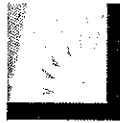


WDAT 691 ISP

***WDAT
INDEPENDENT SYSTEM IMPACT STUDY***

November 15, 2011



SOUTHERN CALIFORNIA
EDISON
An EDISON INTERNATIONALSM Company

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SOUTHERN CALIFORNIA EDISON COMPANY

EXECUTIVE SUMMARY

[REDACTED]

to Southern California Edison ("SCE") for interconnection and wholesale distribution service for its proposed [REDACTED] pursuant to SCE's Wholesale Distribution Access Tariff ("WDAT") Small Generator Interconnection Procedures. SCE performed an Independent System Impact Study as requested by [REDACTED] for a 480V interconnection and distribution service from an existing 12kV distribution line ("Calstate 12kV"). The interconnection is to be located approximately 1.8 miles from the [REDACTED] on the Calstate 12kV circuit out of SCE's [REDACTED]. The request is for a WDAT Fuel Cell generation facility with a total capacity of 1.4 MW. The initial request is for service to commence by [REDACTED].

The new generation, consisting of fuel cell generator, [REDACTED] inverter, would receive interconnection service from SCE's existing 12 kV circuitry on Calstate 12 kV out of [REDACTED] via an underground line extension to the interconnection facility. The generated power would be delivered to the California Independent System Operator ("CAISO") grid at the 220 kV bus of SCE's [REDACTED].

The purpose of this Independent System Impact Study is to determine the effect of the proposed generation on the SCE distribution system and the portion of SCE's electrical system that is part of the CAISO controlled grid, and to identify in general additional Interconnection Facilities, Distribution Upgrades, additions or modifications, or other facilities required to provide the requested service. The study was performed in two parts: Part A (performed by SCE's Distribution Field Engineering department) examines impacts related to that part of the SCE distribution system energized at less than 220 kV, while Part B (performed by SCE's Generation Interconnection Planning department) examines impacts and facilities related to the portion of the SCE electrical system energized at 220 kV and above (the bulk power system), and impacts and facilities associated with the CAISO controlled portion of the SCE grid. This is the Part A study report; a detailed report of the Part B study results is included as Attachment B.

The Part A study was performed for expected year 2011 through 2020 projected peak load conditions as well as 2011 through 2020 minimum load conditions.

The Part A Independent System Impact Study consisted of a power flow analysis, three-phase short circuit duty analysis based on most current thevenin equivalents and circuit voltage profile analysis. The analysis were performed to determine whether the energy associated with the [REDACTED] project can be transmitted through SCE's distribution system to the ISO grid at the 220 kV bus of [REDACTED] without creating the need for modifications to SCE's distribution system and/or to the ISO grid. The study showed that, with the [REDACTED] project on-line:

- For both peak load and light load conditions, the addition of the 1.4 MW [REDACTED] WDAT 691ISP project resulted in no violations of SCE's thermal loading criteria under base case and N-1 conditions for the SCE distribution System.

- The addition of the 1.4 MW [REDACTED] WDAT 691ISP Project did not result in voltage rise exceeding allowable Rule 2 limits.
- The addition of the 1.4 MW [REDACTED] WDAT 691ISP Project resulted in the increase of three phase short circuit duty at one (1) distribution substation. The circuit breaker interrupting capabilities were reviewed at these substation and it was determined that zero (0) circuit breakers will be required to be upgraded based on most current thevenin equivalents.

- Non-binding order of magnitude cost estimates for the required interconnection facilities and system upgrades are as follows:

| | |
|--|------------|
| Interconnection Facilities/Automation | \$ 227.0 K |
| Telemetry Requirements | \$ 112.0 K |
| <hr/> Total non-binding order of magnitude cost estimate | \$ 339.0 K |

