

WDT 273

Southern California Edison, Company
System Impact Study
(Distribution System)

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SOUTHERN CALIFORNIA
EDISON
An EDISON INTERNATIONAL Company

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EXECUTIVE SUMMARY

[REDACTED] applied to Southern California Edison (SCE) for interconnection and wholesale distribution service for its proposed [REDACTED] pursuant to SCE's Wholesale Distribution Access Tariff (WDAT 273) Small Generator Interconnection Procedures. The application requests that 23.5 MW of landfill gas generation (less 3.5 MW of auxiliary load) be paralleled with SCE's distribution system. The generation units will interconnect to what is presently the existing Chatsworth-Mac Neil-Newhall-San Fernando 66kV line out of the Saugus Substation. The [REDACTED] ("Project") is a generation facility consisting of [REDACTED] combustion gas turbine generator sets, with a maximum net export generation of 20 MW (See Appendix A). This project's output is to be transmitted to the California Independent System Operator (CAISO) controlled grid through the [REDACTED] bus (See Appendix B). The Project's proposed in-service date is [REDACTED].

As requested by [REDACTED] SCE performed a System Impact Study (SIS) to identify the impacts to SCE's system from this Project. The Study consists of a power flow analysis and a short-circuit analysis to determine the increase in three-phase and single line-to-ground short-circuit duties on the SCE sub-transmission system due to the Project. The Study showed the adequacy of the sub-transmission equipment interrupting ratings, flicker, grounding reviews and the impact on the electric system operation. Due to the relatively small size of this Project, no stability study was conducted. In addition, the protection coordination study was not included in this Study. [REDACTED] must first provide relay types to SCE before the protection coordination study can be performed.

This SIS concluded that with the proposed Project on-line:

- Load flow, thermal loadings, and voltage levels (both high and low) were all within acceptable limits.
- Three-phase short-circuit duties at [REDACTED] busses increased by more than 0.1 kA.
- Single line-to-ground short-circuit duties at [REDACTED] busses increased by more than 0.1 kA.
- A 66 kV looped substation must be built as a ring bus, or bus arrangement type, to meet criteria, rules, and regulations. Protection and communication requirements must also be met.
- The starting kVA of any auxiliary load, such as the starter motors, compressors, or any other motors, must be limited to 25 MVA based on 2 starts per day to less than 10 starts per hour to maintain a 2% voltage flicker. The customer's equipment must be constructed, operated, and maintained in such a manner as to limit, within acceptable industry standards, any detrimental voltage fluctuations, harmonic distortion, or noise feedback into Edison Company power lines. Failure to limit all such factors detrimental to the Edison system or its customers may subject the Project to disconnection from the system in accordance with CPUC tariff rules.
- A ground bank/detector may be required for this project.
- Telemetry per System Operating Bulletin (SOB) 510.

Based on these results, SCE concludes that a Facilities Study will be required. The Facilities Study should include the following scope:

- 1) Further evaluate the existing Chatsworth-Mac Neil-Newhall-San Fernando 66kV circuit components to determine facilities and upgrades necessary for interconnection of the Project. A preliminary scope of work is included in Appendix D.
- 2) Further evaluate the length, conductor, distance, and other components to build the 66 kV line for the interconnection of this Project. The preliminary generation location provided by [REDACTED] will be used by SCE to determine the design of the 66 kV line that will interconnect this Project to the Chatsworth-Mac Neil-Newhall-San Fernando 66kV circuit. A preliminary scope of work is included in Appendix D.
- 3) Determine if San Fernando Substation must be looped to meet SCE criteria as a result of, and as part of, this Project.
- 4) Further evaluate the type of 66kV substation design required for this Project and the associated requirements.
- 5) Assess 66 kV breakers at various substations (Lockheed, Newhall, Santa Susana, and Saugus) on the Saugus System to determine the need for upgrades (including estimated costs) where the short circuit duty was increased by 0.1 kA or greater. A preliminary assessment is provided in Appendix C.
- 6) Determine Protection interconnection requirements.
- 7) Determine the technical requirements for the ground bank/detector.
- 8) Determine total estimated cost and schedule for all upgrades and modifications needed for this interconnection. A preliminary cost estimate is provided in Appendix E; a preliminary schedule is provided in Appendix F.

