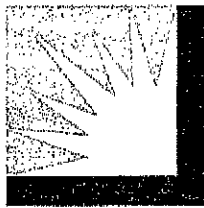


Edison Mission Energy  
FAME PV-36 Solar Generation Project  
Part of Lugo System

SCE WDAT CLGIP Transition Cluster Window  
Phase I Interconnection Study Report

July 31 2009



SOUTHERN CALIFORNIA

**EDISON**

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### Executive Summary

[REDACTED] applied to Southern California Edison (SCE) for interconnection of a new 150 MW solar generation project deemed [REDACTED]. [REDACTED] application was in accordance with SCE Wholesale Distribution Access Tariff Clustering Large Generation Interconnection Procedures (WDAT CLGIP). [REDACTED] requested and paid for Interconnection Studies in compliance with Appendix H, Section 3.4.1 of the WDAT CLGIP.

Southern California Edison (SCE) assessed [REDACTED] original Point of Interconnection (POI) to connect the Project to the existing SCE Roadway 115/33 kV Substation 115 kV bus. The POI proved viable. SCE performed additional assessments for potential alternatives to the POI; no alternatives were found to be superior. The POI from the Project to SCE’s portion of the CAISO Controlled Grid is located within the [REDACTED].

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

Section 6.4 of Appendix H of the WDAT CLGIP, 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 [REDACTED] requirements, SCE estimated the Project costs as follows:

Component	Estimated Costs
SCE Interconnection Facilities	\$1,000,000
Reliability Network Upgrades	\$437,000
Delivery Network Upgrades	\$24,407,000
Distribution System Upgrades	\$15,331,000
<b>TOTAL ESTIMATED COST</b>	<b>\$41,175,000.00</b>

## 1. Introduction

[REDACTED] applied to SCE for interconnection of a new 150 MW solar generation project [REDACTED]. The [REDACTED] will have an output of 150 MW, which will be produced by 300 individual [REDACTED] Tie Solar Inverters.

### 1.1 Grouping Interconnection Requests

In accordance with Section 6.1 of the WDAT CLGIP, an Interconnection Request may be studied individually or in a Group Study for conducting one or more of the analyses forming the Interconnection Studies. 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 or sometimes referred to as the L.A. Basin area. The three electrical radial systems consist of the [REDACTED]

[REDACTED] 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. group of one). Generation interconnection applications requesting interconnections to facilities within [REDACTED] electrical radial systems are to be studied on a group basis.

### 1.2 Group Study Designation

In mutual agreement with SCE [REDACTED] indicated that [REDACTED] is to be connected to the SCE Roadway 115 kV substation located within the [REDACTED]. Since its POI is located on [REDACTED] [REDACTED] will be studied on a group basis along with other similarly situated projects connecting within the [REDACTED]. Details related specifically to the Group Network Analysis for the [REDACTED] are provided in Appendix A.

## 2. Project Description

### 2.1 Point of Interconnection

The [REDACTED] is to be connected by a radial generation tie (constructed, owned, maintained, and operated by the project developer) to the existing SCE Roadway 115/33 kV Substation 115 kV Bus. The solar project developer proposes to utilize 1 MW solar photovoltaic arrays. Each array consists of two 500 kW inverters for a total of 300 inverters. Every [REDACTED] of these inverters will be interconnected to one 0.480V/35 kV step-up transformer; for a total of 150 of these transformers. Consequently, the voltage will be stepped up once more with one main 35 kV/115 kV transformer. The specific electrical parameters for each distribution feeder will be provided by the project developer. Figure 2.1 provides the one-line diagram that illustrates the electrical point of connection of the project relative to the [REDACTED] while Figure 2.2 provides the geographical point of connection for the [REDACTED].

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### 3. Point of Interconnection Assessment

The assessment to identify the most viable POI was done by mutual agreement between the Interconnection Customer and SCE. The assessment considered multiple disciplines, included but not limited to engineering, operations, project permitting, and licensing land use, and ongoing transmission projects in this area. This was a preliminary assessment and was based on information at hand as well as best engineering judgment.

It should be acknowledged that any conclusions drawn in this Phase I Report related to a preferred POI 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.

In addition, the study also includes prior queued projects in the study base case, and shall only study the impact on Distribution provider's electrical system, including that portion that is part of the CAISO grid.

#### 3.1 Original Point of Interconnection Request

SCE performed an assessment to identify Interconnection of the [REDACTED] to be a radial generation tie (constructed, owned maintained, and operated by the project developer) to the existing SCE Roadway 115 kV Substation which is within the [REDACTED]. Based on information provided by [REDACTED] in their Interconnection Request and known information about the geographic area surrounding the POI, SCE assessed the viability of the original POI request. Based on this assessment, the original POI request has been found to be viable.