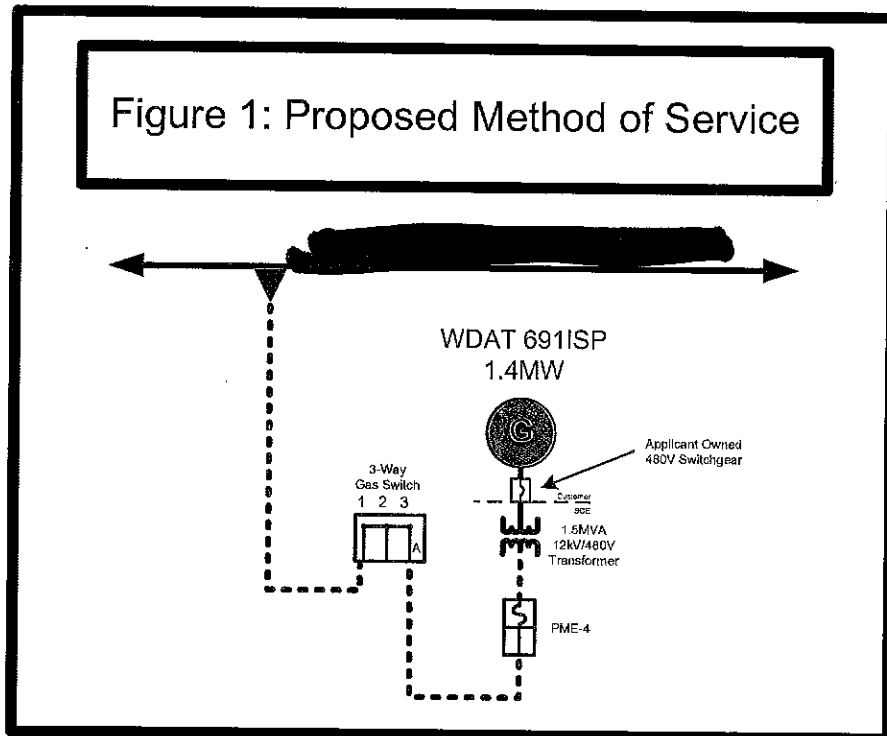
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I. INTRODUCTION TO PART A

[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") Small Generator Interconnection Procedures. SCE performed an Independent System Impact Study as requested by [REDACTED] a 480V interconnection and distribution service from an existing 12kV distribution line ("Calstate 12kV"). The interconnection is to be located approximately 1.8 miles from the [REDACTED] on the Calstate 12kV circuit out of SCE's [REDACTED]. The request is for a WDAT photovoltaic ("PV") generation facility with a total capacity of 1.4 MW. The initial request is for service to commence by [REDACTED].

The new generation, consisting of fuel cell generator, [REDACTED] inverter, would receive interconnection service from SCE's existing 12 kV circuitry on the Calstate 12 kV out of [REDACTED] via an underground line extension to the interconnection facility. The generated power would be delivered to the California Independent System Operator ("CAISO") grid at the 220 kV bus of SCE's Vista Substation.



The purpose of this Independent System Impact Study is to determine the impact of the proposed generation addition on the SCE distribution system and to identify in general additional Interconnection Facilities, Distribution Upgrades, additions or modifications, or other facilities required to provide the requested service. This study was performed for expected year 2011 through 2020 peak load conditions as well as low demand conditions.

II. PART A: SYSTEM IMPACT STUDY CONDITIONS & METHODOLOGY

Planning Criteria

The thermal rating of any conductor, connector, or apparatus should not exceed 100% of its normal rated capacity with all facilities in service (base case).

The thermal rating of any conductor, connector, or apparatus should not exceed 100% of its emergency rating under N-1 conditions.

Operational flexibility and reliability of the distribution system shall be maintained at all times.

Circuit voltage profiles should be maintained to comply within CPUC's Rule 2 requirements.

System Conditions

The power factor for the new generation facility was assumed to be within WDAT requirements of 0.95 lagging or leading.

Expected loading on the distribution system as projected by the SCE 2011 - 2020 plan was used.

Distributed Generation resources connected to the distribution system are analyzed offline and online during peak load conditions as well as during minimum daytime load conditions as to determine worst case scenario.

The Short circuit contribution from the inverter systems was determined using inverter manufacturer datasheets.

