[redacted]

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

July 31, 2009

SOUTHERN CALIFORNIA
EDISON
An *EDISON INTERNATIONAL*SM Company

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Executive Summary

[redacted] applied to Southern California Edison (SCE) for interconnection of a new 48 MW geothermal project called [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.

SCE assesse[redacted]s original Point of Interconnection (POI) to connect the Project to SCE's existin[redacted]15/34.5 k[redacted] The POI proved viable provided all easements and environmental permits are granted by the Inyo National Forest and other relevant regulatory agencies. 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 th[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 COST
SCE Interconnection Facilities	$1,000,000
Reliability Network Upgrades	$1,586,000
Delivery Network Upgrades	$84,000
Distribution System Upgrades	$24,390,000
TOTAL ESTIMATED COST	**$27,060,000.00**

1. Introduction

[redacted] applied to SCE for interconnection of a new 34.7 [1]MW geothermal project [redacted] The [redacted] consists of two individual turbines coupled with two individual generators.

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 or sometimes referred to as the LA Basin area. The three electrical radial systems consist of the [redacted] and the [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. serial project). Generation interconnection applications requesting interconnections to facilities within one of the three electrical radial systems are to be 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.

1.2 Group Study Designation

In mutual agreement with SCE, [redacted] indicated that the [redacted] be connected to the existing SCE [redacted] 115/34.5 kV [redacted] within the [redacted] Since its POI is located on the [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 line from the developer's distribution service entrance to the existing SCE [redacted] 115/34.5 kV [redacted] and delivered to the CAISO Controlled Grid at SCE's Control Substation 115 kV bus. The geothermal project developer proposes to utilize [redacted] high pressure turbines and two low pressure turbines coupled in tandem to two 1800 RPM synchronous generators for total rated output of 48.0 MW. Due to an auxiliary load of 4.1 MW, the total project output is 43.9 MW. These two generators are to be connected to one 38 MVA 34.5/12.47 kV customer owned transformer. This arrangement is shown below in Figure 2.1. Figure 2.2 provides the geographical point of connection.

[1] Conflicting values in the large generator interconnection study process agreement Attachment A and Attachment B lead to confusion over what generator characteristics to study. Emails exchanged between SCE and [redacted] resolved that, the correct generator output value to be 43.9 MW.

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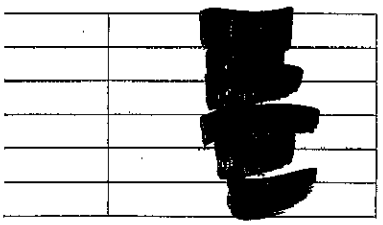


3. Point of Interconnection Assessment

The assessment to identify the most viable POI was done by mutual agreement between the Interconnection Customer and SCE. It was determined that the point of delivery to the CAISO Grid will be at SCE's porition of the CAISO Control Substation 115 kV bus. Conclusions drawn from the assessment typically considered multiple disciplines including but not limited to engineering, operations, project permitting and licensing, land use, and ongoing transmission projects in the 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] to the existing SCE Casa Diablo 115/34.5 kV Substation. 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 provided that all easements and environmental permits are granted by the Inyo National Forest and other relevant regulatory agencies.