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

Based on information provided by [REDACTED] in their Interconnection Request and known information about the geographic area surrounding the POI, SCE assessed potential alternatives to the original POI request. Based on the information at hand during this assessment, no alternatives were found to be superior to the original POI request.

### 4. Study Related to Interconnection Facilities

#### 4.1 SCE Interconnection Facilities

SCE performed an assessment to identify SCE Interconnection Facilities required to connect the [REDACTED] into existing Roadway 115/33 kV substation 115 kV Bus. Based on information provided by [REDACTED] in their Interconnection Request and known information about the geographic area surrounding the POI, SCE has identified the following Interconnection Facilities that need to be installed between the Point of Change of Ownership and the SCE portion of the CAISO Controlled Grid.

## 4.2 Study Results Related to Distribution Upgrades

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

1. The additional telecommunications path from the generating facility to Roadway Substation will be installed by SCE.
2. It is assumed that the last structure of the 115 kV generation tie line outside the SCE Roadway substation property line would be at a distance from the substation switchyard that it would require SCE to install one additional dead end structure and a total of two spans of line to reach the proposed 115 kV line position. The additional structure and conductors between the last generator – owned structure and the substation switchyard will be installed by SCE.
3. The required revenue metering cabinet and retail load meters to be installed at the generating facility will be installed by SCE.
4. The required Remote Terminal Unit (RTU) to be installed at the generating facility will be installed by SCE.

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

1. The [REDACTED] generation tie line from the generating facility to the last structure outside the SCE Roadway substation property line will be installed by the generator.
2. The 115 kV generation tie line must be equipped with Optical Ground Wire (OPGW) to provide [REDACTED] telecommunication paths required for the Special Protection Scheme (SPS). The OPGW 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 115 kV generation tie line.
5. The following 115 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] distance relay.
  - b. [REDACTED] current differential relay.
  - c. [REDACTED] (one each for SPS A and B) to trip the main generator breaker.
  - d. [REDACTED] satellite synchronized clock.

## 4.3 Interconnection Facilities

### A. Subtransmission:

#### [REDACTED] generation tie line

Install [REDACTED] end structure, two spans of conductors and OPGW and twelve dead end insulator / hardware assemblies between the last generator – owned structure and the Roadway Substation dead – end rack at the 115 kV switchyard.

### B. Substations:

#### Roadway Substation

Install the following Interconnection Facilities components for the termination of the new 115 kV generation tie line at the Roadway Substation 115 kV Switchyard.



- [REDACTED] structure (42 Ft. High x 30 Ft. Wide)
- [REDACTED] coupling capacitor voltage transformers
- [REDACTED] distance relay
- [REDACTED] line current differential relay

**C. Metering Services Organization**

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**

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**

Given that [REDACTED] is part of the [REDACTED] then all Network Upgrade requirements were identified within that Group Study. SCE has assessed the need for Network Upgrades to mitigate potential impacts on the CAISO Controlled Grid caused by the [REDACTED]. Details of these results are provided in Appendix A.

**6. Study Related to Distribution Upgrades**

SCE performed an assessment to identify Distribution Upgrades required to mitigate impacts on SCE's Distribution System caused by the connection of and power deliveries from the [REDACTED].

**7. Facilities Requirements and Cost Responsibility**

The following facilities requirements and associated costs have been determined to be the responsibility of the [REDACTED].

**7.1 Distribution Provider Interconnection Facilities**

This Phase I Study has identified the following Interconnection Facilities that are located between the Point of Change of Ownership and the POI. . For a description of the facilities, refer to Section 4, *Study Related to Interconnection Facilities*. For cost information please refer to *Table 7.1, Summary of Cost Estimates*

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

Scope: Interconnect 150MW of Generation to the SCE Distribution System at the [REDACTED] 115kV Bus for an interconnection to the CAISO Grid at the Kramer Substation 115kV Bus.