Thevenin equivalents for this study are based on most current thevenin equivalents.

III. PART A: SYSTEM IMPACT STUDY RESULTS

Short Circuit Analysis

Using the short circuit models from the inverter systems being utilized in this [REDACTED] generation system, it was calculated that the short circuit contribution at [REDACTED] 12 kV substation bus was more than 0.1 kA; thus a breaker analysis was required due to this generation. The circuit breaker analysis concluded that zero (0) 12 kV breakers replacements are required as part of this project.

System Protection Considerations

With this proposed method of service, no changes to the protection system of the SCE electrical system are required.

Thermal Loading

The line section of the Calstate 12 kV between the customer's facility and the 12 kV Point of Interconnection is expected to experience an incremental reverse power flow of approximately 1.4 MW during minimum loading. Of that 1.4 MW, approximately 0.8 MW will flow back into the 12 kV bus at [REDACTED] during minimum loading due to the absorption of the power flow by the local load.

Distribution Voltage Control

The section of the Calstate 12 kV circuit near the project area is expected to experience voltage rise of 1.6 %, which would not exceed the allowable CPUC Rule 2 requirements as a result to the addition of the 1.4 MW [REDACTED] Project under the generating facilities conditions of maximum generation and unity power factor.

Harmonic impact

The harmonic impact of the subject inverter based generation was not part of this System Impact Study. Despite the relatively low THD (<3%) of the equipment, impacts on voltage distortion levels may be significant due to the penetration level of the generation facility with respect to the local distribution grid strength. As with all equipment connected to the SCE distribution system, the generation project will be subject to the provisions of CPUC Rule 2.E, allowing SCE to require customer mitigation of interference with SCE service, including harmonic impacts, if harmonic interference is caused by the customer. Given the amount of generation and the strength of the distribution system, SCE will not require a harmonic study but encourages that the applicant completes a harmonic study during the Facility Study Phase to insure that the generation facility complies with the harmonic studies outlined in CPUC Rule 2.E. If the applicant chooses to complete a harmonic study, SCE will then provide the required SCE distribution system data that are to be used as part of the harmonic study.

IV. PART A: GENERAL DESCRIPTION OF IDENTIFIED UPGRADES

Distribution Upgrades

No Distribution Upgrades are required to interconnect this generation facility

Interconnection Facilities

Interconnection facilities include an underground line extension to the Calstate 12kV line for approximately 1750' of 1/0 CLP, the installation of an automated Pad-Mounted 3-Way Gas Switch, PME-4 Switch, metering CT's and PT's, meters, and associated wiring. The cost estimate for the required interconnection facilities is \$227.0 K.

Customer Equipment

The interface protection will be provided by the applicant and will include a 480V circuit breaker which is to be installed on an applicant-owned 277/480 V 3-phase/4-wire switchgear.

Drawings required by the Electrical Service Requirement (ESR) shall be submitted, reviewed, modified, and approved by SCE prior to release for fabrication/purchase of the equipment.

Applicant generation interconnection equipment must comply with SCE's Interconnection Handbook in regards to generation protection and lockable-visible disconnecting means at the point of interconnection.

V. NON-BINDING ORDER OF MAGNITUDE COST ESTIMATE

- Non-binding order of magnitude cost estimates for the required interconnection facilities and system upgrades are as follows:

Interconnection Facilities/Automation \$ 227.0 K

- 3-Way Pad-Mounted Gas Switch
- PME-4 Switch
- 1750' 1/0 CLP UG Line Extension
- Metering

