Appendix A – WDT1290

Queue Cluster 8 Phase I Report

January 15, 2016

This study has been completed in coordination with the California Independent System Operator Corporation (CAISO) per Southern California Edison Company's Wholesale Distribution Access Tariff, Attachment I Generator Interconnection Procedures (GIP)

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Attachments:

1. Interconnection Facilities, Network Upgrades, and Distribution Upgrades
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4. Distribution Provider's Interconnection Handbook
5. Short Circuit Duty Calculation Study Results (see Appendix H of the Bulk Area Report)
6. Interconnection Customer Provided Dynamic Data
7. Not Used
8. Subtransmission Assessment Report – [redacted]

A. Introduction

[redacted] the Interconnection Customer (IC), has submitted a completed Interconnection Request (IR) to Southern California Edison Company (SCE) for their proposed [redacted] The Project requested a Point of Interconnection (POI) at Southern California Edison Company's (SCE) [redacted] located in [redacted] CA. The IC requested Full Capacity Deliverability Status FCDS) for the Project. The IC desires an In-Service Date (ISD) of January 1, 2018 and a Commercial Operation Date (COD) of March 1, 2018. Such dates are specified in the Project's IR submittal. Actual ISD and COD will depend on detailed design, engineering, and construction requirements to interconnect the Project after the Generator Interconnection Agreement (GIA) has been executed and filed at Federal Energy Regulatory Commission (FERC) for acceptance.

In accordance with FERC approved CAISO Tariff Appendix DD Generator Interconnection and Deliverability Allocation Procedures (GIDAP), the Project was grouped with Queue Cluster 8 (QC8) Phase I projects to determine the impacts of the group as well as impacts of the Project on the CAISO Controlled Grid.

Please note that the discussion related to the impacts at the Transmission and Subtransmission levels of the group reside in the SCE [redacted] and [redacted] Subtransmission Assessment Reports; both are included in the QC8 PI report package. This report focuses only on the impacts or impact contributions of the Project at the local system, and it is not intended to supersede any contractual terms or conditions specified in a GIA.

The report provides the following:

1. Transmission System impacts caused by the Project;
2. Distribution System impacts caused by the Project;
3. System reinforcements necessary to mitigate the adverse impacts caused by the Project under various system conditions;
4. A list of required facilities and a unit cost estimate of the Project's cost responsibility and time to construct[1] 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 [redacted] that required additional analysis be performed to evaluate the impacts of [redacted] within SCE's Distribution System. These analyses focused on the charging[2] aspects of the [redacted] 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 [redacted] 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, which includes detailed engineering, licensing, and other activities required to bring such facilities into service. These durations are from the execution of the GIA, receipt of: all required information, funding, and written authorization to proceed from the IC as will be specified in the GIA to commence the work

[2] Charging is defined as the Project drawing energy from the grid to "charge" the Project and store the energy for later release back to the grid.

[redacted]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[redacted]Generating Facility located in [redacted]California, as disclosed by the IC in its IR and may have been amended during the interconnection Study process, consists of (i) a[redacted]comprising[redacted] [redacted]with an individual rated output of[redacted]each for a collective total gross output of[redacted]at the inverter terminal, (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, there were no internal project losses identified resulting in a net output (as measured at the high-side of the main transformer bank) of[redacted] Losses on the[redacted] [redacted]were found to be negligable resulting in an estimated capacity delivery of[redacted]at the POI.

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.

[redacted]