**Table 7.1  
Summary of Cost Estimates**

No.	ELEMENT	INTERCONNECTION FACILITIES (Subject to ITCC)	ITCC ** (35%)	ONE-TIME PAYMENT
1	Sub-Transmission			
	115kV Gen Tie Segment into Kramer Substation	\$ 279,000	\$ 98,000	\$ 377,000
2	[REDACTED]			
	115kV Gen Tie Line Drop incl. support structure and line protection elements	\$ 294,000	\$ 103,000	\$ 397,000
3	Metering Services			
	Retail Metering Equipment at the Generation Facility	\$ 12,000	\$ 4,000	\$ 16,000
4	Power System Control			
	RTU at Generation Facility	\$ 91,000	\$ 32,000	\$ 123,000
5	General Contractor			
	Project Manager	\$ 80,000	\$ 28,000	\$ 108,000
	<b>Totals</b>	<b>\$ 756,000</b>	<b>\$ 265,000</b>	<b>\$ 1,021,000</b>
				<b>\$ 1,000,000</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 2003A, ITCC is not collected on Reliability Upgrades.  
 \*\* ITCC cost (calculated at 35% based on Customer Operating Data 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]. 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 the SCE portion of the CAISO Controlled Grid caused by the connection of and power deliveries from the [REDACTED]. 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 the SCE portion of the CAISO Controlled Grid caused by the connection of and power deliveries from the [REDACTED]. The CAISO has applied distribution factors to those transmission elements that were identified in Appendix A as Delivery Network Upgrades to determine [REDACTED]'s share of the total cost responsibility. Details of these results are provided in Appendix A.

# 8. Estimated Construction Schedule

The estimated time to construct the required SCE'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 SCE'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 SCE's portion 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.

**Attachment A.1: COST ALLOCATION TABLES**

Project	Point of Interconnection	MW	Comments
1. T264	Homer 500kV Bus	300	500kV Generation tie
2. T163	Ivanpah 220kV Bus	300	220kV Generation tie
3. T234	Eldorado - Ivanpah #1 & #2 220kV	400	Jean Lake Substation
4. T382	Nipton - Pisgah 500kV T/L	290	Crucero Substation
5. T467	Eldorado - Ivanpah #1 220kV T/L	230	Primm Substation
6. T205	Eldorado 220kV Bus	600	220kV Generation tie
7. T381	Eldorado - Ivanpah #1 & #2 220kV	240	Jean Lake Substation
8. T109	Pisgah 220kV Bus	550	220kV Generation tie
9. T110	Pisgah 220kV Bus	1400	2-220kV Generation ties
10. T278	Homer - Pisgah 500kV T/L	565	Siberia Sub. at 220kV
11. T290	Homer - Pisgah 500kV T/L	750	Cadiz Sub. at 220kV
12. T295	Pisgah 220kV Bus	300	220kV Generation tie
13. T384	Homer - Pisgah 500kV T/L	900	Cadiz Sub. at 500kV
14. T385	Homer - Pisgah 500kV T/L	600	Cadiz Sub. at 500kV
15. T203	Cool Water-SEGS-Tortilla 115kV	198.65	Rock Substation
16. T350	Cool Water - Dunn Siding 115kV	80	PV 31 Substation

Project	Point of Interconnection	MW	Comments
17. T144	Kramer 220kV Bus	320	Existing LSP Generation tie
18. T154	Kramer - Whirlwind 500kV T/L	500	Hwy 58 Sub at 220kV
19. T363	Kramer - Whirlwind 500kV T/L	700	Hwy 58 Sub at 220kV
20. T430	Inyokern - Kramer No.2 220kV T/L	250	Desarnet Substation
21. T220	Inyokern - Kramer No.2 220kV T/L	450	Desarnet Substation
22. T255	Inyokern - Kramer No.3 220kV T/L	750	Millennium Substation
23. T391	Inyokern 220kV Bus	15	No Generation tie Required
24. T392	Inyokern 220kV Bus	15	No Generation tie Required
25. T393	Inyokern 115kV Bus	15	No Generation tie Required
26. T394	Non SCE Dixie Valley - Oxbow 220kV	52	No Generation tie Required
27. T396	Non SCE Dixie Valley - Oxbow 220kV	52	No Generation tie Required
28. T398	Non SCE Dixie Valley - Oxbow 220kV	52	No Generation tie Required
29. T399	Non SCE Dixie Valley - Oxbow 220kV	52	No Generation tie Required
30. WDT288	Kramer - Rocket Test 115kV Line	100	PV 28 Substation
31. WDT315	Casa Diablo 34.5kV Bus	35	New 34.5kV Position
32. T221	Lockhart 220kV Bus	450	220kV Generation tie
33. WDT285	Cottonwood - Savage 115kV Line	100	PV 25 Substation
34. WDT286	Victor - New DSP 115kV	150	PV 26 Substation
35. WDT317	Roadway 115kV Bus	150	115kV Generation tie
36. T271	Cool Water - Desert View 220kV T/L	400	Jasper Substation

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