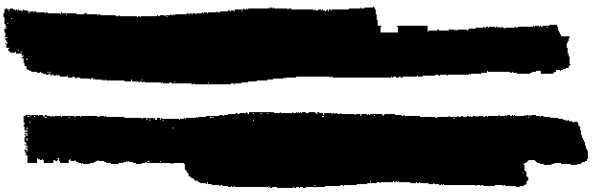
Appendix A – WDT400



Final Report

November 15, 2010

This study has been completed in coordination with Southern California Edison Large Generator Interconnection Procedures (CLGIP) for Interconnection Requests in a Queue Cluster Window

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Attachments:

1. **Generator Machine Dynamic Data**
2. **Dynamic Stability Plots (see Appendix F of the Group Report)**
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5. **Deliverability Assessment Results**
6. **Allocation of Network Upgrades for Cost Estimates**

1. Executive Summary

On July 31, 2009, the Southern California Edison Company ("SCE") received an interconnection request from [redacted], for the interconnection of its [redacted], pursuant to the Cluster Large Generator Interconnection Procedures ("CLGIP") under the SCE Wholesale Distribution Access Tariff ("WDAT"). The Project is a wind generation existing power plant with an output of 30 MW to the requested energy only Point of Interconnection (POI) on Southern California Edison Company's existing Pan Aero 115 kV Substation. The Interconnection Customer's requested Commercial Operation Date of the MRP project is April 1, 2012.

In accordance with the Federal Energy Regulatory Commission (FERC) Cluster Large Generator Interconnection Procedures ("CLGIP"), SCE Transmission and Interconnection Planning has performed a Phase I Interconnection Study to determine the impacts of the group as well as impacts of the Project on the CAISO controlled grid and SCE Distribution System.

The Group Report has been prepared separately identifying the combined impacts of all projects in th[redacted] group on the CAISO Controlled Grid. This report focuses only on the impacts of the Project.

The report provides the following:

1. Transmission and Distribution system impacts caused by the Project;

2. System reinforcements necessary to mitigate the adverse impacts caused by the Project under various system conditions and;

3. A list of required facilities and a non-binding, good faith estimate of the Project's cost responsibility and time to construct these facilities.

The QC2 study has determined that the Project contributes to various reliability and/or deliverability problems for which mitigation plans have been proposed. These mitigation plans are detailed in Section 10 of this report.

The non-binding SCE cost estimate of Interconnection Facilities[1] to interconnect the Project is approximately **$0,** including ITCC[2]. The maximum cost responsibility for the SCE Network Upgrades[3] to interconnect the Project is **$1,791,000,** and the cost of the Distribution Upgrades is **$0.**

The non-binding construction schedule to engineer and construct the facilities is approximately 48 months from the signing of the Cluster Large Generator Interconnection Agreement (CLGIA).

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[1] The transmission facilities necessary to physically and electrically interconnect the Project to the CAISO Controlled Grid at the point of interconnection.

[2] Income Tax Component of Contribution

[3] The SCE transmission facilities, other than Interconnection Facilities, beyond the point of interconnection necessary to physically and electrically interconnect the Project safely and reliably to the CAISO Controlled Grid

2. Project and Interconnection Information

Table 2-1 provides general information about the Project.

Table 2-1: [redacted]

Project Location	[redacted]
SCE Planning Area	[redacted]
Number and Type of Generators	[redacted]
Interconnection Voltage	[redacted]
Maximum Generator Output	[redacted]
Generator Auxiliary Load	[redacted]
Maximum Net Output to Grid	[redacted]
Power Factor Range	[redacted]
Step-up Transformer	[redacted]
Point of Interconnection	[redacted]
Commercial Operation Date	[redacted]

Figure 2-1 shows the conceptual single line diagram of the Project.

Figure 1-1: Proposed Single Line Diagram

3. Study Assumptions

For detailed assumptions, please refer to the Group Report. The [redacted] is a turbine replacement project of an existing generation unit at SCE's Pan Aero Substation.

4. Power Flow Analysis

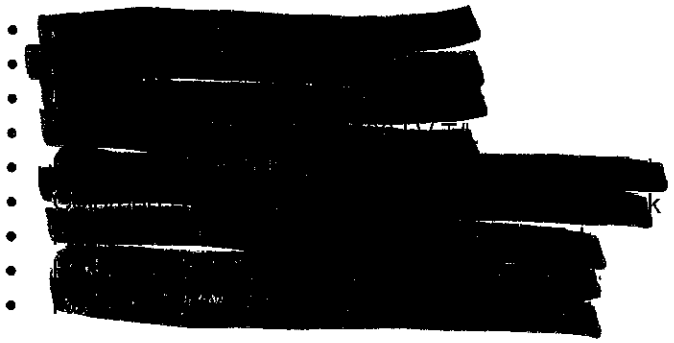
The study indicated that the other [redacted] projects are contributing to overloading of the following transmission facilities. The details of the analysis and overload levels are provided in the group study. The [redacted] does not contribute to the identified overloads.