3.2 Potential Alternatives to 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.

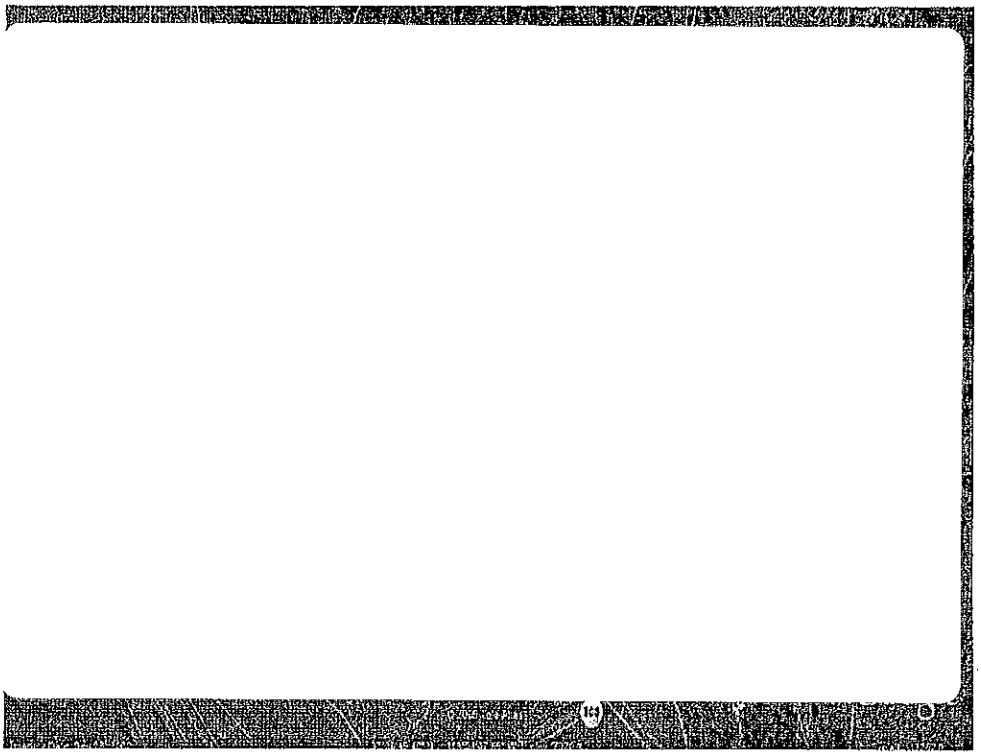
4. Study Related to Interconnection Facilities

4.1 Participating Transmission Owner Interconnection Facilities

SCE performed an assessment to identify Distribution Provider Interconnection Facilities required to connect the [redacted] to the existing SCE [redacted] 115/34.5 kV [redacted] (please see Figure 4.1. on the subsequent page.)

Figure 4.1

Proposed 33 kV Line Route



4.2 Phase I Facilities Study Assumptions

4.2.A Assumptions Included in Phase I Study

1. It is clarified that the project shall interconnect 48 (gross) MW of generation to a new dedicated SCE 33 kV distribution line out o[redacted] and shall not share interconnection facilities with any other SCE customers.
2. Point of receipt to be at SCE's[redacted] 15/33 kV[redacted]
3. SCE will install the required revenue metering cabinet and retail load meters at the generating facility.
4. Total generation net output of 43.9 MW.
5. Point of Interconnection to be at SCE's[redacted]at 33 kV.
6. Existing telecommunications infrastructure is sufficient to provide channels required for any special protection scheme (SPS) relays.
7. SCE will install the required remote terminal unit (RTU) at the generating facility.
8. Technical data for the interconnection study was provided by[redacted]
9. A new 33 kV circuit is installed.

4.2.B Assumptions NOT Included in Phase I Study

1. All required CAISO metering equipment at the generating facility will be provided by the generator.
2. 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 33 kV circuit.
3. The SPS will trip the Casa Diablo 33 kV circuit breaker so there would be no SPS relays required at the generating facility.

4.3 Study Results

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.

A. Distribution:

New 33 kV Circuit

Install a new [redacted] circuit to terminate at the 33 kV generation interconnection facility. The proposed line route is shown in Figure 4.1.

[redacted] of 43.9 MW is too large to be fed from the existing Vulcan 33 kV generation circuit; given the presence of 32 MW of existing generation. Therefore a [redacted] circuit is required to accommodate this generation project. This would consist of approximately 4,000 ft. of new underground 33 kV circuitry with [redacted] runs of 1500CLP cable. The new 33 kV circuit would originate from [redacted] going underground along the existing dirt road, joining the existing paved road toward the new proposed facility. The new line would serve the new generation only and should be considered as part of the interconnection facilities. A portion of new 33 kV circuit will be on Inyo National Forest property and the rest on [redacted] property. There may be substantial environmental review required. Ownership of the circuit has not been finalized.

