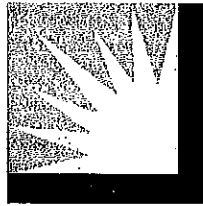




SCE WDAT CLGIP Transition Cluster Window  
Phase I - Interconnection Study Report

July 31, 2009



SOUTHERN CALIFORNIA  
**EDISON**<sup>®</sup>  
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**Prepared by**

Sandy Guerrero, Power System Planner  
Robert J. Tucker, Power System Planner  
Lindsey Sayers, P.E., Substation Engineer

**Approved by**

Diane R. Llamas, Manager  
Customer Interconnections/MOS

Confidential: Contains Critical Energy Infrastructure Information (CEII)

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## Executive Summary

applied to the Southern California Edison (SCE) for interconnection of a new 50 MW solar generation project. requested and paid for Interconnection Studies in accordance with Section 3.5.1 of Appendix Y of the CAISO LGIP Tariff.

The original Point of Interconnection (POI) requested by for the was the Rockair leg of the Helijet-Little Rock-Palmdale-Rockair 66 kV transmission line. Since this requested POI falls within the SCE distribution system, the project was initially processed via the SCE WDAT CLGIP Tariff.

Based on information provided by in their Interconnection Request, and known information about the geographic area surrounding the POI, SCE assessed the viability of the original POI request as part of the Phase I study. The assessment concluded that a SCE distribution system POI for would not be viable without a plan of service that includes significant additional 66 kV network system upgrades and 66 kV distribution system upgrades. An alternate POI and corresponding plan of service was also identified as part of this assessment. This alternate plan of service and POI would involve fewer overall system upgrades, and the majority of these upgrades would be network system upgrades instead of distribution system upgrades. This alternate plan of service would also be more consistent with SCE's identified long-term area needs for service to local area load. However, this alternate plan of service would change the POI from a point on the SCE distribution system to a network point on the CAISO-controlled system.

At the time that this alternate plan of service was identified, SCE, and CAISO discussed the issues related to the requested POI, the alternate POI under consideration, the history behind the interconnection request, and various issues related to the similarities and differences between the CAISO LGIP Tariff and the SCE WDAT CLGIP Tariff. Based on these discussions, CAISO and SCE allowed to modify its requested POI to reflect a network POI within the CAISO-controlled grid without loss of relative queue position. The POI for may be revisited as part of the Phase II study.

The constitutes a portion of the SCE's portion of the CAISO Controlled Grid whereby generation located within this area electrically affects other Interconnection Customer (IC) projects and SCE's transmission system. Consequently, while independent analysis was conducted on the Project, group network analysis was performed in relation to other IC projects located within the. Details related specifically to the network analysis are provided in Appendix A.

Section 6.4 of Appendix H of the WDAT CLIPG Tariff, requires SCE provide a *good faith* estimate on costs pertaining to the Project. Additionally, the Tariff states Network Upgrades are to be estimated as a maximum cost exposure for any network enhancements listed in the Phase I Study. Based on requirements, SCE estimated the Project as follows:

Component	Estimated Costs
SCE Interconnection Facilities	\$12,300,000
Reliability Network Upgrades	\$12,661,000
Delivery Network Upgrades	\$6,221,000
Distribution	\$10,000
<b>TOTAL ESTIMATED COST</b>	<b>\$31,192,000</b>

## 1. Introduction

applied to the California Independent System Operator (CAISO) for interconnection of a new 50 MW solar generation project. The Project consists of two separate blocks of solar units, each block contains 50 inverter units.

### 1.1 Grouping Interconnection Requests

SCE's electrical system can be described as having one network system and three electrical radial systems. The one network system is comprised of the Metro Area (sometimes referred to as the Los Angeles Basin area). Generation interconnection applications requesting interconnections to facilities within the Metro Area are to be studied on a group basis if they electrically affect one another; otherwise they are to be studied on an individual basis (i.e. serial project). The three electrical radial systems consist of the. Generation interconnection applications requesting interconnections to facilities within one of the three electrical radial systems were studied on a group basis. However, these generalized groups are primarily used for organizational purposes and management of work load among the various CAISO and SCE engineers performing the studies. For cost allocation purposes the Groups are determined by the study results. For example, for Delivery Network Upgrades the Groups are determined by the Deliverability Assessment Methodologies <http://www.caiso.com/1c44/1c44b5c3cce0.html>.

