

**NOTE:**

CASE B is presented to show the maximum possible cost exposure of the Project. In the event that any Applicant presently placed ahead of the Project in the Application Queue withdraws the Application, the System Upgrades will be re-evaluated. The new

evaluation may conclude that the Project would be responsible for some or all of the upgrades identified on Case B.

The separation of the Facilities Study Scope of Work and Cost Estimate into two separate Cases A and B has been requested by [REDACTED] at a meeting with SCE representatives held on February 27, 2006.

During the same meeting [REDACTED] requested that SCE include in the Facilities Study an additional point of service to the proposed AES 115kV Start-Up Transformer Bank.

The Facilities Study shows the scope of work and the cost estimate for the following work required for the interconnection:

**CASE A:**

- Install new 115kV Conductors between each Generator Transformer Position inside the Highgrove 115kV Switchyard and the first structure outside the perimeter fence.
- Install Revenue Metering Equipment inside the Highgrove 115kV Switchyard to provide service to an [REDACTED] Transformer Bank
- Upgrade line termination equipment as required at the Vista 220kV Line Position at Etiwanda Gen. Sta. 220kV Switchyard to Contingencies over-loads on the Etiwanda – Vista 220kV T/L.
- Install SPS related equipment at Devers and Vista Substations to eliminate two Double Contingency over-loads.
- Install all required SPS related telecommunications channels and terminal equipment.
- Install RTU at the [REDACTED] Facility.
- Install all required RTU related telecommunications channels and terminal equipment.

**CASE B:**

- Upgrade line termination equipment as required at Devers, Barre, Lewis, Valley, Vista and Walnut Substations and the Etiwanda Gen. Sta. 220kV Switchyard to eliminate Base Case and Contingencies over-loads.

**CASES A and B:**

- Evaluate circuit breakers short circuit capability for a total of [REDACTED] 500kV circuit breakers at three locations, [REDACTED] 220kV circuit breakers at [REDACTED] locations and [REDACTED] 115kV circuit breakers at [REDACTED] locations. The evaluation determined that circuit breaker replacements and/or upgrades are required for two different conditions as follows:

**CASE A:** Identifies only the circuit breaker replacements and upgrades triggered by the Project. This case requires the replacement of four 220kV and nine 115kV circuit breakers at three locations.

**CASE B:** Identifies all the circuit breaker replacements and upgrades required, including those triggered by Applicants placed ahead of the Project in the Application Queue. This case requires the addition of seventeen replacements and nineteen upgrades of 220kV circuit breakers at three locations.

In the event that any Applicant presently placed ahead of the Project in the Application Queue withdraws the Application, the Short Circuit Duties will be re-calculated and all

circuit breakers will be re-evaluated. The new evaluation may conclude that the Project would be responsible for some or all of the replacements and upgrades identified on Case B.