B. Substations

Casa Diablo Substation

Equip new 33 kV [redacted] s a 33 kV circuit position with underground getaway by installing the following equipment:

- [redacted] 1200A circuit breaker
- [redacted] horizontally-mounted group operated disconnects switches
- [redacted] lead-end structure
- [redacted] vertically-mounted-group operated disconnect switches
- [redacted] cable risers
- [redacted] potheads to terminate the underground cables
- [redacted] surge arresters

Install [redacted] underground cables [redacted] of 1500CLP) inside a 100 ft. duct bank between 33 kV [redacted] o station perimeter fence.

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 remote terminal unit (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]s part of th[redacted]ll Network Upgrade requirements were identified within that Group Study. SCE assessed the need for Network Upgrades to mitigate potential impacts on the CAISO Controlled Grid caused by the [redacted]

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] Information related to the Study is detailed below.

A. Additional Study Assumptions and Methodology

1. The study considered [redacted]oad conditions for both peak loading and minimum loads. The light load evaluation was based on recorded minimum distribution system loads for a recent 12 month period. Recorded minimums were documented to be only 7.5 MW.

2. The analysis evaluated the impact of the [redacted]on the [redacted]33 kV line and 115/33 kV transformer loading for Base Case and N-1 condition. Both peak load and light load conditions were modeled. Line loadings were monitored both with and without the proposed project in service to determine if the project caused any potential line or transformer overloads. For light load conditions, max generation was assumed for existing area generation. Peak load conditions were not reported as the light loading, maximum generation condition was found to be worst-case for all scenarios.

3. A short circuit duty study was performed to identify any distribution circuit breakers overstressed by the project's short circuit duty contribution. The data set used for the short circuit study represented all existing generation and all projects in the interconnection queue. This list includes the [redacted]

4. Voltage control requirements will be based on SCE rules, and all applicable Federal Energy Regulatory Commission (FERC) approved rules, tariffs, and regulations.

5. Technical data for the interconnection study was provided by [redacted]

B. Study Results

Based on information provided by [redacted]n their Interconnection Request and known information about the geographic area surrounding the POI, SCE identified the following Distribution Upgrades needed to address impacts on SCE's Distribution System.

1. Instal[redacted]bus dead-end structures and extend the existing 33 kV operating and transfer busses t[redacted]

2. Equip[redacted]s a bank position to allow relocation of existing 33 kV/12 kV transformer bank

3. Install the necessary protection requirements in the substation

4. The new generation will be subject to a potential manual curtailment at the direction of SCE's Grid Control Center for an operating contingency of eithe[redacted] transformer bank[redacted] transformers out of service) under light local load and heavy local generation conditions.

C. Power Flow Study Results

1. The study was performed assuming the following conditions: (Load flow plots are included in Figure 6.1)

   - Light Loading Base Case with WDAT in service
   - Light Loading Base Case with WDAT not in service
   - Light Loading N-1 of Casa Diablo 115/33 kV XFMR with WDAT not in service
   - Light Loading N-1 of Casa Diablo 115/33 kV XFMR with WDAT in service
   - No Load, N-1 of Casa Diablo 115/33 kV XFMR with WDAT in service
   - Heavy loading conditions were determined not to be relevant during the analysis

2. No Base Case (N-0) overloads were identified for the [redacted] distribution transformer banks (No. 1 & No. 2).

3. The worst case N-1 contingency is for loss of the 28 MVA [redacted] East Bank. Remaining capacity of the [redacted] Bank and th[redacted] West Bank at the N-1 ratings of those banks was demonstrated by load flow to be slightly less than the maximum generation case. However, with expected 7.5 MW minimum distribution load, discounted by 50% (as is typical to allow for variation in this value), it was concluded that during an N-1 contingency for 1-28 MVA bank loading would not exceed N-1 ratings.