### 1.2 Group Study Designation

In mutual agreement with the CAISO and SCE, indicated the would interconnect to a new Edison owned 66 kV substation (SUBAB-1) located within the for the purposes of the Phase I Study. The Project will be studied on a cluster basis along with other similarly situated projects located in the. Details related specifically to the Analysis are provided in Appendix A.

## 2. Project Description

### 2.1 Point of Interconnection

originally requested interconnection on to the SCE distribution system via a radial generation tie line to the Rockair leg of the Helijet-Little Rock-Palmdale-Rockair 66 kV transmission line. By mutual agreement between SCE, CAISO, and the plan of service was modified during the Phase I Study to interconnect the Project to a conceptual new SCE-owned 66 kV substation (SUBAB-1) via a radial generation tie line that will be constructed, owned, maintained, and operated by the project developer. The POI for the may be revisited as part of the Phase II study.

The arrangement consists of blocks of solar units. Each block contains 50 inverter units, and there is one 1 MVA pad-mount transformer inverter units that step-up the voltage from 0.48 kV to 35 kV. The solar blocks are then connected to one 71/34.5 kV customer owned transformer, which would ultimately be connected to the SCE 66 kV system.

There were several plans of service that were considered in the Phase I study to connect the to the SCE 66 kV system. The one line diagram is shown below in Figure 2.1 and illustrates the proposed facility arrangement as discussed in Section 3 of this report. The figure illustrates two alternate plans of service, one tapping to the Rockair leg of the existing 66 kV line (i.e., customer original request) and the other "alternate" with direct connection to SUBAB-1. Details of the POI Assessment for are discussed in Section 3 below. Figure 2.2 provides the geographical point of connection.

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### 3. Point of Interconnection Assessment

The assessment to identify the most viable POI was done by mutual agreement among [REDACTED], CAISO, and SCE. Conclusions drawn from the assessment typically considered multiple disciplines including technical, permitting and licensing, land use, and transmission. The conclusions were based on information at hand and engineering judgment.

Any conclusions drawn in this Phase I Report related to the POI for the Project should not be taken as the final recommendation. Many factors will likely influence the final selection of the POI as the Interconnection Request moves through planning and development processes.

#### 3.1 Original Point of Interconnection Request

SCE performed an assessment to identify Interconnection Facilities required to interconnect the [REDACTED] to the Rockair leg of the Helijet-Little Rock-Palmdale-Rockair 66 kV transmission line. Based on the information provided by [REDACTED] in its Interconnection Request, and known information about the geographic area surrounding the POI, SCE assessed the viability of the original POI request. The assessment concluded the original POI is not viable with the 66 kV system in its present configuration (i.e., a 4-point 66 kV transmission line) due to line protection requirements and SCE protection criteria.

#### 3.2 Potential Alternatives to Original Point of Interconnection Request

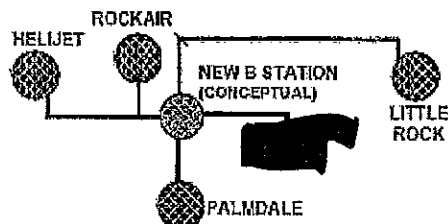
Based on information provided by [REDACTED] in its Interconnection Request and known information about the geographic area surrounding the POI, SCE assessed potential alternatives to the original POI request.

There were a variety of potential POI alternatives that were considered for the [REDACTED]. [REDACTED] alternatives were deemed most viable, including one that would maintain [REDACTED] at a distribution system POI and one which would move the [REDACTED] to a CAISO-controlled POI:

- *ALT 1 (CAISO-controlled POI). [REDACTED] moved to a new 66 kV collector substation built on or near the existing Helijet-Little Rock-Palmdale-Rockair 66 kV line)*

This POI alternative was envisioned to build a new 66 kV collector substation (conceptually named SUBAB-1) located approximately near the intersection of 40<sup>th</sup> street East and Avenue P (i.e., near where the Palmdale leg and the Little Rock leg of the existing line meet). With a new substation at or near that location, the existing 4-terminal line would break into 2-terminal and 3-terminal lines and would provide a geographically closer 66 kV POI for the [REDACTED]. Figure 3.1 below illustrates this configuration.