**V. Facilities Study Details**

**The following SCE Interconnection Facilities and System Upgrades are required to support the new interconnection:**

**V – A. CASE A**

**A. Substations:**

- 1A. Highgrove Gen. Sta. 115kV Switchyard - Interconnection  
Install [REDACTED] new 200 Ft. spans of 605KCMIL ACSR Conductors between each Generator Transformer Position inside the Highgrove 115kV Switchyard and the first structure outside the perimeter fence.
- 1B. Highgrove Gen. Sta. 115kV Switchyard - Interconnection  
Install [REDACTED] 115kV Dead-End Structure and [REDACTED] 115kV Revenue Metering Units with individual steel pedestal.
2. Etiwanda Gen. Sta. 220kV Switchyard - Upgrade  
Replace 2000A Wave Trap on the Vista 220kV Line Position with new 3000A Rated to eliminate N-1 and N-2 contingency overloads.
3. Devers Substation - SPS  
Install the following relays required to support the proposed SPS:
  - [REDACTED] SEL-2595 Contact Transfer Modules
  - [REDACTED] G.E. F35 Line Monitoring Relays
  - [REDACTED] G.E. F485 Protocol Converters
  - [REDACTED] SEL-2030 Telecommunication Processor
  - [REDACTED] SEL-2407 Satellite Synchronized Clock
4. Vista Substation - SPS  
Install the following relays required to support the proposed SPS:
  - [REDACTED] SEL-2100 Protection Logic Processors
  - [REDACTED] SEL-2595 Contact Transfer Modules
  - [REDACTED] SEL-2506 Remote I/O Modules
  - [REDACTED] G.E. F35 Line Monitoring Relays
  - [REDACTED] G.E. F485 Protocol Converters
  - [REDACTED] SEL-2030 Telecommunication Processor
  - [REDACTED] SEL-2407 Satellite Synchronized Clock
5. Devers Substation – CB Replacement  
Replace [REDACTED] 3-cycle 50kA 220kV Circuit Breakers with new 2-cycle 50kA unit. The replacement is required because, under the present short circuit duty at the bus, the 3-cycle 50kA model is subjected to 50.2kA while the new 2-cycle model will only be subjected to 47.8kA.
6. Highgrove Gen. Sta. 115kV Switchyard – CB Replacement  
Replace eight 17.3kA and one 23kA 115kV Circuit Breakers with new 40kA Rated units.

7. Vista Substation – CB Replacement

Replace 23kA 115kV Circuit Breakers with new 40kA Rated units.

B. Telecommunications:

Install multimode fiber optic cable and related terminal equipment to all SPS related relays at the [REDACTED] Station, and the SCE Devers and Vista Substations. Also expand the existing optical communication transport system.

Install two diverse SPS related telecommunications circuits from [REDACTED] to Devers and Vista Substations.

Install a telecommunications circuit from [REDACTED] to Mira Loma Substation to transmit the RTU information to the Mira Loma Regional Control Center.

C. Power System Control:

Install a new full size real-time Remote Terminal Unit (RTU) at the [REDACTED] Station to monitor the following elements:

- Gross and Net MW for each generator
- Gross and Net MVAR for each generator
- Voltage at each generator terminal
- Status of each Generation Unit
- Status of each Generation Unit Circuit Breaker
- Auxiliary Load MW
- Bus Voltage
- Circuit Breaker Status
- Relays Status – Alarms

D. Estimated cost:

\$8,716,000

See Appendix G for cost breakdown

**V – B. CASE B**

The following additional System Upgrades are required to support the new interconnection under Case B:

A. Substations:

1. Barre Substation - Upgrade  
Replace 2-1590KCMIL ACSR Line Drops on the Lewis 220kV Line Position with new 2-2156KCMIL ACSR to eliminate N-1 contingency overload.
2. Lewis Substation - Upgrade  
Replace 2-1590KCMIL ACSR Line Drops on the Barre 220kV Line Position with new 2-2156KCMIL ACSR to eliminate N-1 contingency overload.
3. Valley Substation - Upgrade  
Replace 3,000A Wave Trap and GIS line drops on the Devers 500kV T/L Position with 4,000A rated elements to eliminate Base Case and N-1 & N-2 contingencies over-loads.

4. Devers Substation - Upgrade  
Replace 3,000A Wave Trap on the Valley 500kV T/L Position with 4,000A rated to eliminate Base Case and N-1 & N-2 contingencies overloads.
5. Vista Substation - Upgrade  
Replace 2-1033KCMIL ACSR Line Drops on the Mira Loma No.1 220kV Line Position with new 2-1590KCMIL ACSR to eliminate N-1 and N-2 contingency overloads.
6. Walnut Substation - Upgrade  
Remove 2000A Wave Trap on the Mira Loma 220kV Line Position to eliminate N-1 contingency overload.
7. Etiwanda Gen. Sta. 220kV Switchyard - Upgrade  
Replace two 1200A Group Operated Disconnect Switches on the San Bernardino 220kV Line Position with new 2000A Rated unit to eliminate N-1 and N-2 contingency overloads.
8. Devers Substation – CB Replacement / Upgrade  
~~Replace nine 40kA 220kV Circuit Breakers with new 50kA rated units and upgrade [REDACTED] 40kA Circuit Breakers to 50kA rating.~~  
The upgrade requires the installation of three sets of TRV Line-to-Ground Capacitors with individual support pedestals and corresponding foundations. – [REDACTED]
9. Etiwanda Gen. Sta. 220kV Switchyard – CB Replacement / Upgrade  
Replace [REDACTED] 45.6kA 220kV Circuit Breakers with new 63kA rated units and upgrade [REDACTED] 50kA Circuit Breakers to 63kA rating.  
The upgrade requires the installation of twelve sets of TRV Line-to-Ground Capacitors with individual support pedestals and corresponding foundations. – Total of thirty six units.
10. Lewis Substation – CB Replacement  
Replace [REDACTED] 45.6kA 220kV Circuit Breakers with new 50kA rated units.