Telemetry Requirements \$ 112.0 K

- RTU
- Telecomm

Total non-binding order of magnitude cost estimate \$ 339.0 K

VI. PART A: SUMMARY

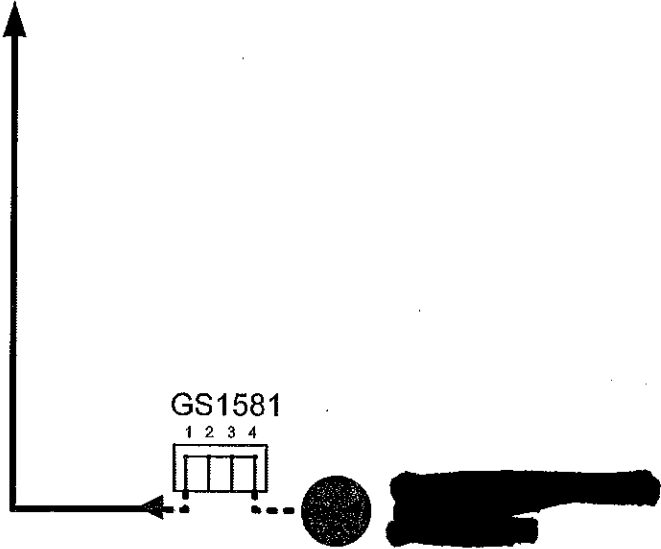
The Part A Independent System Impact Study showed:

1. No Distribution upgrades will be required to interconnection the generation system.
2. Interconnection facilities include an underground line extension to the Calstate 12kV line for approximately 1750' of 1/0 CLP, the installation of an automated Pad-Mounted 3-Way Gas Switch, PME-4 Switch, metering CT's and PT's, meters, and associated wiring.
3. Real time telemetry will be required. It will be required to install an RTU and Telecom systems as required to provide watts and VAR flow from the generation facility to the SCE distribution system.
4. Non-binding order of magnitude cost estimates for the required interconnection facilities and system upgrades are as follows:

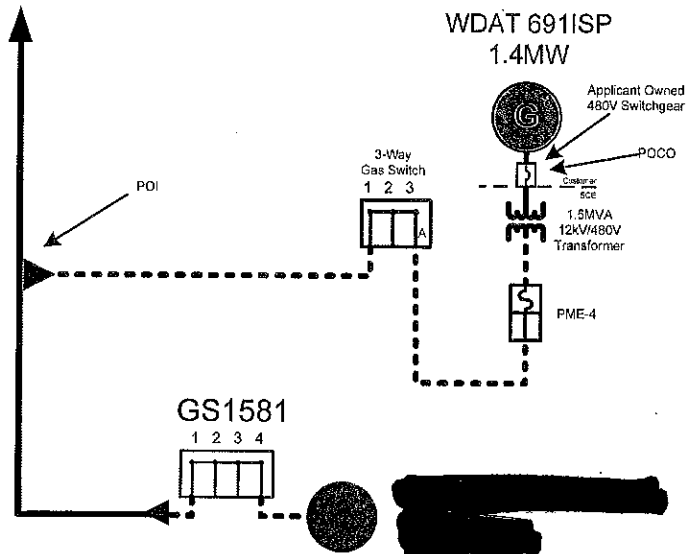
| | |
|--|------------|
| Interconnection Facilities/Automation | \$ 227.0 K |
| Telemetry Requirements | \$ 112.0 K |
| <hr/> | |
| Total non-binding order of magnitude cost estimate | \$ 339.0 K |

5. This Independent System Impact Study is based on various technical data previously provided by the applicant. If any of that information changes significantly, as determined by SCE, the results of this study may no longer be appropriate and may necessitate a new study.
6. The Independent System Impact Study is based on applicant's queue position. Additional studies may be needed if any changes occur in the projects ahead in the queue.

Attachment # 1
System Without WDAT 691ISP



Attachment #2
System With WDAT 691ISP



ATTACHMENT B – BULK POWER SYSTEM IMPACT STUDY REPORT

CAISO Controlled Bulk System

Short Circuit Duty:

Since the project is connecting on low voltage SCE distribution system and the project consist of inverter facilities which have limited short-circuit duty contribution, the SCD analysis determined no impact on SCE's high-voltage bulk power system after inclusion of the project.

Power Flow Study:

The power flow study analysis focused on identifying system thermal overload problems within SCE bulk system. The power flow study results identified that the project in connection with SCE's Vista 220 kV A Station didn't provide system impact to SCE's bulk power system.