Figure 3.1

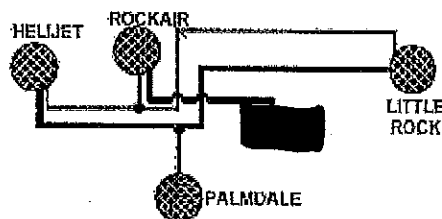


It should be noted that SCE has previously identified the need for additional distribution transformer capacity (“B-bank capacity”) in the local area in which [REDACTED] proposes to construct the [REDACTED]. Currently, SCE is exploring options of either building a new distribution station in the area for service to load or expanding Rockair Substation to meet the load demands of the area. While Rockair is an existing substation, it is a small customer-dedicated substation that was deeded over to SCE and SCE anticipates that it will not be large enough to accommodate the full build-out of a standard-sized SCE distribution substation. In contrast, building a new distribution substation would allow for a substation that could be sized to full build-out capability.

- *ALT 2 (Distribution POI):* [REDACTED] moved to Rockair Substation with a system reconfiguration (network upgrade) on the existing Helijet-Little Rock-Palmdale-Rockair 66 kV line

Moving the [REDACTED] to Rockair Substation would retain the interconnection point as a distribution POI but, by itself, would not resolve the protection issues and therefore is not a viable option without additional upgrades. A network upgrade to convert the [REDACTED] terminal 66 kV line to [REDACTED] terminal 66 kV lines would be possible with the conversion of the existing line between Helijet and Little Rock from single-circuit 66 kV to double-circuit 66 kV facilities. This would result in a new Helijet-Little Rock-Rockair 66 kV line (Palmdale leg would be transferred onto the other circuit) and would allow for Rockair Substation to be a viable POI within protection criteria. Figure 3.2 below illustrates this configuration

**Figure 3.2**  
**PV-9 – ALT 2 Plan of Service**



Although this plan of service would maintain the [REDACTED] at a distribution POI, it would require substantial distribution upgrades to Rockair Substation and substantial network upgrades between Helijet and Little Rock. The distribution upgrades to Rockair may not be consistent with long-term area requirements due to size constraints at Rockair Substation. This alternative would also require the generation tie-line between [REDACTED] and Rockair to be designed and built to SCE 66 kV design standards and remain available to SCE for future reconfiguration and network use. This is because the Rockair Substation site is geographically constrained in a manner that limits the number of 66 kV lines that can connect to the substation, yet SCE would ultimately require two-line service to Rockair Substation to meet SCE 66 kV reliability criteria.

### 3.3 Point of Interconnection Assessment Conclusions

SCE, CAISO and [REDACTED] discussed the above issues at length during the course of the Phase I study. Based on these discussions, and upon mutual agreement between SCE, CAISO and [REDACTED] for purposes of the Phase I study the [REDACTED] was modeled consistent with “ALT 1” described above. This alternative involves the least amount of overall system upgrades, and the majority of these upgrades would be network system upgrades instead of distribution system upgrades. This alternative would also be more consistent with SCE’s identified long-term area plans for service to local area load. The POI for [REDACTED] may be revisited as part of the Phase II study.



## 4. Study Related to Interconnection Facilities

### 4.1 Distribution Provider's Interconnection Facilities

SCE performed an assessment to identify the Distribution Provider's Interconnection Facilities required to connect the Project to SCE's conceptual new SUBAB-1 66 kV Substation. Based on information provided by [REDACTED] in their Interconnection Request, and known information about the geographic area surrounding the POI, SCE identified the following Interconnection Facilities that need to be installed between the Point of Change of Ownership and the CAISO Controlled Grid. Section 4.2 identifies assumptions included and excluded from this Phase I Study Report.

### 4.2 Phase I Facilities Study Assumptions

#### 4.2.A Assumptions Included in Phase I Study

1. SCE will install the additional telecommunications path from the generating facility to SCE as noted in Appendix A.
2. The last structure of the 66 kV generation tie line outside SUBAB-1 Substation property line would be at a distance from the substation switchyard that it requires SCE to install one additional tubular steel pole (TSP) and a total of two spans of line to reach the proposed 66 kV line position. SCE will install the additional structure and conductors between the last generator-owned structure and the Substation switchyard.
3. SCE will install the required revenue metering cabinet and retail load meters at the generating facility.
4. SCE will install the required remote terminal unit (RTU) at the generating facility.