**B. Telecommunications:**

No additional Telecommunications Circuits required for Case B

**C. Power System Controls:**

Install additional points to the existing RTU's at the SCE Highgrove 115kV Switchyard, Devers and Vista Substations to monitor analog readings and relays status and alarms for the SPS related elements.

Also install additional points to the existing RTU at the SCE Highgrove 115kV Switchyard to monitor the existing Station Automation System.

**D. Additional Estimated cost:**

\$14,686,000

See Appendix G for cost breakdown



**VI. Conclusions**

- A. The estimated cost for the Interconnection is approximately \$8,716,000 for Case A with the potential additional cost of \$14,686,000 for a total of \$23,402,000 for Case B.
- B. The completion of the proposed project requires approximately 15 months for Case A and approximately 13 months for Case B. These time-frames include engineering, material procurement, and construction.  
Please note that Case A and Case B will have different Starting Dates.  
The Start date of Case B will depend on the System Conditions at the time the Project comes on line. These conditions will determine the time when the additional upgrades described on Case B will be required.
- C. The costs indicated in the attached tables are 2007 dollars and are not firm, these are preliminary estimates only. These cost estimates are based on conceptual engineering and system unit costs, and are subject to change based on the final design and actual material costs. This Facilities Study and cost estimates as presented are valid for a period of 90 days.
- D. The estimated Project Cost will be reconciled to actual costs upon closure of the subject work orders. The necessary billing adjustments will be made at that time.

**EXHIBIT A**

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**SYSTEM IMPACT STUDY  
SUB – TRANSMISSION SYSTEM**

**EXECUTIVE SUMMARY**

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# ***SYSTEM IMPACT STUDY***

***April 18, 2005***

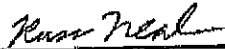


**SOUTHERN CALIFORNIA  
EDISON**  
An EDISON INTERNATIONAL Company

***Prepared by:***

***Brian Stonerock***

***Approved by:***



***Russ Neal***

***SOUTHERN CALIFORNIA EDISON COMPANY***

## EXECUTIVE SUMMARY

[REDACTED] applied to Southern California Edison ("SCE") for distribution service under the terms of SCE's Wholesale Distribution Access Tariff ("WDAT"). [REDACTED] will own and operate a 300 MW generating facility [REDACTED] to be interconnected at SCE's Highgrove Substation. Distribution service pursuant to the WDAT is proposed to be from SCE's 115 kV Highgrove Substation to the California Independent System Operator ("ISO") grid at SCE's 230 kV Vista Substation. The proposed in-service date of [REDACTED] is May 2007.

The [REDACTED] is a generation system consisting of [REDACTED] 100 MW Brush Electrical Machines Ltd. Gas Turbine Generators, with a net generation export of 300 MW. As requested by [REDACTED] SCE performed a System Impact Study to identify the general electrical system impacts of the [REDACTED] and possible mitigation measures to maintain conformance with SCE, ISO, or other applicable reliability planning criteria.

