
Appendix A – WDT1187




Queue Cluster 7 Phase II Report

November 24, 2015

This study has been completed in coordination with the California Independent System Operator Corporation (CAISO) per CAISO Tariff Appendix DD Generator Interconnection and Deliverability Allocation Procedures (GIDAP)

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A. Introduction

██████████ has submitted a completed Interconnection Request (IR), on behalf of ██████████ (together, the Interconnection Customer or IC) to Southern California Edison Company (SCE) for the proposed ██████████ (Project). The IC requested a Point of Interconnection (POI) at SCE's ██████████ located in ██████████. The IC elected that the Project be Option A with Full Capacity Deliverability Status, and desires an In-Service Date (ISD) and Commercial Operation Date (COD) of March 30, 2018 and June 1, 2018 respectively for the ██████████ and ISD of July 1, 2019 and COD of November 1, 2019 for the ██████████ of the Project. Such dates are specified in the Project Attachment B. Actual ISD and COD will depend on design and construction requirements to interconnect for the Project.

In accordance with Federal Energy Regulatory Commission (FERC) approved CAISO Tariff Appendix DD Generator Interconnection and Deliverability Allocation Procedures (GIDAP), the Project was grouped with Queue Cluster 7 (QC7) Phase II projects to determine the impacts of the group as well as impacts of the Project on the CAISO Controlled Grid.

An Area and Subtransmission Assessment Report have been prepared separately which identify the combined impacts of all projects in the group on the CAISO Controlled Grid (Area Report) and impacts of projects seeking interconnection to distribution facilities served out of the ██████████ (Subtransmission Assessment Report – ██████████ both are included in the QC7 PII report package. This report focuses only on the impacts or impact contributions of the Project, and it is not intended to supersede any contractual terms or conditions specified in a Generator Interconnection Agreement (GIA).

The report provides the following:

1. Distribution System impacts caused by the Project;
2. System reinforcements necessary to mitigate the adverse impacts caused by the Project under various system conditions;
3. A list of required facilities and a good faith estimate of the Project's cost responsibility and time to construct¹ these facilities. Such information is provided in Attachment 1 and Attachment 2 as separate documents in the Appendix A Project report package.

Additionally, the Project encompasses ██████████ that required additional analysis be performed to evaluate the impacts of ██████████ within SCE's Distribution System. These analyses focused on the charging² aspects of the ██████████ and consider varying levels of system demand with minimal generation dispatch within the local distribution system.

Consequently, the report also discloses the adequacy of SCE's Distribution System to support the charging aspects of the ██████████ identifies system limitations that may restrict the

¹ It should be noted that construction is only part of the duration of months specified in the study, includes detailed engineering, licensing, etc, and other activities required to bring such facilities into service. These durations are from the execution of the Generator Interconnection Agreement, receipt of: all required information, funding, and written authorization to proceed from the IC as will be specified in the Generator Interconnection Agreement to commence the work

² Charging is defined as when the Project draws energy from the grid to "charge" the Project-associated ██████████

ability to charge during certain demand conditions, and provides a high-level explanation of potential exposure to charging restrictions on the distribution system.

All equipment and facilities comprising the Project are located in as disclosed by the IC in its Interconnection Request (IR), as may have been amended during the Interconnection Study process, which consists of (i) (ii) the associated infrastructure and step-up transformers, (iii) meters and metering equipment, (iv) appurtenant equipment, and (v) auxiliary loads.

Based on the technical data provided, internal project losses were identified to be for the collective output of both the. The net output, as measured at the high-side of the main transformer bank, is identified to be when taking into account the the estimated auxiliary loads and identified internal project losses of. While the Project has the capability of producing a net as measured at the high side of the main transformer bank, the IC indicated that they would limit total Project output to not exceed as metered at the Point of Interconnection (POI). To ensure POI delivery does not exceed the total Project will need to install or demonstrate that a control system will be put in place which will manage output as measured at the high side of the main transformer bank to not exceed. This values represents the maximum output at the high side of the main transformer bank that can be transmitted taking into account the expected total losses on the which would limit total delivery at POI to not exceed when this project is fully dispatched.

The Project shall consist of the Generating Facility and the IC's Interconnection Facilities as illustrated below in Figure A.1 and summarized below in Table A.1. Figure A.2 provides a map that illustrates the geographic location of the Project.