#### 4.2.B Assumptions NOT Included in Phase I Study

1. The [REDACTED] 66 kV generation tie line from the generating facility to the last structure outside SCE's SUBAB-1 Substation property line will be installed by the generator.
2. The [REDACTED] generation tie must be equipped with fiber optics to provide [REDACTED] telecommunication paths required for the line protection scheme and SPS. The fiber optics is an element of the generator-owned line.
3. All required CAISO metering equipment at the generating facility will be provided by the generator.
4. All required revenue metering equipment to meter the generating facility retail load will be specified by SCE and installed by the generator at their end of the 66 kV generation tie line.
5. The following 66 kV generation tie line protection and SPS relays to be installed at the Generating Facility will be specified by SCE and provided by the generator:
  - a. [REDACTED] current differential relay with dual dedicated digital communication channels to Neenach Substation
  - b. [REDACTED] current differential relay with dual dedicated digital communication channels to Neenach Substation
  - c. [REDACTED] (one each for SPS A and B) to trip the main generator breaker
  - d. [REDACTED] satellite synchronized clock

### 4.3 Phase I Facilities Installed by SCE

#### *A. Transmission*

##### **66 kV generation tie line**

SCE will install 66 kV, 70-foot TSP, spans of conductors; and dead end insulator / hardware assemblies between the last Structure and the substation dead-end rack at the 66 kV switchyard.

#### *B. Substation*

##### **SUBAB-1 Substation**

SCE will install a dedicated 66 kV line position to terminate the new generation tie line. The interconnection facilities will be installed as follows:

- lead-end structure (three surge arresters)
- potential transformers
- line current differential relay (digital communication channel)
- line current differential (digital communication channel)

#### *C. Metering Services Organization*

SCE will install a revenue metering cabinet and revenue meters required to meter the retail load at the Generating Facility. The Generator will provide the required metering equipment (voltage and current transformers).

#### *D. Power System Control*

SCE will install one RTU at the generating facility to monitor the typical Generation elements such as MW, MVAR, terminal voltage and circuit breaker status at each generating unit and the plant auxiliary load and transmit this information to the SCE Grid Control Center.

## 5. Study Related to Network Upgrades

All Network Upgrade requirements within the , which include the , were identified within that Group Study. SCE identified Network Upgrades to mitigate impacts on the CAISO Controlled Grid caused by the Project. Details of these results are provided in Appendix A.

## 6. Study Related to Distribution Upgrades

Given that the part of the , all impacts related to the Distribution System were identified within the Group Study. This Group Study identified impacts to the Distribution System caused by Interconnection Requests connecting to the CAISO Controlled Grid and impacts to the CAISO Controlled Grid caused by Interconnection Requests connecting to the Distribution System.

## 7. Facilities Requirements and Cost Responsibility

The following facilities requirements and associated costs have been determined to be the responsibility of . The CAISO applied distribution factors to those transmission elements identified in Appendix A as Delivery Network Upgrades to determine share of the total cost responsibility.

### 7.1 Distribution Provider's Interconnection Facilities

This Phase I Study identified the following Interconnection Facilities located between the Point of Change of Ownership and the CAISO Controlled Grid. For a description of the facilities, please refer to Section 4, *Study Related to Interconnection Facilities* on page seven. For cost information please refer to *Table 7.1, Summary of Cost Estimates*.

**Table 7.1  
Summary of Cost Estimates**

**WDT312**

**Interconnection Facilities Cost Estimate Summary (2009 Dollars)**

Scope: Interconnect 50MW of Generation to the SCE Grid at Rockair Substation 66kV Bus.

No.	ELEMENT	INTERCONNECTION FACILITIES (Subject to ITCC)	ITCC ** (35%)	ONE-TIME PAYMENT
1	Sub-Transmission 66kV Gen Tie Segment into [redacted] Substation	\$ 743,204	\$ 260,121	\$ 1,003,325
2	[redacted] Substation Line drop incl. support structure and line element protection Line drop incl. support structure and line element protection Line drop incl. support structure and line element protection Line drop incl. support structure and line element protection	\$ 1,788,939 \$ 10,133 \$ 2,447,967 \$ 548,819	\$ 626,129 \$ 3,547 \$ 856,788 \$ 192,087	\$ 2,415,067 \$ 13,680 \$ 3,304,755 \$ 740,905
3	Helijet Substation Upgrade Line protection	\$ 281,481	\$ 98,518	\$ 380,000
4	Little Rock Substation Upgrade Line protection	\$ 281,481	\$ 98,518	\$ 380,000
5	Palmdale Substation Upgrade Line protection	\$ 281,481	\$ 98,518	\$ 380,000
6	Telecommunication Diverse route between Gen. and PV6 Line Protection - SCADA and SPS	\$ 1,042,963 \$ 1,578,519	\$ 365,037 \$ 552,482	\$ 1,408,000 \$ 2,131,000
7	Power System Control RTU at PV6	\$ 82,222	\$ 28,778	\$ 111,000
<b>Totals</b>		<b>\$ 9,087,209</b>	<b>\$ 3,180,523</b>	<b>\$ 12,267,732</b>
				<b>\$ 12,300,000</b>

This document includes confidential trade secrets and proprietary information of Southern California Edison, to be used only by the Interconnection Customer 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 the Interconnection Customer preserve its confidentiality.