The study consisted of a power flow analysis and a short circuit duty analysis (Phase I study scope) to determine whether the energy associated with [REDACTED] can be transmitted through SCE's distribution system to the ISO grid at Vista Substation, without creating the need for modifications to SCE's distribution system and/or the ISO grid. The study showed that, with the [REDACTED] on-line:

- Thermal loadings on the SCE facilities used to provide the requested distribution service are all within criteria limits.
- Three-phase short-circuit duties increase by 0.1 kA or more at [REDACTED] 115 kV buses, [REDACTED] 230 kV buses, and [REDACTED] 500 kV buses that have duty levels above 60% of their nameplate three-phase ratings.
- Single line-to-ground short-circuit duties increase by 0.1 kA or more at [REDACTED] 115 kV bus that have duty levels above 60% of their nameplate single line-to-ground ratings. The evaluation of the single line-to-ground duty increases for the 230 kV and 500 kV buses will be conducted as part of the Facilities Study.

Based on these results, SCE concludes that a Facilities Study will be required to evaluate the need for circuit breaker replacements at the 115 kV, 230 kV, and 500 kV levels as a result of the [REDACTED]. The Facilities Study should include the following scope:

- Evaluate the need for circuit breaker replacement and develop detailed costs for any identified breaker replacement at the following [REDACTED] 115 kV buses, [REDACTED] 230 kV buses, and [REDACTED] 500 kV buses where the [REDACTED] increases three-phase short-circuit duties by 0.1 kA or more and where duty levels are above 60% of three-phase ratings:
  - Devers 500 kV
  - Lugo 500 kV
  - Miraloma 500 kV
  - Serrano 500 kV

- o Stagecoach 500 kV
- o Barre 230 kV
- o Chino 230 kV
- o Del Amo 230 kV
- o Devers 230 kV
- o Etiwanda 230 kV
- o Huntington Beach B 230 kV
- o La Fresa 230 kV
- o Lugo 230 kV
- o Mira Loma E 230 kV
- o Mira Loma W 230 kV
- o Olinda 230 kV
- o Padua 230 kV
- o San Onofre 230 kV
- o San Bernardino 230 kV
- o Serrano 230 kV
- o Stagecoach 230 kV
- o Villa Park 230 kV
- o Vista 230 kV
- o Altwind 115 kV
- o Callectic 115 kV
- o Highgrove 115 kV
- o Homart 115 kV
- o Pepper 115 kV
- o Shandin 115 kV
- o Vista 115 kV
- o Devil Canyon 115 kV
- o Mojave Siphon (Cdwr) 115 kV
- o San Bernardino 115 kV

- Evaluate the need for circuit breaker replacement and develop detailed costs for any identified breaker replacement at the following five (5) 115 kV substations where the [REDACTED] increases single line-to-ground short-circuit duties by 0.1 kA or more and where duty levels are above 60% of single line-to-ground ratings:
  - o Callectic 115 kV
  - o Highgrove 115 kV
  - o Shandin 115 kV
  - o San Bernardino 115 kV
  - o Vista 115 kV

- The evaluation of the single line-to-ground duty increases for the 230 kV and 500 kV buses will be conducted as part of the Facilities Study.

Preliminary cost estimates to replace all of the circuit breakers at the identified substations are included in Table 1 and Table 2 of this System Impact Study. Detailed costs will be developed in the Facilities Study.

Phase II of this System Impact Study (i.e., stability study and post-transient voltage study) will not be required unless requested by a third party.

## **EXHIBIT B**

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# **SYSTEM IMPACT STUDY TRANSMISSION SYSTEM**

## **EXECUTIVE SUMMARY**

**GENERATION INTERCONNECTION**

**SYSTEM IMPACT STUDY  
TRANSMISSION ASSESSMENT**

April 7, 2005



SOUTHERN CALIFORNIA  
**EDISON**  
AN ILLINOIS UTILITIES COMPANY

Prepared by  
Sheridan Mascarenhas

Southern California Edison Company

---

  
for Patricia L. Arons

[REDACTED]

## SYSTEM IMPACT STUDY - TRANSMISSION ASSESSMENT

### EXECUTIVE SUMMARY

The [REDACTED] applied to the California Independent System Operator (CAISO) for Interconnection. The [REDACTED] proposed to interconnect [REDACTED] gas turbine generators, each with a maximum operating rating at 108.19 MW. The generator auxiliary load is 1 MW and net capacity of the project is rated at 323.57 MW. The [REDACTED] proposed to interconnect the project [REDACTED] to the 115-kV bus at SCE's Highgrove Substation. The in-service date proposed by [REDACTED] is January 1, 2007.