4. An operating contingency (N-2) analysis was performed for temporary loss of both transformers included in either [redacted] distribution (No. 1 or No. 2) transformer bank with all local generation at maximum contract output. This N-2 condition will occur temporarily when a bank circuit breaker relays, until such time as manual switching can restore one or both transformers to service. This operational analysis revealed that for this N-2 condition an overload of the remaining banks may occur during light load, maximum generation conditions. [redacted] e 28 MVA transformer within the remaining [redacted] hould this scenario occur [redacted] nding on actual generation output and actual distribution load at the time of contingency. SCE may limit the operation, disconnect, or require the disconnection of the generation from SCE's distribution system at any time, with or with out notice, to correct unsafe operating conditions at SCE's [redacted]

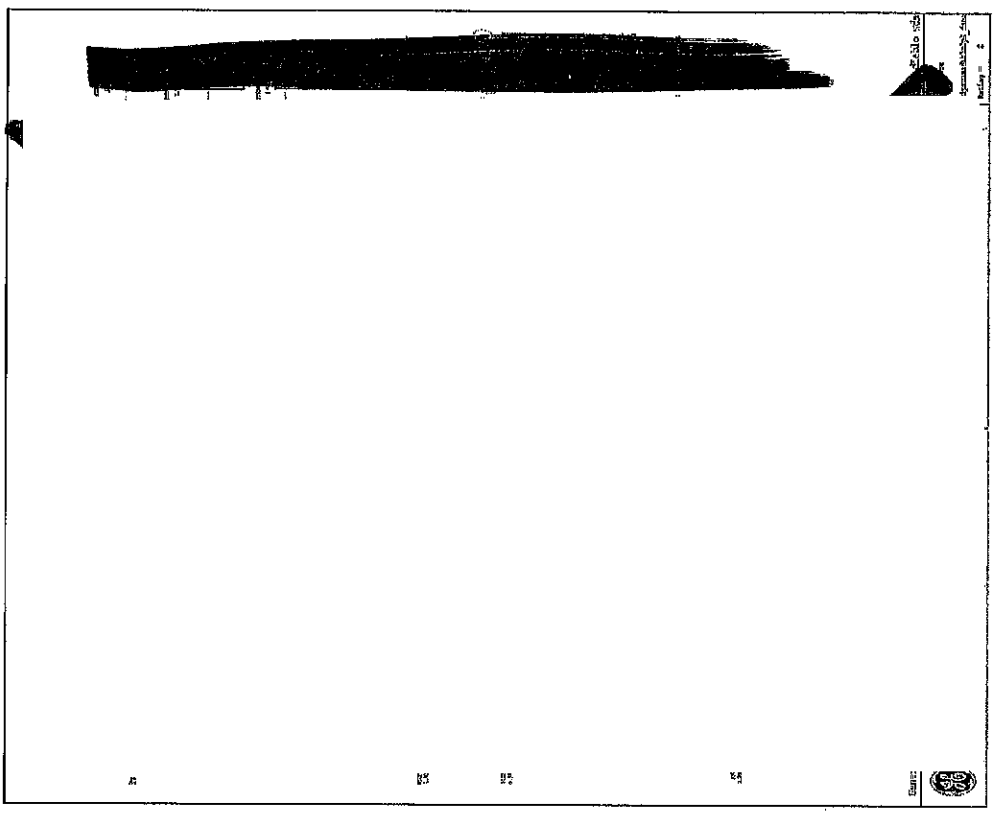
D. Voltage Control

The total generation (MW) output and total VAR production of generation facility [redacted] will materially affect [redacted] bus voltage and all local distribution voltage. The generation facility will be required to operate so as to maintain voltage as per SCE direction with respect to voltage and VAR production, and will be subject to all applicable SCE rules, all applicable Federal Energy Regulatory Commission (FERC) approved rules, tariffs, and regulations.