Figure A.1: Project IC Facilities One-Line Diagram

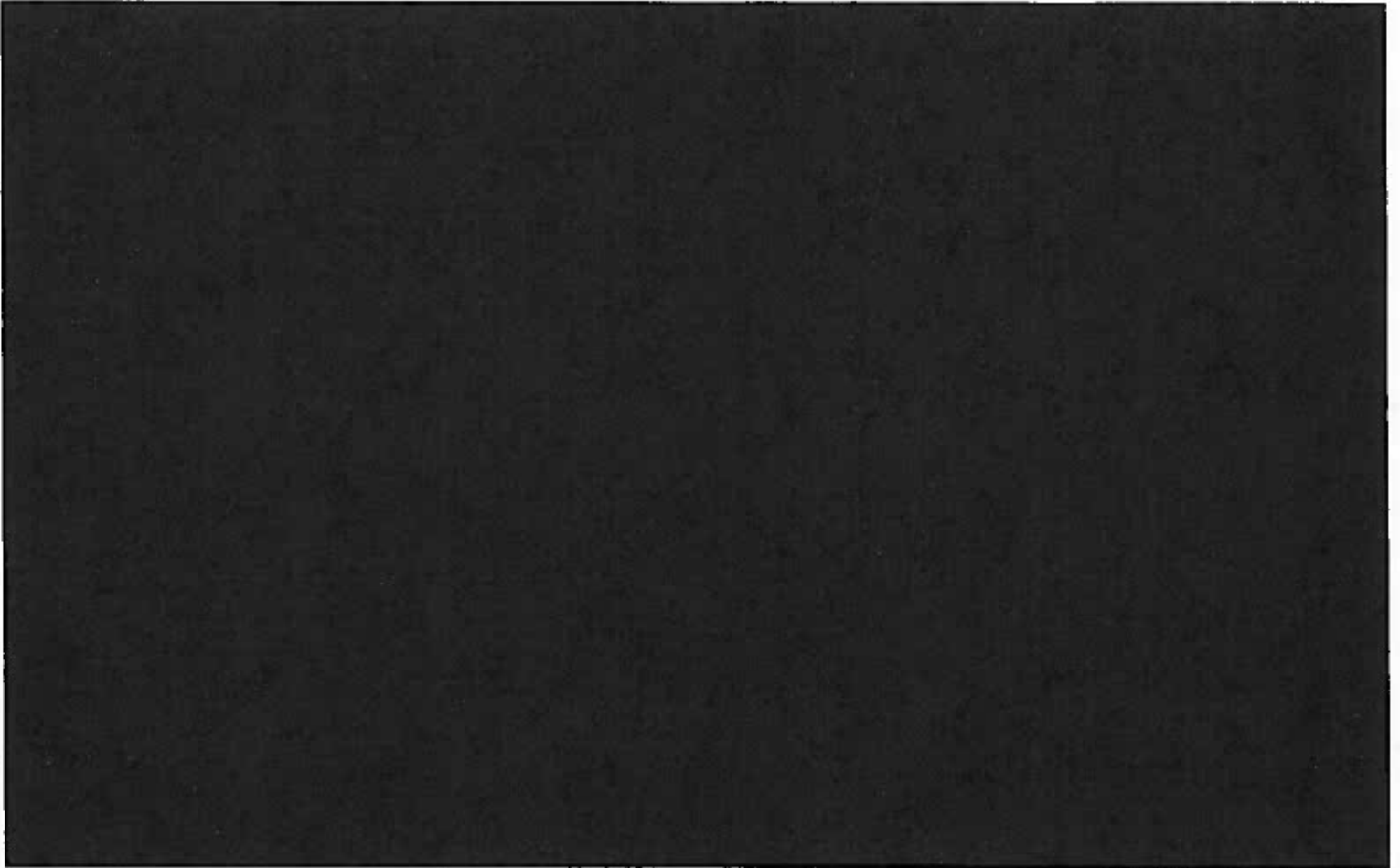


Figure A.2: Project Location Map

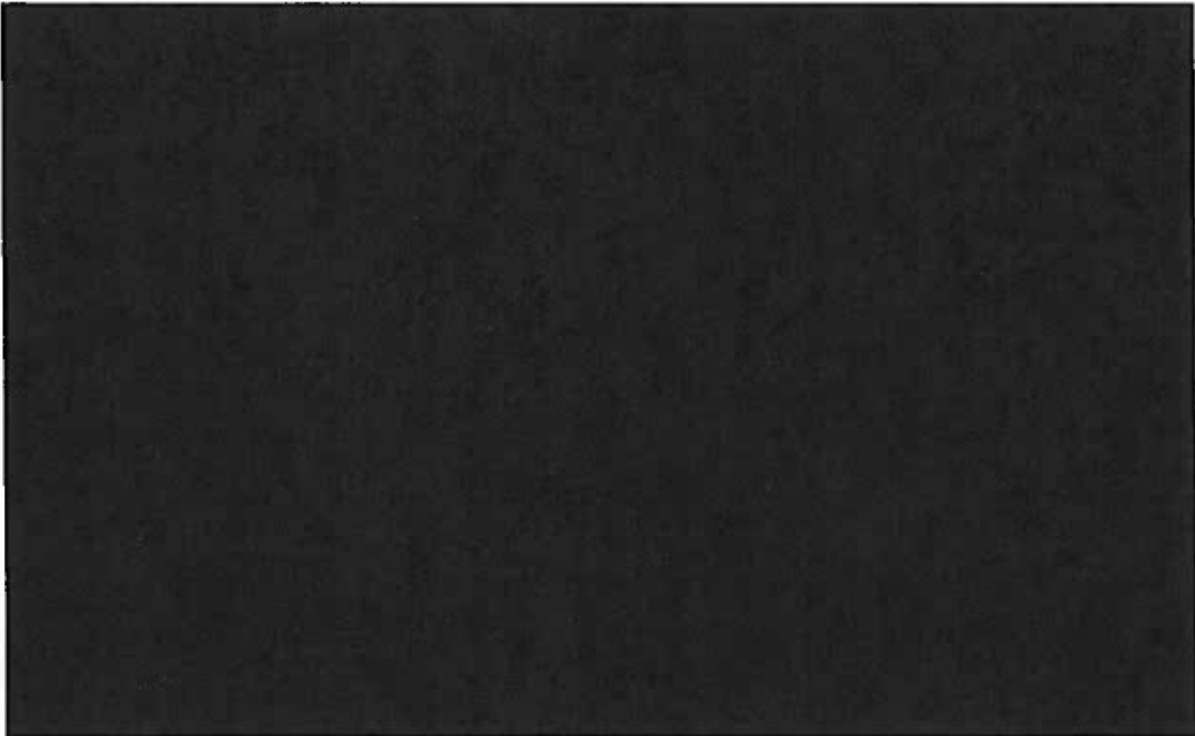


Table A.1 Project General Information

Project Location	[REDACTED]
Distribution Provider's Planning Area	SCE [REDACTED] System
Number and Types of Generators	[REDACTED]
Interconnection Voltage	[REDACTED]
Requested Maximum Project Output as measured at POI	[REDACTED]
Gen-Tie	[REDACTED]
Estimated Losses on Gen-Tie Facilities	[REDACTED]
Limited Maximum Net Output (Metered on High-Side of Main Transformer)	[REDACTED]
Step-up Transformer(s)	[REDACTED]
Generator Auxiliary Load	[REDACTED]
Internal Generation Facility Losses	[REDACTED]
Power Factor Range	[REDACTED] at POI per interconnection application
POI	Distribution Provider's [REDACTED]
IC Requested COD	June 1, 2018

Note: Based on the technical data provided, the Project is requesting to install more megawatts [REDACTED] as measured at the generator and inverter terminals which will result in more than the requested [REDACTED] delivery at the POI. As a result, the Project will need to be limited to not exceed the values shown under Limited Maximum Net Output (metered on high-side of the main transformer bank).

B. Study Assumptions

For detailed assumptions regarding the group cluster analysis at the transmission and subtransmission level, please refer to the applicable QC7 Phase II Area and Subtransmission Assessment Reports. Below are the assumptions specific to the Project.

1. The following is the Plan of Service (POS) assumed for the Project in the Phase II Study:

The Project was modeled as interconnecting [REDACTED] combination of [REDACTED] through the [REDACTED]

2. The following Facilities will be installed by SCE and are included in this Phase II Study:

- The new [REDACTED] position at [REDACTED]
- The segment of [REDACTED] inside the [REDACTED] property line.
- The segments of each one of the two telecommunications paths inside the [REDACTED] [REDACTED] property line.
- The required revenue and wholesale load meters.
- Lightwave, channel bank(s) and associated equipment at [REDACTED] and at the Generating Facility.

NOTE: SCE installation does not include metering voltage, current transformers, and metering cabinet. The SCE meters will be connected to the generator – owned voltage and current transformers to be installed for their CAISO metering.

3. The following Facilities will be installed by the IC and are not included in this Phase II Study:

- The [REDACTED] from the Generating Facility to the last structure outside the [REDACTED] [REDACTED] property line.
- The fiber optic cables to provide two diversely routed telecommunication paths required for the line protection relays.
- The required CAISO metering equipment (voltage and current transformers and CAISO meters) and metering cabinet for SCE revenue and wholesale meters.

NOTE: The metering voltage and current transformers installed for the CAISO metering will also be used for the SCE owned revenue and wholesale meters.

- The following line protection relays to be installed at the Generating Facility end of the [REDACTED]
 - [REDACTED] with dual dedicated digital communication channels to the tap substation.
 - [REDACTED] with dual dedicated digital communication channels to tap substation.

4. [REDACTED] Charging Considerations

- This study assumes that the IC facility will include all equipment, software, appropriate controls, and other related equipment necessary to maintain the [REDACTED] demand profile per SCE requirements.

- In order to ensure limits are communicated in a timely and reliable manner, the IC is responsible for providing reliable communications between the Project and the SCE system to transmit the required telemetry data as outlined in the Interconnection Handbook. Should the communication channel fail, the Project’s operating limits will automatically revert to zero (no charging allowed).