Southern California Edison's (SCE's) Transmission and Interconnection Planning (TIP) department has performed a System Impact Study to determine the adequacy of SCE's transmission system to accommodate the [REDACTED]. The study indicates that the system is not adequate to accommodate the 323.57 MW of generation without modifications. A Facilities Study will be required for the [REDACTED].

The results of the System Impact Study will be used as the basis to determine project cost allocation for facility upgrades in the Facilities Study. *The study accuracy and the results for the assessment of the system adequacy are contingent on the accuracy of the technical data provided by the [REDACTED].* Any changes from the attached data could void the study results.

SCE's Field Engineering department has performed a System Impact Study on the SCE affected distribution network.

### POWER FLOW STUDY RESULTS

The power flow study results show that overloading problems are found on several transmission lines for base-case, single and double contingencies. Specifically:

#### Base case

Under spring conditions, the project increased prior base case overloads from 113% to 114% on the Devers - Valley 500 kV line causing a net 1% increase.

Under summer conditions there were no base case overloads

#### Single Contingency

Single contingency overload problems are found on a total of [REDACTED] transmission lines. Under spring conditions, the Etiwanda - Vista 230 kV line was overloaded from 90% - 97% to 103% - 107% of the nominal rating. Prior overloads on the other lines were increased from 104% - 135% to 100% - 140% of the nominal ratings of the lines.



Under summer conditions, the project increased prior overloads on the Devers – Valley 500 kV line ranging from 100 – 102% to 102% - 104 %.

### Double Contingency

Double contingency overload problems are found on a total of [REDACTED] transmission lines. Under spring conditions, the project overloaded the Serrano – Valley 500 kV line from 90% to 101% of its nominal rating for one double contingency. Also, the project overloaded the Etiwanda – Vista 230 kV line from 96% - 135% to 110% - 150% of its nominal rating. The project increased prior overloads on the rest of the lines from 105% - 163% to 110% - 175%. In particular, the project increased a prior overload on the San Bernardino – Vista 230 kV line from 163% to 175% - which is in excess of the line's N-2 conductor rating..

Under summer conditions, the Devers – Valley 500 kV line was overloaded from 103% - 106% to 105% - 108% of its nominal rating.

Most overloads were due to the existing wave trap limitations and other limitations on the GIS line terminals located at Valley Substation. The exception is the San Bernardino – Vista 230 kV line, where overloads exceeded the N-2 emergency limit on the line conductor.

## **TRANSIENT STABILITY STUDY RESULTS**

No transient stability voltage violations were found with the addition of the [REDACTED]

## **SHORT CIRCUIT DUTY STUDY**

The data provided by the [REDACTED] has been used to study the Short Circuit Duty contribution. The addition of the Project has impacted [REDACTED] substations with increases in the short circuit duty. These impacts require further study to determine the need for circuit breaker upgrades.

## **SCOPE OF WORK**

The scope of upgrades to accommodate the generation interconnection on the SCE network is listed below. This study has not assumed overload mitigation requirements for projects ahead of the queue.

- Upgrades of the 3000A wave traps and line terminals at Valley Substation 4000A on the Devers – Valley 500 kV line.
- Upgrades of line terminals at Serrano & Valley substations on the Serrano - Valley 500 kV line.
- Upgrades of line terminals at Vista and San Bernardino substations on the Vista – San Bernardino 230 kV line from 2300A to 3000A (or greater) line terminals.

- Upgrades of line terminals at Vista Substation on the Etiwanda and Mira Loma #1 230 kV lines
- Upgrade of line terminals at Barre & Lewis Substations on the Barre – Lewis 230 kV line.
- Upgrade the wave traps at Etiwanda Substation on the Vista 230 kV line.
- Upgrade the wave traps at Walnut Substation on the Mira Loma 230 kV line.
- Replacement of transmission line conductors on the San Bernardino – Vista 230 kV line.
  - Note: The San Bernardino – Vista 230 kV line conductors are overloaded over its N-2 rating.