[REDACTED]

WHOLESALE DISTRIBUTION ACCESS TARIFF

WDT 273

SYSTEM IMPACT STUDY

I. INTRODUCTION

[REDACTED] applied to Southern California Edison (SCE) for interconnection and wholesale distribution service for its proposed [REDACTED] pursuant to SCE's Wholesale Distribution Access Tariff (WDT 273) Small Generator Interconnection Procedures. The application requests that 23.5 MW of landfill gas generation is (less 3.5 MW of auxiliary load) be paralleled with SCE's distribution system. The generation units will interconnect to what is presently the existing Chatsworth-Mac Neil-Newhall-San Fernando 66kV circuit out of the Saugus Substation. The [REDACTED] "Project") is a generation facility (to be sited at the [REDACTED] located at [REDACTED] consisting of [REDACTED] combustion gas turbine generator sets, with a maximum net export generation of 20 MW (See Appendix A). This project's output is to be transmitted to the California Independent System Operator (CAISO) controlled grid through the [REDACTED] bus (See Appendix B). The Project's proposed in-service is [REDACTED]. As requested, SCE has performed a System Impact Study (Study) on SCE's Saugus 66 kV sub-transmission system served from the California Independent System Operator (CAISO) controlled grid at the [REDACTED]. The Study has identified system constraints, additional direct assignment facilities, and system upgrades required to provide the requested service and to maintain conformance with SCE, CAISO, or any other applicable system reliability planning criteria.

The scope of the Study includes those aspects defined in Sections 5 and 6 of the Study agreement applicable to the distribution system under consideration. This Study report describes the Study conditions and assumptions, and presents the results of the load flow, contingency, and short circuit duty analysis for interconnection of the proposed project on the Chatsworth-Mac Neil-Newhall-San Fernando 66kV line and the Saugus 66kV sub-transmission system, including the preliminary scope of the subsequent required Facilities Study.

As part of the Facilities Study scope, a 66 kV looped substation must be constructed in accordance with following criteria, rules, and regulations. A ground bank/detector will be connected to the 66 kV bus at the new substation. [REDACTED] must provide enough land to construct this substation on [REDACTED] property and provide an easement to SCE for the SCE-owned facilities without cost to SCE. The size, criteria, regulations, and other conditions of the substation will be developed in the Facilities Study. Final estimated costs will also be developed in the Facilities Study.

II. SYSTEM IMPACT STUDY ASSUMPTIONS AND METHODOLOGY

A. Study Assumptions

Study assumptions are those set out in the Study agreement. It is clarified that the project shall interconnect 23.5 MW of generation to SCE's Chatsworth-Mac Neil-Newhall-San Fernando 66kV circuit (20.0 MW net of auxiliary loads) and shall not share interconnection facilities with any other SCE customers. Applicant provided data utilized is included as Attachment A.

B. System Load Conditions

The Study was performed using the Saugus 66 kV sub-transmission system high and light load conditions. The maximum and minimum peak load forecasts are based on SCE's preliminary 2008-2017 Distribution Substation Plan (Year 2010)

C. Power Flow Study

This study evaluated the impact of the Project on the Chatsworth-Mac Neil-Newhall-San Fernando 66kV circuit, Saugus 66kV sub-transmission system, and transformer loadings for Base Case and N-1 conditions. Load flow, conductor thermal limits, and voltage limits were studied (with and without the proposed Project), to determine if the Project caused any adverse overloads or voltage conditions. The study also included potential impact of a large retail customer Method of Service (MOS) interconnection request to the Saugus system.