5. Additional Study and/or Assumption Notes:

- The study assumptions used for the charging analysis on SCE’s [REDACTED] [REDACTED] are disclosed in the Subtransmission Assessment Report enclosed as part of the report package.
- The [REDACTED] of the Project will need to be metered separately. The IC should be prepared to install multiple sets of metering (i.e. separate sets of PTs & CTs and supporting metering equipment) for the Project. Additionally, the Project may also need to connect the [REDACTED] to a dedicated transformer.

C. Reliability Standards, Study Criteria and Methodology

The generator interconnection studies will be conducted to ensure the CAISO-controlled grid is in compliance with the North American Electric Reliability Corporation (NERC) reliability standards, WECC regional criteria, and the CAISO planning standards. Refer to Section C of the Area Report for details of the applicable reliability standards, study criteria and methodology.

D. Power Flow Reliability Assessment Results

❖ Discharge Analysis of the Project

I. Steady State Power Flow Analysis Results – 220 kV and above

The study did not identify any power flow issues on the Bulk Electric System not addressed via the use of CAISO Congestion Management or via already approved transmission upgrades. The Project will be required to participate in any congestion management mitigation until such time that the already approved transmission upgrades are placed into service. Consequently, the Project is not allocated cost for any Network Upgrades identified to address power flow issues. The details of the power flow analysis are provided in Section D of the Area Report.

II. Steady State Power Flow Analysis Results – 66 kV

1. Thermal Overloads

The study indicated that the Project contributes to the following facility overloads or non-convergence problems. The details of the analysis and overload levels are provided in the Subtransmission Assessment Report.

- Category “P0” – No issues identified
- Category “P1”

- [REDACTED]
- [REDACTED]
- Common Corridor
 - o None

2. Voltage Performance

The Project is required to provide power factor regulation capability [REDACTED] at POI for asynchronous generation and [REDACTED] at generator terminals for [REDACTED] to alleviate power flow non-convergence and maintain the Transmission transfer capability.

3. Required Mitigations

The upgrade discussed in the Subtransmission Assessment Report and assigned to the Project involves a transfer trip scheme which would automatically trip the Project under the identified [REDACTED] outage conditions in order to mitigate the overload on the underground segments of either the [REDACTED] or the [REDACTED]. Refer to Attachment 1 for detailed description of the scope associated with this upgrade.

❖ Charging Analysis of Project

- I. Steady State Power Flow Analysis Results – 220 kV and above
The study indicated that the Project does not contribute to any overloads or case non-convergence problems on the Bulk Electric System during charging operation of the Project.
- II. Steady State Power Flow Analysis Results – 66 kV
The study indicated that the Project does not contributes to facility overloads in excess of allowable limits or case non-convergence problems under charging operations.

E. Short Circuit Duty Results

Short circuit studies were performed to determine the fault duty impact of adding the QC7 Phase II 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 QC7 Phase II is determined. Each project in the cluster will be responsible for its share of the upgrade cost based on the rules set forth in CAISO Tariff Appendix DD.

1. Short Circuit Duty Study Input Data

The customer provided technical data for the identified inverter (specified in Section 2). If the technical data obtained from the inverter manufacturer by SCE illustrates differences in the Short Circuit Duty (SCD) parameters, then SCE utilized the manufacturer data of the inverter model specified by the IC in the application in the SCD study. SCE did utilize the parameters provided by the IC.

"Synchronous Gen"

Data for each generation unit:

[REDACTED]

"Inverter Based Generation"

Data for Each generation unit: Maximum Fault contribution: [REDACTED]

Generation tie-line:

Length:	[REDACTED]
Conductor:	[REDACTED]
Z1(p.u.) conductor Impedance information:	[REDACTED]
Z0(p.u.) conductor Impedance information:	[REDACTED]

This generation tie-line impedance was based on Distribution Provider calculation of generation tie-line electrical parameters utilizing tower and line conductor characteristics provided by the IC.

Collector System:

Given the compact nature of the [REDACTED] no technical data was provided by the IC for the BESS collector system.

Generation Step-up and Pad-Mount Transformers technical details are provided above in Table A-1.

2. Short Circuit Duty Study Results

All bus locations where the QC7 Phase II projects increase the short-circuit duty by [REDACTED] or more and where duty was found to be in excess of 60% of the minimum breaker nameplate rating are listed in the Area Report(Appendix H). These values have been used to determine if any equipment is overstressed as a result of the inclusion of QC7 Phase II interconnections 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 Generating Facility.

Please refer to the QC7 Phase II Area Report for the QC7 Phase II breaker evaluation identified overstressed circuit breakers at the SCE buses, an d Attachment 2 for the pro-rata allocation with corresponding estimated costs (if any) for the Project, based on SCD contribution at each location.

3. SCE Substations with Ground Grids Duty Concerns

The short circuit studies flagged SCE-owned substations beyond the Project POI with ground grid duty concerns that necessitate a ground grid study. The Project's contribution to the [REDACTED] [REDACTED] are significant and will require the project to fund the cost of performing such ground grid studies at these locations.

4. Preliminary Protection Requirements

Protection requirements are designed and intended to protect the Distribution Provider's system only. The preliminary protection requirements were based upon the interconnection plan as shown in the one-line diagram depicted in line item #7 in Attachment 1.

The IC is responsible for the protection of its own system and equipment and must meet the requirements in the SCE Interconnection Handbook provided in Attachment 4.

F. Transient Stability Evaluation

With the Project providing [REDACTED] correction as measured at the POI and including the required mitigation identified above, transient stability performance was found to be acceptable. Refer to enclosed Area Report and Subtransmission Assessment Report in the QC7 Phase II report package, for the QC7 Phase II transient stability evaluation criteria and assessment results.

G. Power Factor Requirements

Based on the results of the Study, the Project will need to be designed to maintain a composite power delivery at continuous rated power at the POI at a power factor within the range of [REDACTED] at POI for asynchronous generation and [REDACTED] at generator terminals for [REDACTED]. [REDACTED] Additionally, the generation system must be designed to accommodate a VAR schedule provided by SCE. SCE will determine if the VAR schedule is necessary based on future re-arrangements of SCE's Transmission system.

H. Deliverability Assessment Results

1. On Peak Deliverability Assessment

The Project does not contribute to any deliverability constraint.

2. Off- Peak Deliverability Assessment

There are no overloads in the off peak deliverability that can't be mitigated by the SPS's and congestion management.

3. Required Mitigations

No Delivery Network Upgrades are required.

I. In-Service Date and Commercial Operation Date Assessment

The latest information provided by the IC has indicated that the requested generator ISD is March 30, 2018 and a COD of June 1, 2018 for the [REDACTED] and an ISD of July 1, 2019 and a COD of

November 1, 2019 for the [REDACTED] of the Project. To determine if these dates could be met, an In-Service Date and Commercial Operation Date Assessment was performed which considered both the QC7 Phase II process timelines as well as the following facilities needed to provide for reliable [REDACTED] interconnection of the Project. Timing of the upgrades required to provide for the requested Full Capacity Deliverability Status are discussed in the section below.