The following items 1 – 4 also need to be evaluated for replacement or upgrade in the Facilities Study.

1. Breakers & Disconnects at Devers Substation on the Valley 500 kV line.
2. Breakers & Disconnects at Etiwanda Substation on the Vista 230 kV line.
3. Breakers at Mira Loma & Vista Substations on the Mira Loma - Vista 230 kV line.
4. Breakers & Disconnects at Walnut Substation on the Mira Loma 230 kV line.

**Note:**

Study results may change due to changes in other projects ahead of the queue in the area. A re-study may be required if there are changes in the project queue or the scope of projects ahead in the queue.

**EXHIBIT C**

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**POWER FLOW RESULTS**  
**TABLES 1 through 5**





TABLE 5  
 Double Contingency Overloads—Summer Condition

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Mira Loma - Vista 230 kV ck1 & Mira Loma - Vista 230 kV ck2					(a)
Etiwanda - San Berna 230 kV ck1 & Mira Loma - Vista 23 ck1					(a)
Etiwanda - San Berna 230 kV ck1 & Mira Loma - Vista 23 ck2					(a)
Etiwanda - San Berna 230 kV ck1 & Etiwanda - Vista 230 kV ck1					(a)
Etiwanda - San Berna 230 kV ck1 & Lugo - Mira Loma 230 kV ck3					(a)

**EXHIBIT D**

**VISTA 115kV SYSTEM**

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**PAGES OMITTED FOR  
CEII REGULATIONS**



## **EXHIBIT E**

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# **MAJOR EQUIPMENT AND RELAYS**

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**MAJOR EQUIPMENT AND RELAYS - CASE A**

**HIGHGROVE 115kV SWITCHYARD**

- 18 Dead End insulator/hardware assemblies
- 600 Circuit Feet of 605KCMIL ACSR Conductor (1,800 Ft.)
- 9 115kV 2000A 40kA Circuit Breakers

**BARRE SUBSTATION**

- 3 Dead End insulator/hardware assemblies
- 60 Circuit Feet of 2-2156KCMIL ACSR Line Drop Conductor (360 Ft.)

**LEWIS SUBSTATION**

- 3 Dead End insulator/hardware assemblies
- 60 Circuit Feet of 2-2156KCMIL ACSR Line Drop Conductor (360 Ft.)

**VALLEY SUBSTATION**

- 1 4,000A Wave Trap
- 3 4,000A Rated GIS Line Drops

**DEVERS SUBSTATION**

- 1 4,000A Wave Trap
- 2 SEL-2595 Contact Transfer Modules for SPS
- 2 G.E. F35 Line Monitoring Relays for SPS
- 2 G.E. F485 Protocol Converters for SPS
- 1 SEL-2030 Telecommunication Processor for SPS
- 1 SEL-2407 Satellite Synchronized Clock for SPS
- 2 220kV 3000A 50kA Circuit Breakers

**VISTA SUBSTATION**

- 60 Circuit Feet of 2-2156KCMIL ACSR Line Drop Conductor (360 Ft.)
- 2 SEL-2100 Protection Logic Processors for SPS
- 4 SEL-2595 Contact Transfer Modules for SPS
- 4 SEL-2506 Remote I/O Modules for SPS
- 2 G.E. F35 Line Monitoring Relays for SPS
- 2 G.E. F485 Protocol Converters for SPS
- 1 SEL-2030 Telecommunication Processor for SPS
- 1 SEL-2407 Satellite Synchronized Clock for SPS
- 2 115kV 2000A 40kA Circuit Breakers

**ETIWANDA 220kV SWITCHYARD**

- 1 3,000A Wave Trap
- 2 220kV 2000A Group Operated Disconnect Switches

**E. A. ROMERO**  
11/29/05

**ADDITIONAL MAJOR EQUIPMENT FOR CASE B**

**DEVERS SUBSTATION:**

- 9 220kV 3000A 50kA Circuit Breakers
- 9 220kV TRV Line to Ground Capacitors with individual steel pedestals