D. Short Circuit Duty Study

A short circuit duty study was performed to identify any circuit breakers whose short circuit duty ratings were exceeded due to the Project's short circuit duty contribution. Three-phase and single-line-to-ground faults were modeled with and without the Project on-line to determine the Project's contribution to short circuit duty at system buses. The data used for the short-circuit study represented all existing generation and all projects in the interconnection queue ahead of the [REDACTED] as on-line. The magnitude of the short circuit duty was also used to determine the interrupting capabilities of SCE's upstream protection devices.

E. Voltage Flicker

A voltage flicker study was performed to identify the maximum amount of starts per day allowed and the maximum motor starting MVA that will limit the amount of voltage flicker to 2% on SCE's 66 kV system.

III. STUDY RESULTS

A. Power Flow Study

66kV Subtransmission System

The Power Flow study included:

- 1) 2010 Loading Base Case with all 66 kV generation on and off and the [REDACTED] In-Service and Out-of-Service.
- 2) 2010 Loading Base Case with all 66 kV generation on and off and the [REDACTED] In-Service and Out-of-Service with a large customer MOS.
- 3) 2011-2017 Loading Base Cases with all 66 kV generation on and off and the [REDACTED]

[REDACTED] In-Service and Out-of-Service with the large retail customer MOS.

Base Case

The load flow study showed that there are no base case conductor or transformer overloads, or voltage level criteria violations on the Chatsworth-Mac Neil-Newhall-San Fernando 66kV circuit or Saugus 66kV system using 2010-2017 projected maximum and minimum loads and all 66 kV generation on and off with the [REDACTED] In-Service and Out-of-Service including the previously mentioned large retail customer MOS. These results are not expected to change significantly if the MOS does not materialize.

The generator is required to maintain its power factor within a range of 0.95 lagging to .95 leading or a greater range, pursuant to Good Utility Practice and SCE's Interconnection Handbook for Wholesale Generators. This SIS recognizes that a generator may provide or receive reactive power support to maintain SCE Rule 2 voltage levels to all our distribution customers connected to the Chatsworth-Mac Neil-Newhall-San Fernando 66 kV circuit. The operating power factor at the point of receipt shall be at unity unless [REDACTED] is otherwise notified by SCE to maintain a specified voltage schedule while operating within the power factor range as specified above.

Single Contingency (N-1)

During N-1 conditions there are no conductor or transformer overloads, or voltage level violations on the Chatsworth-Mac Neil-Newhall-San Fernando 66 kV circuit or Saugus 66 kV system using 2010-2017 projected maximum and minimum loads and all 66 kV generation on and off with the [REDACTED] In-Service and Out-of-Service plus the large retail customer MOS. These results are not expected to change significantly if the MOS does not materialize.

B. Short Circuit Duty Study

The results of the short circuit duty studies are provided in Appendix C. Preliminary analysis revealed the short circuit duty at several 66 kV substation buses on the Saugus System due to the Project was increased by 0.1 kA. These results require that a breaker assessment be included in the Facilities Study for this Project to determine if any circuit breakers will require replacement. The final number of breakers (if any) and the final estimated cost to replace such breakers will be included in the Facilities Study.

C. Voltage Flicker

SCE has determined that the maximum allowable starting MVA for any motor at this site is 25 MVA, based on less than 2 starts per day less than 10 starts per hour. This limit will ensure a voltage flicker of less than 2% on SCE's 66 kV system. The motor starting MVA may have to be further reduced to decrease the amount of flicker seen at the Project site and at [REDACTED]

IV. CONCLUSIONS

A Facilities Study will be required and should include the following:

- 1) Further evaluate the existing Chatsworth-Mac Neil-Newhall-San Fernando 66kV line components to determine facilities and upgrades necessary for interconnection of the Project. A preliminary scope of work is included in Appendix D.
- 2) Further evaluate the length, conductor, distance, and other components to build the 66 kV line for the interconnection of this Project. The preliminary generation location provided by [REDACTED] will be used by SCE to determine the design of the 66 kV line that will interconnect this Project to the Chatsworth-Mac Neil-Newhall-San Fernando 66kV line. A preliminary scope of work is included in Appendix D.
- 3) Determine if San Fernando Substation must be looped to meet SCE criteria as a result of, and as part of, this Project.
- 4) Further evaluate the type of 66kV substation design required for this Project and the associated requirements.
- 5) Assess 66 kV breakers at various substations (Lockheed, Newhall, Santa Susana, and Saugus) on the Saugus System to determine the need for upgrades (including estimated costs) where the short circuit duty was increased by 0.1 kA. A preliminary assessment is provided in Appendix C.
- 6) Determine Protection interconnection requirements.
- 7) Determine the technical requirements for the ground bank/detector.
- 8) Determine total estimated cost and schedule for all upgrades and modifications needed for this interconnection. A preliminary cost estimate is provided in Appendix E; a preliminary schedule is provided in Appendix F.

APPENDIX A
Distribution One-Line Diagram

TABLE
5 X 4700 KW ON SAUGUS SYSTEM
THREE PHASE SHORT-CIRCUIT DUTY SUMMARY

[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
8

SINGLE LINE-TO-GROUND SHORT-CIRCUIT DUTY SUMMARY

[REDACTED]
[REDACTED]

[REDACTED]
[REDACTED]
8

APPENDIX D
Distribution Interconnection System Impact Study Facilities Description

Scope of Work:

- Install [REDACTED] of double circuit and approximately 600 ft of 3 wire single conductor 954 SAC overhead conductor.
- Install a ground bank/detector and conductor.
 - Install disconnects on the 66 kV Sunshine Substation to connect the ground bank/detector.

Chatsworth-Mac Neil-Newhall-San Fernando 66 kV line:

- No work is necessary assuming that re-routing of the Chatsworth-Mac Neil-Newhall-San Fernando 66kV circuit (a proposed SCE project) will be completed to facilitate the proposed interconnection.

Customer's Responsibility:

- Provide conduit and structures in accordance with SCE's provided "B" drawings from the relay section on the switchgear to the ground bank/detector.

APPENDIX E
Interconnection System Impact Study Preliminary Cost Summary

Cost Summary

Results are Preliminary, Non-Binding Cost Estimates

Distribution

New Construction for Interconnection

1.) Install [REDACTED] and approximately 600 ft of 954 SAC of 3 wire single conductor overhead conductor

Estimated Distribution Cost: \$ 155,000.00

Additional time and costs may be applicable due to unexpected field conditions, events, or other reasons beyond SCE's control.

Substation(s)

Replace 66kV circuit breakers at various substation locations, if applicable

Estimated Substation(s) Cost: \$ 2,200,000.00

Substation cost to build a ring type substation and a ground bank/detector at SGP location on property provided [REDACTED]

Estimated Substation(s) Cost: \$ 4,100,000.00

ESTIMATED TOTAL COST DUE: \$ 6,455,000.00

Note: A refined cost estimate will be implemented on the Facility Study.

APPENDIX F
Preliminary Time Schedule for Construction

PROJECT SCHEDULE
Results are Non-Binding

ELEMENT	START	END	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9	Month 10	Month 11	Month 12	Month 13	Month 14	Month 15	Month 16 - 24	
PROJECT APPROVAL	Final Work Orders																		
SCE 16 KV & 16 KV SUBSTATIONS UPGRADES	Engineering & Design Major Equipment Procure & Deliver Construction Testing	Start of Mo. 2 Start of Mo. 4 Middle of Mo. 8 Start of Mo. 12																	
OTHER RELATED SUBSTITUTIONS	Engineering & Design Relays & Panels Construction Testing	Start of Mo. 5 Start of Mo. 7 Start of Mo. 10 Start of Mo. 12																	
NEW SCE 16 KV INTERCONNECTION FACILITY	Engineering & Design Customer Installation of Substructure and Panels Customer Signs and Pave Contract Scheduling Construction	New Distribution 16 KV Facilities Start of Mo. 2 Start of Mo. 4 Start of Mo. 4 Start of Mo. 7 Start of Mo. 7 3rd Week of Mo. 7																	

Attachment A

**PAGES OMITTED FOR
CEII REGULATIONS**

Attachment B