1. QC7 Interconnection Process Timelines

To enable physical interconnection, a Generator Interconnection Agreement (GIA) is required. As part of the QC7 interconnection process, a GIA is not scheduled to be tendered until after completion of the CAISO's Reassessment and Transmission Planning Deliverability (TPD) Allocation Study Process which does not commence until late January 2016. The TPD Allocation is scheduled to be completed by April. If the CAISO and SCE can make a determination that the TPD allocation outcomes do not change the scope requirements, a letter is provided at the end of April³ informing no change to Network Upgrade requirements and initiating the GIA process. Otherwise, further re-assessment will be performed for the Project. Any updates to scope, costs and schedules are developed and updated reports are issued by the end of July. The GIA negotiations commences after either the issuance of the letter of no change to Network Upgrade requirements at the end of April or upon issuance of the updated reports at the end of July. Provided the Project does not elect to Park, the letter or updated reports are used as the basis to proceed with the GIA negotiations. Assuming a three month timeframe for GIA negotiations, a GIA is not expected until either early August 2016 or early November 2016 depending on TPD study results and decision to Park or proceed.

2. System Upgrade Timelines for Reliable Interconnection

The Operational Studies identified that the following facilities are required in order to provide for an [REDACTED] interconnection:

a. Distribution Provider's Interconnection Facilities

As described in Section 1.b of Attachment 1, a new [REDACTED] position [REDACTED] [REDACTED] line protection, telecomm, and SCE portion of [REDACTED] among other items will be required to terminate the IC [REDACTED] at the SCE [REDACTED]. Preliminary durations estimated to install the Distribution Provider's Interconnection Facilities is 27 months.

b. Reliability Network Upgrades – Short-Circuit Duty (SCD) Mitigation

Short circuit duty operational mitigation was identified taking into account new generation projects which have executed GIAs, approved transmission system upgrades fully permitted and under construction, and new generation projects including QC7 Phase II Projects which do not yet have an executed GIA. The study results for these operational studies are

³ The TPD allocation is estimated to complete in April. The actual date may vary.

provided in Section II of the Generation Sequencing Implementation (GSI) Short Circuit Duty evaluation (Appendix G). Based on the study results, the following upgrades/mitigation are required to be in place in order to enable energy only interconnection of this Project:

- Reconfiguration of the system to operate one [REDACTED] on the east side as normally open (requires simply opening [REDACTED] so no duration identified)
- [REDACTED] which has an estimated in-service date of July 2016

In addition to the above mitigation requirements which already have established in-service dates, the following additional SCD mitigations may be needed in order to enable [REDACTED] interconnection. It is important to note that the mitigations have not been initiated since the timing of need is dependent on development of queued generation projects, including QC7, which have not yet executed a GIA.

- [REDACTED] (triggered by QC3&4)
- [REDACTED] (triggered by QC7)

The identification of need was based on the assumption that all queued generation projects actually materialize and are interconnected [REDACTED] Timing to implement these SCD mitigations are currently estimated at 27 months from the date the need is identified. These additional SCD mitigations will be continuously evaluated as part of ongoing GIA negotiations and ongoing studies to properly define the time when actual need to undertake these mitigations is required based on the actual GIA negotiations with corresponding requested in-service dates. Once the actual need is triggered, project development will commence.

c. Voltage Support Mitigation

No voltage support upgrades were identified to be required to enable this Project to interconnect.

d. Distribution Upgrades

No distribution upgrades were identified to be required to enable this Project to interconnect.

3. Conclusion

The requested IC In-Service Date of March 30, 2018 for the [REDACTED] cannot be met due to the following reasons:

- The QC7 Interconnection Process Timelines will not yield a Generator Interconnection Agreement until either early August 2016 or early November 2016 depending on TPD study results. Timelines associated with constructing the

Interconnection Facilities needed for physical interconnection are estimated at 27 months from the date the GIA is executed, payments are made, and notice to proceed with interconnection is provided. Following the standard process, this would result in a best case in-service date of December 2018 or March 2019 depending on TPD study results. Such dates are beyond the requested in-service timellines for the [REDACTED]. It should be noted that the ability to meet a best case in-service date is tied directly to the IC's timely execution of the Interconnection Agreement, submittal of payments, and notice to proceed.

- o Potential need to replace [REDACTED] and upgrade [REDACTED] [REDACTED] which would require an estimated 27 months to complete from the day a project is initiated to commence the upgrade at each location.

The requested IC In-Service Date of Nov 1, 2019 for the BESS portion of the Project appears to be achievable provided timely execution of the Interconnection Agreement and submittal of payments and notice to proceed are the received.

J. Timing of Full Capacity Deliverability Status, Interim Deliverability, Area Constraints, and Operational Information

The IC elected that the Project be Option A with Full Capacity Deliverability Status (FCDS). Timing of obtaining the requested FCDS is dependent on the completion of Delivery Network Upgrades. Until such time that the Delivery Network Upgrades are completed and placed into service, the Project may experience additional congestion exposure due to transmission limitations or may be granted Interim Deliverability Status based on annual system availability. The sections below provide a discussion of the timing of Full Capacity Deliverability Status, Interim Deliverability, Area Constraints, and Operational Information.

1. System Upgrades Required for Full Capacity Deliverability Status

In order to provide for Full Capacity Deliverability Status, the following facilities are required:

- a. Triggered Delivery Network Upgrades - None
- b. Delivery Network Upgrades Triggered by Earlier Queued Projects - None.
- c. Approved Transmission Upgrades - None

Consistent with the QC7 Phase I study, the Project is exempted from the [REDACTED] deliverability constraint under the assumption that the OTC generators in [REDACTED] will be repowered to a lower capacity.

- d. Transmission Upgrades outside the CAISO Controlled Grid - None
- ##### **2. Interim Operational Deliverability Assessment for Information Only**

The operational deliverability assessment was performed for study years 2016~2020 by modeling the Transmission and generation in service in the corresponding study year. For details of the Transmission and generation assumption, refer to Attachment 9 of the report. Although the Project is exempted from the [REDACTED] deliverability constraint, its annual NQC value might be reduced due to the constraint, especially during the period when the existing gas-fired generation capacity in [REDACTED] hasn't reduced.

3. Area Constraints

With all approved transmission upgrades modeled and exemption from the [REDACTED] deliverability constraint, no area deliverability constraints were identified for the Project. However, until all these upgrades are put in service and generation retirement happens, the CAISO Deliverability assessment indicates that the addition of this QC7 Phase II project contributes to the previously identified [REDACTED] Deliverability Constraint [REDACTED]. As such, interconnection of new generation may result in increased congestion on the system. This system constraints will likely be exacerbated during the construction period of the upgrades as transmission facilities will be taken out of service (thus reducing system capability) to enable construction of new facilities. Furthermore, there are known transfer capability limitations, such as Path 26 and [REDACTED] flows which may limit the total [REDACTED] dispatch amounts. See Section D.1.1-(ii) for more details.

4. SCE Northern Hemisphere Import Nomogram

As part of the QC7 Phase II studies there were no Delivery Network Upgrades allocated to the Project for its requested Full Capacity Deliverability Status. It is important to note that while no Delivery Network Upgrades were allocated to the Project, this outcome does not mean that the Project will be able to generate at its maximum Generating Facility output. Congestion could happen whenever the amount of generating resources exceeds the available Transmission capability. The generating resources' output may be curtailed, regardless of their deliverability status, as the result of congestion under the CAISO market operation.