**ETIWANDA GEN. STA. 220kV SWITCHYARD:**

- 6 220kV 3000A 63kA Circuit Breakers
- 36 220kV TRV Line to Ground Capacitors with individual steel pedestals

**LEWIS SUB:**

- 2 220kV 3000A 50kA Circuit Breakers

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**E. A. ROMERO**  
11/29/05

# **EXHIBIT F**

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## **PROJECT SCHEDULE**

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PROJECT SCHEDULE

CASE A

ELEMENT	START												END															
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14
<b>PROJECT APPROVAL</b> Initials Work Orders																												
<b>HIGHGROVE 115KV SWITCHYARD</b> Engineering & Design																												
Construction and Hardware																												
Testing																												
<b>ETWANDA</b> Engineering & Design																												
Wave Traps & Line Drops Materials																												
Construction																												
Testing																												
<b>DEVERS SUB</b> Engineering & Design																												
Relays & Panels																												
Construction																												
Testing																												
<b>VISTA SUB</b> Engineering & Design																												
Relays & Panels																												
Construction																												
Testing																												
<b>DEVERS SUB</b> Engineering & Design																												
Major Equipment Procure & Deliver																												
Construction																												
Testing																												
<b>HIGHGROVE 115KV SWITCHYARD</b> Engineering & Design																												
Major Equipment Procure & Deliver																												
Construction																												
Testing																												
<b>VISTA SUB</b> Engineering & Design																												
Major Equipment Procure & Deliver																												
Construction																												
Testing																												

ADDITIONAL ELEMENTS FOR CASE B

ELEMENT	START												END																
	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14
<b>PROJECT APPROVAL</b> Initials Work Orders																													
<b>BARRE - LEWIS VALLEY - DEVERS - ETWANDA</b> Engineering & Design																													
Wave Traps & Line Drops Materials																													
Construction																													
Testing																													
<b>DEVERS SUB</b> Engineering & Design																													
Major Equipment Procure & Deliver																													
Construction																													
Testing																													
<b>ETWANDA GEN. STA. 220KV SWITCHYARD</b> Engineering & Design																													
Major Equipment Procure & Deliver																													
Construction																													
Testing																													
<b>LEWIS SUB</b> Engineering & Design																													
Major Equipment Procure & Deliver																													
Construction																													
Testing																													

NOTE:  
Case A and Case B will have different Start Dates.  
The Start Date of Case B will depend on the System Conditions at the time of the Project which will determine when the additional upgrades will be required.

**EXHIBIT G**

**COST SUMMARY**

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**Cost Estimate Summary (2007 Dollars)**

**Elements for Case A**

**Scope:**

Interconnect 323.6MW of generation to the SCE Highgrove 115kV Switchyard.  
 The interconnection requires the installation of three new 115kV connections from the SCE Switchyard to the first structure of each new incoming 115kV Line from the generator transformers. It also requires upgrades of line terminal equipment at one station, the installation of SPS relays at two stations, new telecommunication facilities for the SPS and a new RTU at the generation facility plus upgrades of existing RTU's at three stations. It also requires the replacement of two 220kV and eleven 115kV circuit breakers at three locations.

**COLOR**

- Interconnection Facilities
- Distribution System Upgrades (Non ISO)
- Reliability Upgrades (ISO Controlled)

