[redacted]

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

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SOUTHERN CALIFORNIA
EDISON
An *EDISON INTERNATIONAL*SM Company

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Table of Contents

Tables

Figures

Appendices

Executive Summary

[redacted] applied to Southern California Edison (SCE) for interconnection of a new 100 MW solar generation project deemed [redacted] (Project). [redacted] application was in accordance with SCE Wholesale Distribution Access Tariff Clustering Large Generation Interconnection Procedures Tariff (WDAT CLGIP Tariff). [redacted] requested and paid for Interconnection Studies in compliance with Appendix H, Section 3.4.1 of the WDAT CLGIP Tariff.

Southern California Edison (SCE) assessed [redacted] original Point of Interconnection (POI) to connect the Project to SCE Cottonwood-Savage 115 kV Line via a new [redacted] Substation to form the new Cottonwood-[redacted] 115 kV Line. 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 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 [redacted] requirements, SCE estimated the Project costs as follows:

Component	Estimated Costs
SCE Interconnection Facilities	$900,000
Reliability Network Upgrades	$292,000
Delivery Network Upgrades	$13,002,000
Distribution System Upgrades	$13,238,000
TOTAL ESTIMATED COST	**$27,432,000.00**

1. Introduction

[redacted] applied to SCE for interconnection of a new 100 MW solar generation project ([redacted]). The [redacted] will have an output of 100 MW, which will be produced by [redacted]

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 [redacted] network system is comprised of the Metro Area or sometimes referred to as the LA Basin area. The [redacted] electrical radial systems consist of the [redacted] Generation interconnection applications received during the queue cluster window 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] will interconnect to the Cottonwood-Savage 115 kV line via a new [redacted] Substation within the [redacted] by tapping the Cottonwood-Savage 115 kV line and forming a new Cottonwood-[redacted]-Savage 115 kV line. Since its Point of Interconnection is located on the [redacted] the [redacted] Solar generation project 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] will tap the Cottonwood-Savage 115 kV line, forming the new Cottonwood-[redacted]-Savage 115 kV line. The solar project developer proposes to utilize [redacted] photovoltaic arrays. Each array consists of [redacted] inverters. Every two of these inverters will be interconnected to one 0.480V/35 kV step-up transformer, for a total of [redacted] 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 interconnection of the project relative to the East of Lugo system while Figure 2.2 provides the geographical point of interconnection for PV-25 Solar Generation Project.

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Figure 2.1
[redacted] Project POI Diagram

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Figure 2.2
East of Lugo System Google Earth Map
PV-25 Solar Generation Project

[redacted]

2.2 Generation Requests within East of Lugo Bulk System

High level details and locations of these generation resources are shown in Table 1 and Figure 1 of Appendix A.

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Figure 2.3

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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 Controlled Grid.

3.1 Original Point of Interconnection Request

SCE performed an assessment to identify Interconnection Facilities required to connect the [redacted] into the Cottonwood-Savage 115 kV line within the East of Lugo System via a new [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 Distribution Provider Interconnection Facilities

SCE performed an assessment to identify SCE Interconnection Facilities required to connect the [redacted] Solar Generation Project into the Cottonwood-Savage 115 kV line via a new [redacted] Based on information provided by [redacted] in their Interconnection Request and known information about the geographic area surrounding the POI, SCE has identified Interconnection Facilities that need to be installed between the Point of Change of Ownership and 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 [redacted] will be installed by SCE.
2. It is assumed that the last structure of the 115 kV generation tie line outside the SCE [redacted] 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 [redacted] 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] 115 kV generation tie line from the generating facility to the last structure outside the SCE [redacted] 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] *relays (one each for SPS A and B) to trip the main generator breaker*
   d. [redacted] *– 2407 satellite synchronized clock*

4.3 Interconnection Facilities

A. Subtransmission

[redacted]

Install [redacted] 115 kV dead end structure, two spans of conductors, OPGW, and 12 dead end insulator / hardware assemblies between the last generator – owned structure and the [redacted] substation dead – end rack at the 115 kV switchyard.

B. Substations

[redacted]

Install the following Interconnection Facilities Components for the termination of the new 115 kV generation tie line.

- [redacted] dead end structure (42 ft. high x 30 ft. wide)
- [redacted] 115 kV 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 [redacted] 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] Solar generation project 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 connect the [redacted] to a new SCE 66 kV substation.

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 Point of Interconnection. *Please refer to Table 7.1, Cost Summary, on the subsequent page.*

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Table 7.1
Summary of Cost Estimates

[redacted] - WDT285

Interconnection Facilities Cost Estimate Summary (2009 Dollars)

Scope: Interconnect 100MW of Generation to the SCE Distribution System at the Cottonwood-Savage 115kV line via [redacted] Substation for an interconnection to the CAISO Grid at the Victor Substation 115kV Bus.

No.	ELEMENT	INTERCONNECTION FACILITIES (Subject to ITCC)	ITCC ** (35%)	ONE-TIME PAYMENT
1	**Transmission**			
	115kV Gen Tie Segment into Victor Substation	$ 198,000	$ 69,000	$ 267,000
2	[redacted] **Substation**			
	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 Management	$ 69,000	$ 24,000	$ 93,000
	Totals	$ 664,000	$ 232,000	$ 896,000
				$ 900,000

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 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]. 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 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 CAISO Controlled Grid caused by the connection of and power deliveries from the [redacted] project. The CAISO applied distribution factors to those transmission elements identified in Appendix A as Delivery Network Upgrades to determine [redacted] 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.

East of Lugo D-22

Install 3rd 500/230 kV transformer banks at Pisgah (D-22)
PISGAH SUBSTATION – ADDITIONAL No.3AA 500/220kV TRANSFORMER BANK
Delivery Needed for [redacted]

	Elements
1	**Pisgah Substation:** Expand the Initial Configuration as follows to include the installation of the additional facilities required to support the Transitional Queue Interconnections: **Substation Expansion Required:** · Extend the North and South 500kV buses six positions to the west to span new Positions 5 through 10. · Equip new 500kV Position 8 as a Double Breaker Line Position to connect the new No.3AA Transformer Bank. · Install new 1120MVA 500/220kV No.3AA Transformer Bank consisting of four 373MVA Single Phase Units (Includes one Spare Unit) and 13.8kV Tertiary Buses. · Install a new East Section of North and South 220kV Buses to span four new 220kV Positions 16 through 23. · Equip one new 220kV Positions as a Double Breaker Positions to connect the new No.3AA Transformer Bank. · The expansion addressed above requires an approximate extension of the original 1350 Ft. by 875 Ft. area · The expansion addressed above area requires grading and site preparation and also the extension of the original grounding grid, interior driveways and control cable trenches. **Power System Control** · Expand the existing RTU at [redacted] to install additional points required for all new substation elements.

Cost Allocation Factor						
Queue #	Flow Impact (MW)	Fotely Impact	Cost Share	Total Cost of Upgrade		Cost per Element
	100.00	100.00	100%	$70,948,374	$	70,948,000
				TOTAL	**$**	**70,948,000**