E. Short-Circuit Duty Study

The results of the short-circuit duty studies are provided in Table 6.1. Preliminary investigation revealed the project drives no requirements to replace any distribution circuit breakers; however, the short-circuit duty was increased by 0.2 kA or more at the [redacted] sub-transmission bus. This will require that a sub-transmission breaker assessment be included in the required Phase II Study for the project.

Figure 6.1
Load Flow Diagram for Bank Analysis



"The estimated costs of Distribution Upgrades identified as a result of an Interconnection Request studied separately shall be assigned solely to that Interconnection Request. The estimated costs of Distribution Upgrades identified through a Group Study shall be assigned to all Interconnection Requests in that Group Study pro rata based on each Interconnection Request's contribution to the need for the upgrade."

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 (please reference *Table 7.1, Cost Summary* on the subsequent page).

A. Substation

[redacted] *General Scope of Work*

Engineer and install a new 33 kV circuit position with underground getaway to terminate a 33 kV generation interconnection.

B. Distribution (Proposed)

Build approximately [redacted] f new underground 33 kV circuit with two runs of 1500CLP cable. The new 33 kV circuit would originate from [redacted] going underground along the existing dirt road, joining the existing paved road toward the new proposed facility. It is clarified the project shall interconnect to the new SCE 33 kV line and shall not share interconnection facilities with any other SCE customers. A portion of new 33 kV circuit will be on Inyo National Forest property and the remained on [redacted] roperty. Because substantial environmental review may be required, the project scope may change.

[redacted] WDT315

Interconnection Facilities Cost Estimate Summary (2009 Dollars)

Scope: Interconnect 45.6MW of Generation to the SCE Distribution System at th[redacted]or an Interconnection to the CAISO Grid at the Control Substation 115kV Bus.

No.	ELEMENT	INTERCONNECTION FACILITIES (Subject to ITCC)	ITCC ** (35%)	ONE-TIME PAYMENT
1	[redacted]			
	Underground duct bank from stations fence to new 33kV Circuit Position	$ 542,000	$ 190,000	$ 732,000
	Equip new 33 kV Position 9 as a 33 kV circuit position with underground getaway by installing the following equipment:			
	• One 33 kV 1200A circuit breaker			
	• One set of 33 kV horizontally mounted group-operated disconnects switches			
	• One dead-end structure			
	• Two sets of 33 kV vertically mounted group-operated disconnect switches			
	• Three 33 kV cable risers			
	• Three 33 kV potheads to terminate the underground cables			
	• Three 33 kV surge arresters			
	• 33 kV underground cables (two runs of 1500CLP) inside a 100 ft. duct bank between 33 kV Position 9 to station perimeter fence			
2	**Metering Services**			
	Retail Metering Equipment at the Generation Facility	$ 12,000	$ 4,000	$ 16,000
3	**Power System Control**			
	RTU at Generation Facility	$ 91,000	$ 32,000	$ 123,000
4	**General Contractor**			
	Project Management	$ 65,000	$ 23,000	$ 88,000
	Totals	**$ 710,000**	**$ 249,000**	**$ 959,000**
				$ 1,000,000

* 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.

Table 7.1
Summary of Cost Estimates

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.

There is additional scope that only applies to the [redacted] That scope is described below.

A. Substation

[redacted] *General Scope of Work*

Engineer and install a new 33 kV circuit position with underground getaway to terminate a 33 kV generation interconnection.

B. Distribution Upgrades Scope Details

Install [redacted] new 33 kV bus dead-end structures 48 ft. and extend the existing 33 kV operating and transfer buses three position (48 ft) to the east to create new 33 kV [redacted] Equip new 33 kV Position 8 as a bank position for existing 33 kV/12 kV transformer bank by installing the following equipment:

- [redacted] circuit breaker
- [redacted] horizontally mounted group-operated disconnect switches.
- [redacted] dead-end structure
- [redacted] vertically mounted group-operated disconnect switches.

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] 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 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.

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