ELEMENT	INTERCONNECTION FACILITIES	DISTRIBUTION SYSTEM UPGRADES	RELIABILITY UPGRADES	Income Tax Component of Contribution *	ONE TIME PAYMENT
Highgrove Gen. Sta. - 115kV Switchyard - Conductors	\$ 115,000	\$ -	\$ -	\$ 40,000	\$ 155,000
Highgrove Gen. Sta. - 115kV Switchyard - Metering	\$ -	\$ 422,000	\$ -	\$ 148,000	\$ 570,000
Eliwanda Gen. Sta. - 220kV Switchyard - Upgrade	\$ -	\$ -	\$ 66,000	\$ 30,000	\$ 96,000
Devers Sub. - SPS	\$ -	\$ -	\$ 205,000	\$ 72,000	\$ 277,000
Vista Sub. - SPS	\$ -	\$ -	\$ 332,000	\$ 116,000	\$ 448,000
Devers Sub. - Replace 2 - 220kV CB's	\$ -	\$ -	\$ 920,000	\$ 322,000	\$ 1,242,000
Highgrove Gen. Sta. - Replace 7 - 115kV Line & B.T. CB's	\$ -	\$ 2,287,000	\$ -	\$ 800,000	\$ 3,087,000
Vista Sub. - Replace 2 - 115kV CB's	\$ -	\$ 653,000	\$ -	\$ 234,000	\$ 887,000
Manhattan Santa Fe Organization	\$ -	\$ 9,000	\$ -	\$ 3,000	\$ 12,000
Telecommunications (RTU)	\$ 11,000	\$ -	\$ -	\$ 4,000	\$ 15,000
Telecommunications (SPS)	\$ -	\$ -	\$ 608,000	\$ 213,000	\$ 821,000
Power Systems Control - RTU	\$ 80,000	\$ -	\$ -	\$ 28,000	\$ 108,000
Power Systems Control - Upgrades	\$ -	\$ -	\$ 75,000	\$ 26,000	\$ 101,000
<b>TOTAL</b>	<b>\$ 206,000</b>	<b>\$ 4,024,000</b>	<b>\$ 2,225,000</b>	<b>\$ 2,250,000</b>	<b>\$ 8,705,000</b>

**Additional Elements for Case B**

**Scope:**

The additional elements include the upgrade of terminal equipment at six stations and the replacement of seventeen and upgrade of nineteen 220kV circuit breakers at three stations.

ELEMENT	INTERCONNECTION FACILITIES	DISTRIBUTION SYSTEM UPGRADES	RELIABILITY UPGRADES	Income Tax Component of Contribution *	ONE TIME PAYMENT
Barre Sub. - Upgrade	\$ -	\$ -	\$ 64,000	\$ 22,000	\$ 86,000
Lewis Sub. - Upgrade	\$ -	\$ -	\$ 64,000	\$ 22,000	\$ 86,000
Valley Sub. - Upgrade	\$ -	\$ -	\$ 364,000	\$ 127,000	\$ 491,000
Devers Sub. - Upgrade	\$ -	\$ -	\$ 96,000	\$ 34,000	\$ 130,000
Vista Sub. - Upgrade	\$ -	\$ -	\$ 64,000	\$ 22,000	\$ 86,000
Walnut Sub. - Upgrade	\$ -	\$ -	\$ 54,000	\$ 19,000	\$ 73,000
Eliwanda Gen. Sta. - 220kV Switchyard - Upgrade	\$ -	\$ -	\$ 268,000	\$ 94,000	\$ 362,000
Devers Sub. - Replace 9 & Upgrade 2 - 220kV CB's	\$ -	\$ -	\$ 4,557,000	\$ 1,585,000	\$ 6,142,000
Eliwanda Gen. Sta. - Replace 6 & Upgrade 17 - 220kV CB's	\$ -	\$ -	\$ 4,428,000	\$ 1,550,000	\$ 5,978,000
Lewis Sub. - Replace 2 - 220kV CB's	\$ -	\$ -	\$ 920,000	\$ 322,000	\$ 1,242,000
<b>TOTAL</b>	<b>\$ -</b>	<b>\$ -</b>	<b>\$ 10,879,000</b>	<b>\$ 3,807,000</b>	<b>\$ 14,686,000</b>

This document includes confidential trade secrets and proprietary information of Southern California Edison, to be used only by [redacted] in connection with its evaluation of this Facility Study Proposal. Southern California Edison retains all rights to maintain the confidentiality of this information and requests that [redacted] preserve its confidentiality.

\* ITCC tax (calculated at 35%) is collected via Letter of Credit.

\* Pursuant to FERC Order 2003A, there will be no ITCC collected on Reliability Upgrades.