As stated in Attachment 7, studies indicate that as high amounts of resources in the [REDACTED] develop and are dispatched, the amount of available Transmission capacity for the [REDACTED] resources is diminished. Such conclusions point to a potential need for congestion management, and generation resource curtailments. For additional information on potential congestion under expected amounts of renewable generation development in 2021, please see Chapter 5 of the ISO 2014-2015 Transmission Plan report.
<http://www.aiso.com/Documents/Board-Approved2014-2015TransmissionPlan.pdf>.

K. Interconnection Facilities, Network Upgrades, and Distribution Upgrades

Please see Attachment 1 for the Interconnection Facilities, Reliability Network Upgrades, Delivery Network Upgrades and Distribution Upgrades allocated to the Project. Please note that SCE will not "reserve" the identified Interconnection Facilities (IFs) for the proposed POI. The identified

scope/facilities will be allocated to the Project upon the successful execution of the Generator Interconnection Agreement (GIA) and SCE has completed the detailed design and engineering of the facilities according to tariff timelines.

L. Cost and Construction Duration Estimates

To determine the cost responsibility of each generation project in QC7 Phase II, the CAISO developed cost allocation factors (Attachment 3) for Reliability Network Upgrades, Local Delivery Network Upgrades and Area Delivery Network Upgrades. Attachment 2⁴ provides the 'constant' 2015 dollars and their escalation to the estimated COD year for Interconnection Facilities, Reliability Network Upgrades, Delivery Network Upgrades, and Distribution Upgrades which the Project was allocated cost.

For the QC7 Phase II Study, the estimated COD is derived by assuming the duration of the work element will begin in December 2016, which accounts for the CAISO tariff scheduled completion date of the QC7 Phase II study plus: the TP Deliverability (TPD)⁵ allocation, Annual Reassessment effort, and the interconnection agreement signing period and submittal of required funds by the IC.

The IC should note that any Local Delivery Network Upgrades and Area Delivery Network Upgrades allocated to the Project may be assessed 35% Income Tax Component of Contribution (ITCC) pending the results of the TPD allocation Process several months after the Phase II Study Reports are released, [REDACTED]

[REDACTED] For your information, Attachment 2 contains a potential ITCC estimate⁶ based on the Phase II cost in this study. It does not represent the "maximum ITCC exposure" of the Project. Attachment 3 provides an estimated non-reimbursable RNU cost that would be subject to ITCC, taking into account the Network Upgrade maximum cost responsibility. The maximum ITCC warranted by the Project will be addressed, calculated, and included during the Interconnection Agreement development phase once the IC submits the TP Deliverability allocation options form confirming the acceptance, waiver (parking), or denial of awarded deliverability assigned to the Project.

M. SCE Technical Requirements

The IC is responsible for the protection of its own system and equipment and must meet the requirements in the Distribution Provider Interconnection Handbook provided in Attachment 4.

N. Subsynchronous Interaction Evaluations

Certain generators or inverter based generators when interconnected within electrical proximity of series capacitor banks on the transmission system are susceptible to Sub-Synchronous Interaction (SI) conditions which must be evaluated. [REDACTED]

⁴ For Energy Storage Projects the Attachment 2 Includes upgrade(s) Identified from the "Charging" analysis.

⁵ Transmission Plan Deliverability: Deliverability supported by the CAISO's Transmission Plan

⁶ The maximum ITCC exposure applies ITCC (35%) to assigned IF and DU facilities. Network upgrades that are not subject to transmission credits incremental to a repayment \$/MW cap or an award of 0 MW TPD Allocation, and that SCE will own the facilities in question. The maximum ITCC exposure is calculated by applying the following formula: [REDACTED]

[REDACTED]

The IC is 100% responsible for any studies related to the SSR or SSTI. The only study that SCE will perform (at the IC's expense) is for SSCI; to ensure that the Project does not damage SCE's control systems.

The SSCI study will require that the IC provide a detailed PSCAD model of its Generating Facility and associated control systems, along with the manufacturer representative's contact information. The study will identify any mitigation(s) that will be required as part of project execution and need to be completed prior to initial synchronization of the Generating Facility. The study and the proposed mitigation(s) shall be at the expense of the IC.

It is the IC's responsibility to select, purchase, and install turbine/inverter based generators that are compatible with the series compensation in the area.

O. Environmental Evaluation, Permitting, and Licensing

Please see Appendix K of the QC7 Phase II Area Report.

P. Affected Systems Coordination

Please see Section H of the QC7 Phase II Area Report.

Q. Items not covered in this study

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 detailed engineering and design.

2. IC's Technical Data

The study accuracy and results for the QC7 Phase II Study are contingent upon the accuracy of the technical data provided by the IC. Any changes from the data provided could void the study results.

3. Study Impacts on Neighboring Utilities

Results or consequences of this QC7 Phase II 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). Refer to Affected Systems Coordination Section of the Area Report for additional information.

4. Use of Distribution Provider Facilities

The IC is responsible for acquiring all property rights necessary for the IC's Interconnection Facilities, including those required to cross Distribution Provider facilities and property. This Interconnection Study does not include the method or estimated cost to the IC of Distribution Provider mitigation measures that may be required to accommodate any proposed crossing of Distribution Provider facilities. The crossing of Distribution Provider property rights shall only be permitted upon written agreement between Distribution Provider and the IC at Distribution Provider's sole determination. Any proposed crossing of Distribution Provider property rights will require a separate study and/or evaluation, at the IC's expense, to determine whether such use may be accommodated.

5. Distribution Provider Interconnection Handbook

The IC shall be required to adhere to all applicable requirements in the Distribution Provider Interconnection Handbook. These include, but are not limited to, all applicable protection, voltage regulation, VAR correction, harmonics, switching and tagging, and metering requirements.

6. Western Electricity Coordinating Council (WECC) Policies

The IC shall be required to adhere to all applicable WECC policies including, but not limited to, the WECC Generating Unit Model Validation Policy.

7. System Protection Coordination

Adequate Protection coordination will be required between Distribution Provider-owned protection and IC-owned protection. If adequate protection coordination cannot be achieved, then modifications to the IC-owned facilities (i.e., Generation-tie or Substation modifications) may be required to allow for ample protection coordination.

8. Standby Power and Temporary Construction Power

The QC7 Phase II 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 Distribution Provider prior to the In-Service Date of the Interconnection Facilities, the IC is responsible to make appropriate arrangements with Distribution Provider to receive and pay for such revenue service.

9. Licensing Cost and Estimated Time to Construct Estimate (Duration)

The estimated licensing cost and durations applied to this Project are based on the Project scope details presented in this study. These estimates are subject to change as Project environmental and real estate elements are further defined. Upon execution of the Interconnection Agreement, additional evaluation including but not limited to preliminary engineering, environmental surveys, and property right checks may enable licensing cost and/or duration updates to be provided.

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 the IC. The IC will own, operate, maintain, and construct diverse telecommunication paths associated with the IC's generation tie line, 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 Distribution Provider substation. Due to uncertainties related to telecommunication upgrades for the numerous projects in queue ahead of QC7 Phase II, 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 QC7 Phase II may be reduced. Any changes in these assumptions may affect the cost and schedule for the identified telecommunication facilities.