Figure A.2: Project Location Map

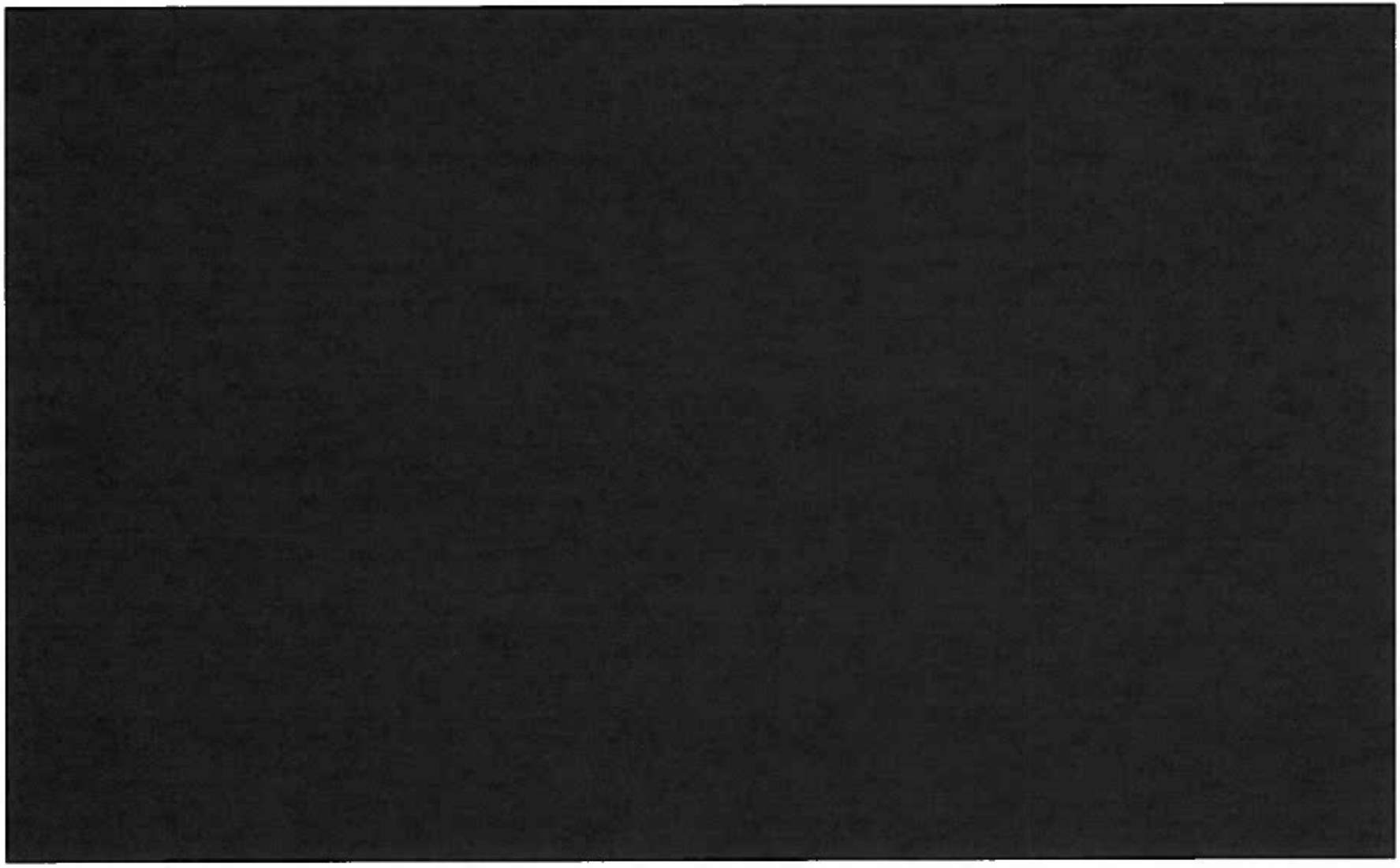


Table A.1 Project General Information

Project Location	[redacted]
Distribution Provider's Planning Area	SCE's Metro Area
Number and Types of Generators	[redacted]
Requested Maximum Project Output as measured at POI	[redacted]
Maximum Battery Storage Charging Demand	[redacted]
Interconnection Voltage	[redacted]
POI	[redacted]
Gen-Tie	[redacted]
Step-up Transformer(s)	Main Transformer: [redacted] 66/12 kV (Ygnd-Ygnd), [redacted] H-X Impedance Value: [redacted] Pad-Mount Transformers: [redacted] [redacted] H-X Impedance Value: [redacted]
Estimated Losses on Gen-Tie Facilities (All Gen-Tie Facilities used to deliver to POI)	[redacted] (minimal distance results in negligible losses)
Step-Up Transformer(s) Losses For SCE, x/r ratio set to 30/1 which is assumed as a "typical value"	[redacted]
Pad-Mount Transformer Losses For SCD, x/r ratio set to 10/1 which is assumed as a "typical value"	[redacted]
Collector System Losses	IC did not provide Collector System Data
Internal Generation Facility Losses	[redacted] (collector system assumed negligible for BESS)
Total Auxiliary Load	[redacted]
POI Delivery (Gross output less losses less aux load)	[redacted]
Power Factor Range	[redacted] at POI per interconnection application
IC Requested COD	March 1, 2018

B. Study Assumptions

For detailed assumptions regarding the group cluster analysis, please refer to the QC8 Phase I Area report. Below are the assumptions specific to the Project.