4.1 Overloaded Transmission Facilities

Category "A"

- [redacted]

Category "B"



Category "C"

4.2 Power Flow Non-Convergence

There were no non-convergence issues identified by the addition of this project with all proposed system upgrades.

4.3 Recommended Mitigations

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5. Short Circuit Analysis

Short circuit studies were performed to determine the fault duty impact of adding the [redacted] projects to the transmission system and to ensure system coordination. The fault duties were calculated with and without the projects to identify any equipment overstress conditions. Once overstressed circuit breakers are identified, the fault current contribution from each individual project in [redacted]s determined. Each Project in [redacted] will be responsible for its share of the upgrade cost based on the rules set forth in CAISO Tariff Appendix Y.

5.1 Short Circuit Study Input Data

The following input data provided by the Applicant of the Project was used in this study:

Short Circuit Data @ 35.25 MVA Base:

- Positive Sequence subtransient reactance (X"1) = 0.131 p.u.
- Negative Sequence subtransient reactance (X"2) = 0.131p.u.
- Zero Sequence subtransient reactance (X"0) Infinity

Station Step-up Transformers (total of one)

- One transformer, three-phase 115 kV/34.5 rated for 20/26.7/33.3 MVA with an impedance of 8% at 30 MVA base.

5.2 Results

All bus locations where the [redacted] projects increase the short-circuit duty by 0.1 kA or more and where duty is in excess of 60% of the minimum breaker nameplate rating are listed in the Group Report Appendix H. These values have been used to determine if any equipment is overstressed as a result of the [redacted] nterconnections and corresponding network upgrades, if any.

The responsibility to finance short circuit related Reliability Network Upgrades identified through a Group Study shall be assigned to all Interconnection Requests in that Group Study pro rata on the basis of short-circuit duty contribution of each Large Generating Facility.

As discussed in the Group Report, the [redacted] breaker evaluation identified overstressed circuit breakers at the following buses. The pro-rata cost allocation for this project, based on SCD contribution at each location, is also provided:

- [redacted]

5.3 Preliminary Protection Requirements

Protection requirements are designed and intended to protect SCE's system only. The preliminary protection requirements were based upon the interconnection plan as shown in Figure 2-1.

The applicant is responsible for the protection of its own system and equipment and must meet the requirements in the SCE Interconnection Handbook provided in Attachment 3.

6. Reactive Power Deficiency Analysis

Limited reactive power deficiency analysis was performed. In the base case study, serious voltage and VAR issues were identified based on system VAR requirements for power flow converge [redacted] VAR support is proposed

- [redacted]
- [redacted]
- [redacted]

With all proposed system upgrades listed above and in Section 4.3, the power flow studies for Category "B" and Category "C" contingencies indicated that this QC2 project did not cause voltage drops of 5% or more from the pre-project levels, or cause the SCE system to fail to meet applicable voltage criteria. This project, therefore, did not cause any adverse voltage impacts on the CAISO Controlled Grid with the proposed upgrades in place.

More detailed reactive power deficiency analysis will need to be performed as part of the Phase II Study.

This Project did not contribute to any reactive power deficiencies, and is not allocated any portion of the proposed reactive power mitigations.

7. Transient Stability and Post-Transient Evaluations

Limited transient stability studies were conducted using full loop base cases to ensure that the transmission system remains in operating equilibrium, as well as operating in a coordinated fashion, through abnormal operating conditions after the [redacted] begin operation. The generator dynamic data used in the study for the Project is shown in Attachment 1.

7.1 Transient Stability and Post-Transient Study Scenarios

Disturbance simulations were performed for a study period of 10 seconds to determine whether the [redacted] will create any system instability during a variety of line and generator outages. The most critical single contingency and double contingency outage conditions in the Devers area of the overall greater [redacted] were evaluated. For the list of specific line and generator outages evaluated, see the group report.

7.2 Results

Limited stability analysis was performed for the [redacted] to identify "relative" as opposed to "absolute" conclusions regarding the stability impacts of this [redacted] queued generation project.

In the limited stability analysis performed in the 500 kV, 220 kV and 115 kV systems with the upgrades in place to mitigate base case and outage related overload problems, the transient voltage showed unacceptable performance, and a voltage collapse under the N-2 contingency Alberhill – Valley No.1 and No.2 500 kV T/Ls.

To mitigate the transient voltage violations, a 550 MVAR (500kV voltage base) dynamic VAR support is proposed at Colorado River Substation 500 kV bus.

With all proposed system upgrades listed above and in Section 4.3, the [redacted] in SCE's [redacted] would not cause the transmission system to go unstable under Category B and Category C outages.

Stability plots are shown in Appendix F of the Group Report. More detailed stability analysis will be performed as part of the Phase II Study.

This Project did not contribute to any transient or post-transient violations, and is not allocated any portion of the proposed mitigations discussed in this section.

8. Deliverability Assessment

There is no deliverability assessment required for the Energy Only project.

9. Environmental Evaluation/Permitting

Please see Section 12 of group report.