11. Ground Grid Analysis

A detailed ground grid analysis will be required as part of the detailed engineering for the Project at the SCE substations whose ground grids were flagged with duty concerns.

12. Applicability

This document has been prepared to identify the impact(s) contributions of the Project on the SCE electrical system; as well as establish the technical requirements to interconnect the Project to the POI that was evaluated in the QC7 Phase II Study for the Project. Nothing in this report is intended to supersede or establish terms/conditions specified in interconnection agreements agreed to by SCE, CAISO and the IC.

13. Process for synchronization/trial operations and commercial operations of the Project

The IC is reminded that the CAISO has implemented a New Resource Implementation (NRI) process that ensures that a generation resource meets all requirements before synchronization/trial operations and commercial operations. The NRI uses a bucket system for deliverables from the IC that are required to be approved by the CAISO. The first step of this process is to submit an "ISO Initial Contact Information Request form" at least 7 months in advance of the planned initial synchronization. Subsequently an NRI project number will be assigned to the project for all future communications with the CAISO. The Distribution Providers have no involvement in this NRI process except to inform the IC of this process requirement. Further information on the NRI process can be obtained from the CAISO Website using the following links:

New Resource Implementation webpage:

<http://www.caiso.com/participate/Pages/NewResourceImplementation/Default.aspx>

NRI Checklist:

<http://www.caiso.com/Documents/NewResourceImplementationChecklist.xls>

NRI Guide:

<http://www.caiso.com/Documents/NewResourceImplementationGuide.doc>

14. Potential Changes in Cost Responsibility

The IC is hereby placed on notice that interconnection of its proposed generating facility may be dependent upon certain Network Upgrades which are currently the cost responsibility of projects ahead of the proposed generating facility in the interconnection application queue. Section 14.2.2 of the GIDAP provides that should Network Upgrades required for queued-ahead projects be included in an executed GIA (or unexecuted GIA filed at FERC) at the time of withdrawal of the earlier queued generating facility, and the upgrades are determined to still be needed by later queued generating facilities, the financial responsibility for such upgrades falls to the Distribution Provider. However, if the Network Upgrades required by earlier queued generating facilities are not subject to an executed GIA (or unexecuted GIA filed at FERC) at the time of withdrawal of the earlier queued generating facilities, the financial responsibility for such upgrades may fall to the IC⁷. Section 14.2.2 also discusses how Network Upgrades required by interconnection customers selecting Option (B) might be required to be reapportioned among interconnection customers selecting Option (B) in the case of withdrawals of earlier queued generating facilities. Changes in costs allocated to the IC could also arise as the result of the CAISO's reassessment process described in Section 7.4 of the GIDAP. SCE encourages the IC to review Sections 7.4 and 14.2.2 of the GIDAP for the rules and processes under which the financial responsibility might be reapportioned to the IC. Potential changes in the IC's cost responsibility resulting from application of the provisions of these Sections of GIDAP are not included in this Phase II study, nor are the potential impacts to the IC's maximum cost responsibility outlined.

15. Charging restrictions may occur in the future under future base case overloads.
16. Additional limitations may be driven by the CAISO market and distribution system operations.
17. Please note that SCE has made its best efforts to convey as much information possible based on information provided by the IC about its proposed project. The information contained herein may indicate to ICs that a project of its magnitude may be better suited to interconnect at higher voltage levels, or downsize as to not incur significant amount of restrictions. Any determination to change POIs or downsize is purely at the IC's discretion and would be subject to a SCE material modification review pursuant to the tariff.

⁷ Such circumstance was not identified for the Project in the Study.

Attachment 1
Interconnection Facilities, Network Upgrades and Distribution Upgrades
Please refer to separate document

Attachment 2
Escalated Cost and Time to Construct for Interconnection Facilities, Reliability Network Upgrades, Delivery Network Upgrades, and Distribution Upgrades
Please refer to separate document

**Attachment 3
Allocation of Network Upgrades for Cost Estimates and Maximum Network Upgrade Cost Responsibility**

Project	Project Allocation(%)	Total Upgrade Cost (2015 \$k)	Allocated Cost (2015 \$k)	Allocated Cost (Escalated \$k)
Vista 220kV CB upgrade	2.10%	\$ 2,359	\$ 50	\$ 55
Vista 220kV CB upgrade grid ground study	100.00%	\$ 43	\$ 43	\$ 48
RNU Total		\$ 2,403	\$ 93	\$ 103
Grand Total		\$ 2,403	\$ 93	\$ 103

Attachment 4

Distribution Provider Interconnection Handbook

Preliminary Protection Requirements for Interconnection Facilities are outlined in the Distribution Provider Interconnection Handbook (separate document)

Attachment 5
Short Circuit Calculation Study Results
Please refer to the Appendix H of the Area Report

**Attachment 6
Customer Provided Dynamic Data**

The following data was submitted by the IC for Dynamic simulation:

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

Attachment 7
SCE Northern Hemisphere Import Nomogram
Please refer to separate document

Attachment 8
Subtransmission Assessment Report
Please refer to separate document

Queue Cluster 7 Phase II - Attachment 1
WDT1187 – [REDACTED]
Interconnection Facilities, Network Upgrades, and Distribution Upgrades

Interconnection Facilities, Network Upgrades and Distribution Upgrades

Distribution Provider's Interconnection Facilities, Network Upgrades and Distribution Upgrades described below are based on the Distribution Provider's preliminary engineering and design. Such descriptions are subject to modification to reflect the actual facilities that are constructed and installed following the Distribution Provider's detailed engineering and design, identification of field conditions, and compliance with applicable environmental and permitting requirements¹.

1. Interconnection Facilities.

(a) **Interconnection Customer's Interconnection Facilities.** The Interconnection Customer shall:

- (i) [REDACTED]
- (ii) [REDACTED] from the Generating Facility to a position designated by the Distribution Provider, outside of the Distribution Provider's [REDACTED] where Interconnection Customer shall install a structure designed and engineered in accordance with the Distribution Provider's specifications ("Last Structure"). This [REDACTED] will be referred to as the WDT1187 – [REDACTED] Line. The right-of-way for the WDT1187 – [REDACTED] Line shall extend up to the edge of the [REDACTED] property line.

(Note: The WDT1187 – [REDACTED] Line name is subject to change by the Distribution Provider based upon its transmission line naming criteria. Should the WDT1187 – [REDACTED] Line name be changed, this GIA may be amended to reflect such change.)