\* Pursuant to FERC Order 2008A, ITCC is not collected on Reliability Upgrades.  
 \*\* ITCC cost (calculated at 35% based on Customer Operating Date after 2009) may be satisfied with a letter of credit in accordance with the tax provisions of the LGIA.

## 7.2 Distribution Upgrades

This Phase I Study has identified Distribution Upgrades required to mitigate impacts on SCE's distribution system caused by the connection of and power deliveries from the [REDACTED] to the CAISO Controlled Grid. Details of these results are provided in Appendix A.

## 7.3 Reliability Network Upgrades

This Phase I Study has identified Reliability Network Upgrades required to mitigate impacts on SCE's transmission system caused by the connection of and power deliveries from the [REDACTED] to the CAISO Controlled Grid. Details of these results are provided in Appendix A.

## 7.4 Delivery Network Upgrades

This Phase I Study has identified Delivery Network Upgrades required to mitigate impacts on SCE's transmission system caused by the connection of and power deliveries from the [REDACTED] to the CAISO Controlled Grid. Details of these results are provided in Appendix A.

## 8. Estimated Construction Schedule

The estimated time to construct the required PTO's Interconnection Facilities, any Distribution Upgrades, Reliability Network Upgrades, and Delivery Network Upgrades will be provided in the Phase II Study. Given the magnitude of the Network Upgrades required to interconnect the generation, as requested in the Transition Cluster, the non-binding estimated date the PTO's interconnection facilities, network upgrades, and distribution upgrades will be completed as identified in the Phase I Study could take up to 96 months from execution of an LGIA to engineer, license, permit, and construct.

## 9. Other Study Assumptions and Responsibilities

### 9.1 Conceptual Plan of Service

The results provided in this Phase I study are based on conceptual engineering and a preliminary plan of service and are not sufficient for permitting of facilities. The Plan of Service is subject to change as part of the Phase II Interconnection Study.

### 9.2 Customer's Technical Data

Additional technical data related to the Interconnection Customer's project may be required as part of the Phase II study. The study accuracy and results for the Phase I Study are contingent upon the accuracy of the technical data provided by the Interconnection Customer. Any changes from the data provided could void the study results.

### 9.3 Study Impacts on Neighboring Utilities

Results or consequences of this Phase I Study and/or to-be-performed Phase II Interconnection Study may require additional studies, facility additions, and/or operating procedures to address impacts to neighboring utilities and/or regional forums. For example, impacts may include but are not limited to WECC Path Ratings, short circuit duties outside of the CAISO Controlled Grid, and sub-synchronous resonance (SSR).

### 9.4 Use of SCE Facilities

The Interconnection Customer is responsible for acquiring all property rights necessary for the Interconnection Customer's Interconnection Facilities, including those required to cross SCE facilities and property. This Interconnection Study does not include the method or estimated cost to the Interconnection Customer of SCE mitigation measures that may be required to accommodate any proposed crossing of SCE facilities with Interconnection Customer's Interconnection Facilities. The use of SCE property rights shall only be permitted upon written agreement between SCE and the Interconnection Customer. Any proposed use

of SCE property rights may require a separate study and/or evaluation, at the Interconnection Customer's expense, to determine whether such use may be accommodated.

#### **9.5 SCE Interconnection Handbook**

The Interconnection Customer shall be required to adhere to all applicable requirements in the SCE Interconnection Handbook. These include, but are not limited to, all applicable protection, voltage regulation, VAR correction, harmonics, switching and tagging, and metering requirements.

#### **9.6 Western Electricity Coordinating Council (WECC) Policies**

The Interconnection Customer shall be required to adhere to all applicable WECC policies including, but not limited to, the WECC Generating Unit Model Validation Policy.

#### **9.7 System Protection Coordination**

Adequate Protection coordination will be required between SCE-owned protection and Interconnection Customer-owned protection. If adequate protection coordination cannot be achieved, then modifications to the Interconnection Customer-owned facilities (i.e., Generation-tie or Substation modifications) may be required to allow for ample protection coordination.

**Appendix A**  
**Group Network Analysis**



**SCE WDAT CLGIP Transition Cluster Window**  
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July 31, 2009



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