10. Upgrades, Cost Estimates and Construction schedule estimates

To determine the cost responsibility of each generation project in [redacted] the CAISO developed cost allocation factors based on the individual contribution of each project (Attachment 6). The cost allocation for the Interconnection Facilities and Network Upgrades for which the Project is solely responsible is as follows:

10.1 PTO's INTERCONNECTION FACILITIES

No interconnection facilities were identified

10.2 PLAN OF SERVICE NETWORK UPGRADES

No Plan of Service Network upgrades were identified

10.3 RELIABILITY NETWORK UPGRADE

Short-Circuit Duty Mitigation

- Serrano Substation – Split the existing 220 kV GIS bus, re-configure existing six lines, addition of a fourth AA bank, and equip a 500 and 220 kV position.

10.4 DELIVERY NETWORK UPGRADES

No Delivery Network upgrades were identified

10.5 DISTRIBUTION UPGRADES

No Distribution upgrades were identified

Table 10.1: Total SCE Cost Allocated to QC2 projects in SCE's [redacted] and Estimated Time to Construct Summary

Type of Upgrade	Upgrade (May include the following)	Description	Estimated Cost x 1000	Estimated Time to Construct *(Note 3)*
PTO's Interconnection Facilities *(Note 1)*	None	Non-network facilities needed to enable interconnection	N/A	N/A
Plan of Service Reliability Network Upgrades	None	Direct Assigned Network upgrades needed to enable interconnection.	N/A	N/A
Reliability Network Upgrades	SCD Mitigation	Allocated Network upgrades needed to maintain system Reliability	$1,791	48 Months
Delivery Network Upgrades	None	Network upgrades needed to support Full Delivery, if requested	N/A	N/A
Distribution Upgrades *(Note 2)*	None	Non-CAISO SCE Distribution Facilities	N/A	N/A
Total			**$1,791**	**48 Months**

Note 1: The Interconnection Customer is obligated to fund these upgrades and will not be reimbursed.

Note 2: These upgrades are not identified in ISO tariff, and are not reimbursable. Allocated costs may change if all projects responsible for these upgrades do not execute LGIAs.

Note 3: The estimated time to construct (ETC) is for a typical project; schedules duration may change due to number of projects approved and release dates. Stacked projects impact resources, system outage availability, and environmental windows of construction. Assumption is SCE will need to obtain CPUC licensing and regulatory approvals prior to design, procurement and construction of the proposed facilities required to serve the interconnection customer and prerequisite facilities are in service.

11. Items not covered in this study

11.1 Conceptual Plan of Service

The results provided in this 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.

11.2 Customer's Technical Data

Additional technical data related to the 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.

11.3 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).

11.4 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 at SCE's sole determination. 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.

11.5 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 coMRPtion, harmonics, switching and tagging, and metering requirements.

11.6 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.

11.7 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

11.8 Standby Power and Temporary Construction Power
The QC2 Study does not address any requirements for standby power or temporary construction power that the Project may require prior to the in-service date of the Interconnection Facilities. Should the Project require standby power or temporary construction power from SCE prior to the in-service date of the Interconnection Facilities, the IC is responsible to make appropriate arrangements with SCE to receive and pay for such retail.

11.9 Construction Schedule

The estimated time to construct (ETC) is for a typical project; schedules and duration may change due to number of projects approved and release dates. Stacked projects impact resources, system outage availability, and environmental windows of construction. The assumption is that SCE will need to obtain CPUC licensing and regulatory approvals prior to design, procurement and construction of the proposed facilities required to serve the interconnection customer and prerequisite facilities are in service.

11.10 Network/Non-Network Classification of Telecommunication Facilities

The cost for telecommunication facilities that were identified as part of the IC's Interconnection Facilities was based on an assumption that these facilities would be sited, licensed, and constructed by SCE as opposed to the IC doing this work (IC may own, operate, maintain, and construct diverse telecommunication paths associated with the IC's gen tie, excluding terminal equipment at both ends). In addition, the telecommunication requirements for SPS were assumed based on tripping of the generator breaker as opposed to tripping the circuit breakers at the SCE substation. Due to uncertainties related to telecommunication upgrades for the numerous projects in queue ahead of [redacted] telecommunication upgrades for higher queued projects were not considered in this study. Depending on the outcome of interconnection studies for higher queued projects, the telecommunication upgrades identified for [redacted] may be reduced. Any changes in these assumptions may affect the cost and schedule for the identified telecommunication facilities.

Attachment 1

Generator Machine Dynamic Data

Attachment 2

Dynamic Stability Plots

Please refer to Appendix F of the Group Report.

Attachment 3

SCE Interconnection Handbook

Preliminary Protection Requirements for Interconnection Facilities are outlined in the SCE Interconnection Handbook.

Attachment 4

Short Circuit Calculation Study Results

Please refer to Appendix H of the Group Report.

Attachment 5

Deliverability Assessment Results

There is no deliverability upgrade required for the Project.

Attachment 6

Allocation of Network Upgrades for Cost Estimates

Upgrades	Needed For	Cost factor	Cost Share ($1000)
Short circuit duty	[redacted]	1.33%	$1,791