- (iii) The normal (continuous) rating of the Interconnection Customer's [REDACTED] equipment that is part of the [REDACTED]
- (iv) Install single mode fiber optic cable on WDT1187 – [REDACTED] Transmission Line to a point designated by the Distribution Provider at a Distribution Provider-owned vault near the Distribution Provider's [REDACTED] to provide one of two telecommunication paths required for the line protection scheme, and the Remote Terminal Units ("RTU"). A minimum of eight (8) strands within the single mode fiber optic cable shall

¹ Such descriptions are subject to modification to reflect the actual facilities that are constructed and installed following the Distribution Provider's detailed engineering and design, identification of field conditions, and compliance with applicable environmental and permitting requirements.

be provided for the Distribution Provider's exclusive use into [REDACTED]
[REDACTED]

- (v) Install appropriate fiber optic cable from the Generating Facility to a point designated by the Distribution Provider at a Distribution Provider-owned vault near the Distribution Provider's [REDACTED] to provide the second telecommunication path required for the line protection scheme. A minimum of eight (8) strands within the fiber optic cable shall be provided for the Distribution Provider's exclusive use. The telecommunication path shall meet the Applicable Reliability Standards criteria for diversity.
- (vi) Own, operate and maintain both telecommunication paths (including the fiber optic cables and appurtenant facilities), with the exception of the terminal equipment at both [REDACTED] and at the Generating Facility, which will be installed, owned, operated and maintained by the Distribution Provider.
- (vii) Allow the Distribution Provider to review the Interconnection Customer's telecommunication equipment design and perform inspections to ensure compatibility with the Distribution Provider's terminal equipment and protection engineering requirements; allow the Distribution Provider to perform acceptance testing of the telecommunication equipment and the right to request and/or to perform correction of installation deficiencies.
- (viii) Provide required data signals, make available adequate space, facilities, and associated dedicated electrical circuits within a secure building having suitable environmental controls for the installation of the Distribution Provider's RTU in accordance with the Interconnection Handbook.
- (ix) Make available adequate space, facilities, and associated dedicated electrical circuits within a secure building having suitable environmental controls for the installation of the Distribution Provider's telecommunications terminal equipment in accordance with the Interconnection Handbook.
- (x) Extend the single mode fiber optic cables for the two telecommunication paths to an Interconnection Customer provided and installed patch panel located adjacent to the Distribution Provider's telecommunications terminal equipment specified above.
- (xi) Install all required ISO-approved compliant metering equipment at the Generating Facility, in accordance with Section 10 of the ISO Tariff.
- (xii) Install revenue and wholesale metering cabinets and revenue and wholesale metering equipment (typically, potential and current transformers) at the Generating Facility to meter the Generating Facility retail and wholesale loads, as specified by the Distribution Provider. The metering cabinets must be placed at a location that would allow twenty-four hour access for the Distribution Provider's metering personnel.
- (xiii) Allow the Distribution Provider to install, in the revenue metering cabinet provided by the Interconnection Customer, revenue meters and appurtenant equipment required to meter retail load at the Generating Facility.

- (xiv) Allow the Distribution Provider to install, in the revenue metering cabinet provided by the Interconnection Customer, revenue meters and appurtenant equipment required to meter wholesale load at the Generating Facility.
- (xv) Install relay protection to be specified by the Distribution Provider to match the relay protection used by the Distribution Provider at [REDACTED] [REDACTED] in order to protect the WDT1187 – [REDACTED] Transmission Line, as follows:
 - 1. Two (2) current differential relays connected via diversely routed dedicated digital communication channels to [REDACTED] The make and type of current differential relays will be specified by the Distribution Provider during detailed engineering of the Distribution Provider's Interconnection Facilities.
 - 2. One (1) logic processing relay or equivalent successor to receive additional tripping signals.
- (xvi) Install disconnect facilities in accordance with the Distribution Provider's Interconnection Handbook to comply with the Distribution Provider's switching and tagging procedures.

(b) **Distribution Provider's Interconnection Facilities.** The Distribution Provider shall:

- (i) [REDACTED]
 - 1. Install facilities for a new [REDACTED] position to terminate the WDT1187 – [REDACTED] This work includes the following:
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - 2. Install the following relays to protect the WDT1187 – [REDACTED]
 - a. [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - 3. Perform ground grid study.

- (ii) **WDT1187 – [REDACTED]**
Install an appropriate number of [REDACTED] sub-transmission structures including insulator/hardware assemblies between the Last Structure and the dead-end substation structure at [REDACTED] The actual number and location of the sub-transmission structures and spans of

conductor will be determined by the Distribution Provider following completion of detailed engineering of the Distribution Provider's Interconnection Facilities. The Phase II Interconnection Study assumed one (1) sub-transmission structure and two (2) spans of conductor.

(iii) Telecommunications.

1. Install all required lightwave, channel bank(s), and associated equipment (including terminal equipment), supporting protection and SCADA requirements at the Generating Facility and [REDACTED] [REDACTED] for the interconnection of the Generating Facility. Notwithstanding that certain telecommunication equipment, including the telecommunications terminal equipment, will be located on the Interconnection Customer's side of the Point of Change of Ownership, the Distribution Provider shall own, operate and maintain such telecommunication equipment as part of the Distribution Provider's Interconnection Facilities.
2. Install appropriate length of fiber optic cable, including conduit and vaults, from the point designated by the Distribution Provider near the Distribution Provider's [REDACTED] to extend the fiber optic cable into the communication room at [REDACTED]. The actual location and length of fiber optic cable and conduit, and location and number of vaults, will be determined during detailed engineering of the Distribution Provider's Interconnection Facilities.
3. Install appropriate length of fiber optic cable, including conduit and vaults, to extend the Interconnection Customer's second telecommunications path from the point designated by the Distribution Provider near the Distribution Provider's [REDACTED] into the communication room at [REDACTED]. The actual location and length of fiber optic cable and conduit, and location and number of vaults, will be determined during detailed engineering of the Distribution Provider's Interconnection Facilities.

(iv) Real Properties, Transmission Project Licensing, and Corporate Environmental Health and Safety.

Obtain easements and/or acquire land, obtain licensing and permits, and perform all required environmental activities for the installation of the Distribution Provider's Interconnection Facilities, including any associated telecommunication equipment for the WDT1187 – [REDACTED]

(v) Metering.

- a. Install revenue meters and appurtenant equipment required to meter the retail load at the Generating Facility. Notwithstanding that the meters and appurtenant equipment will be located on the Interconnection Customer's side of the Point of Change of Ownership, the Distribution Provider shall own, operate and maintain such facilities as part of the Distribution Provider's Interconnection Facilities.

- b. Install revenue meters and appurtenant equipment required to meter the wholesale load at the Generating Facility. Notwithstanding that the meters and appurtenant equipment will be located on the Interconnection Customer's side of the Point of Change of Ownership, the Distribution Provider shall own, operate and maintain such facilities as part of the Distribution Provider's Interconnection Facilities.

(vi) **Power System Control.**

Install [REDACTED] at the Generating Facility to monitor typical generation and [REDACTED] such as MW, MVAR, terminal voltage and circuit breaker status for the Generating Facility and plant auxiliary load, and transmit the information received thereby to the Distribution Provider's grid control center. Notwithstanding that the [REDACTED] will be located on the Interconnection Customer's side of the Point of Change of Ownership, the Distribution Provider shall own, operate and maintain the [REDACTED] as part of the Distribution Provider's Interconnection Facilities.

2. Network Upgrades.

(a) **Stand Alone Network Upgrades.**

None identified in the Phase II Study.

(b) **Other Network Upgrades.**

(i) **Distribution Provider's Reliability Network Upgrades.**

Short Circuit Duty (SCD) Mitigation – RNU

a. [REDACTED]

[REDACTED]

ii. Perform ground grid study.

b. **Real Properties, Transmission Project Licensing, and Corporate Environmental Health and Safety**

Obtain easements and/or acquire land, obtain licensing and permits, and perform all required environmental activities for the installation of the TRV's.

(ii) **Distribution Provider's Delivery Network Upgrades**

1. **Area Delivery Network Upgrades.**

None identified in the Phase II Study.

2. **Local Delivery Network Upgrades.**

None identified in the Phase II Study.

3. Distribution Upgrades. The Distribution Provider shall:

(a) [REDACTED]

- (i) [REDACTED]
- (b) **Power System Controls.**
 - (i) Point additions to the existing [REDACTED] to accommodate new relays, statuses, and alarms.
- (c) **Ground grid studies.**
Perform ground grid studies at [REDACTED]

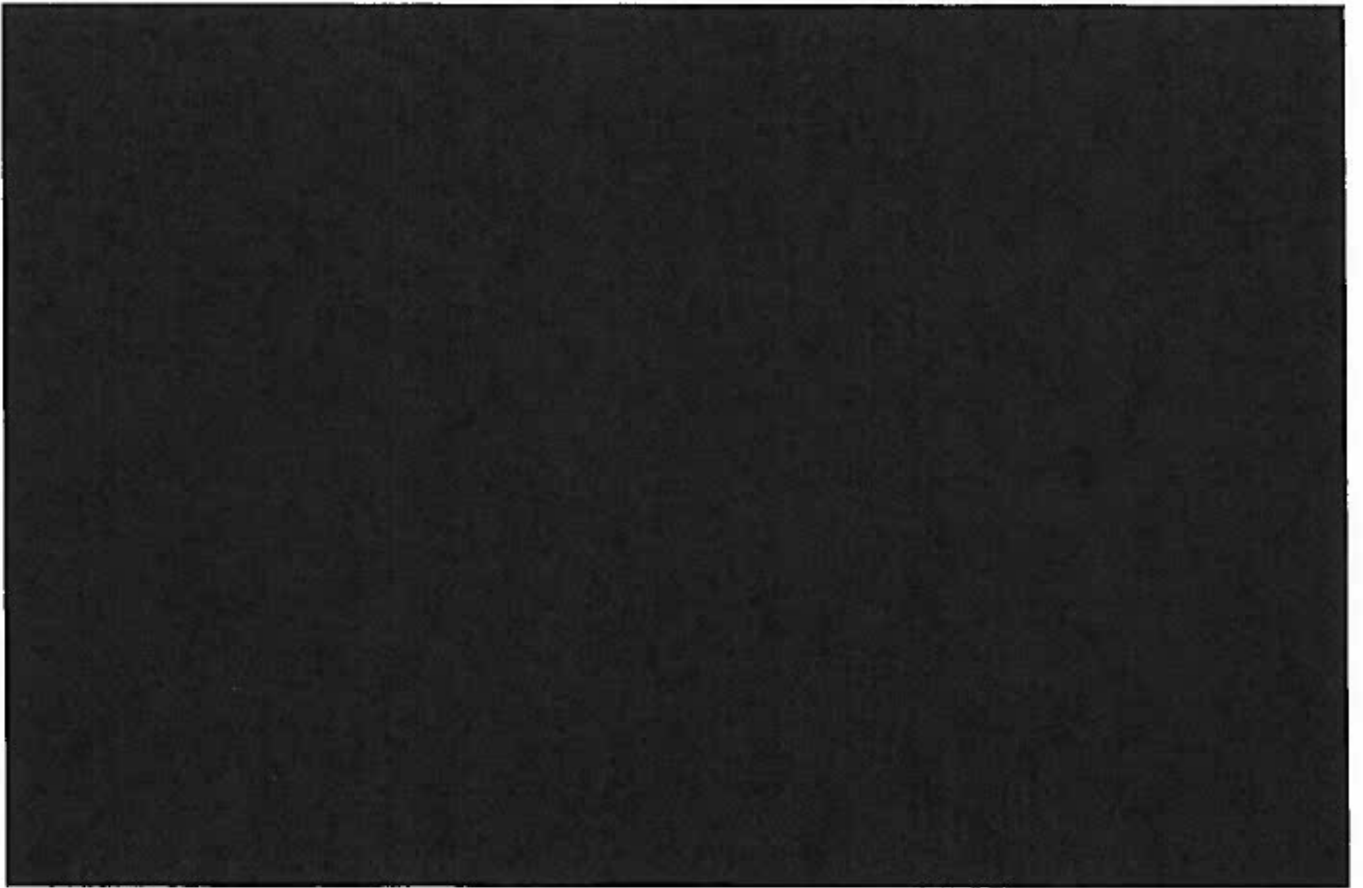
4. Affected System Upgrades.
Not Used.

5. Point of Change of Ownership.

- (a) WDT1187 – [REDACTED] The Point of Change of Ownership shall be the point where the conductors of the WDT1187 – [REDACTED] are attached to the Last Structure, which will be connected on the side of the Last Structure facing Capitan Substation. The Interconnection Customer shall own and maintain the Last Structure, the conductors, insulators and jumper loops from such Last Structure to the Interconnection Customer's Generating Facility. The Distribution Provider will own and maintain [REDACTED] as well as all circuit breakers, disconnects, relay facilities and metering within [REDACTED] together with the line drop, in their entirety, from the Last Structure to [REDACTED]. The Distribution Provider will own the insulators that are used to attach the Distribution Provider-owned conductors to the Last Structure.
- (b) Telecommunication single mode fiber optic cable: The Point of Change of Ownership shall be the point at a Distribution Provider-owned vault, where the Interconnection Customer's fiber optic cable is connected to the Distribution Provider's fiber optic cable.
- (c) Telecommunication diverse fiber optic cable: The Point of Change of Ownership shall be the point at a Distribution Provider-owned vault, where the Interconnection Customer's fiber optic cable is connected to the Distribution Provider's fiber optic cable. [REDACTED]

6. Point of Interconnection. The Distribution Provider's [REDACTED] at the [REDACTED]

7. One-Line Diagram of Interconnection to [REDACTED]



Addendum to Appendix A – WDT1187



Addendum #1

Cluster 7 Phase II Final Report

December 22, 2015

This study has been completed in coordination with the California Independent System Operator Corporation (CAISO) per CAISO Tariff Appendix DD Generator Interconnection and Deliverability Allocation Procedures (GIDAP)

Project No.		No	Date	Document Title	Description of Document
WDT1187	<div style="background-color: black; width: 100px; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: black; width: 100px; height: 15px;"></div>	2	12/22/2015	Addendum #1 to Queue Cluster 7 Phase II Appendix A Final Report	The purpose of this report is to publish the written comments provided by the IC to SCE in accordance with the timelines stated per Section 4.6.10 in GIP
WDT1187	<div style="background-color: black; width: 100px; height: 15px; margin-bottom: 5px;"></div> <div style="background-color: black; width: 100px; height: 15px;"></div>	1	11/24/2015	Queue Cluster 7 Phase II Appendix A Final Report	Report to disclose results of QC7 Phase II cluster.

ADDENDUM
IC SUBMITTED WRITTEN COMMENTS

QC7 Phase II – WDAT1187 – [REDACTED]

1. Written comments provided by IC within ten (10) Business Days of receipt of the QC7 PII report
 - a. None

2. Written comments provided by IC three (3) Business Days following the Results Meeting
 - a. None