1. The following is the Plan of Service (POS) assumed for the Project in the QC8 Phase I Study:

   The Project was modeled as interconnecting [redacted] of battery storage through the proposed [redacted]

2. The following facilities will be installed by SCE and **<u>are included</u>** in this Phase I Study:
   - The new [redacted] position at the [redacted]
   - The segment of a [redacted] inside the [redacted] property line.
   - The segments of each one of the two generators – owned telecommunications channels inside the [redacted] property line.
   - Lightwave, channel bank, and associated equipment at [redacted] and at the Facility
   - The required retail metering cabinet and retail load meters
   - The wholesale load meters (charging project)

   NOTE:
   SCE installation does not include metering, voltage and 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 Interconnection Customer and **<u>are not included</u>** in this Phase I Study:
   - The [redacted] from the Generating Facility to the last structure outside the [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 meter.

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

   - The [redacted] following line protection relays to be installed at the Generating Facility end of the [redacted]

     (a) [redacted]

     (b) [redacted]

4. [redacted] Facility Charging Considerations
   - This study assumes that the IC Generating Facility will include all equipment, software, appropriate controls, and other related equipment necessary to maintain the [redacted] facility 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 Point of Interconnection 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).

- Depending on the study results, the Project may need to participate in the [redacted]

- A [redacted] which at this stage is a technical concept, is under development to incorporate the increased amount of [redacted] applications to SCE's Distribution System with minimal distribution upgrades. It is assumed that a [redacted] or similar system will be available prior to the In-Service Date of the [redacted] facility and further details will be available during the detailed engineering and design phase of the Project. The [redacted] will actively communicate allowable Project limits under charging mode to maintain safe and reliable operation of the distribution system.

- The [redacted] component of the Project will need to be metered separately from the revenue load components. The IC should be prepared to install multiple sets of metering (i.e. separate sets of voltage and current transformers and supporting metering equipment) for the Project. Additionally, the Project may also need to connect the [redacted] component to a dedicated transformer.

- For this study, an additional reliability assessment for the charging of the [redacted] component was evaluated. Please refer to Attachment 8 for additional details.

C. Reliability Standards, Study Criteria and Methodology

The generator interconnection studies were 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 Bulk 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

1. Thermal Overloads

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. 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.

2. Voltage Performance

The Project is required to provide power factor regulation capability [redacted] at POI) to alleviate transmission level voltage constraints.

II. Steady State Power Flow Analysis Results – 66 kV

1. Thermal Overloads

The study did not identify any power flow issues on the [redacted] Subtransmission System. The details of the power flow analysis are provided in the Subtransmission Assessment Report.

2. Voltage Performance

With the Project providing power factor regulation capability [redacted] at POI for asynchronous generation, no additional voltage performance issues were identified at the subtransmission voltage level.

3. Required Mitigations

No mitigations on the Subtransmission System were identified to be required by the Project under discharge mode.

❖ Charging Analysis of 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. 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

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.

1. Thermal Overloads

a. Category "A" (All facilities in service, N-0) - None

b. Category "B" (loss of a single element, N-1)

- [redacted] overloads upon loss of either
  - [redacted] or

- [redacted]
- [redacted] overloads upon loss of either
  - [redacted] or
  - [redacted]
- [redacted] overloads upon loss of either
  - [redacted] or
  - [redacted]

- Category "C" (loss of a two elements, N-2) - 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 synchronous generators) to alleviate power flow non-convergence and maintain the Transmission transfer capability.

3. Required Mitigations

   The Project is required to provide [redacted] power factor regulation capability at the POI. In addition, a [redacted] (Distribution Upgrade) is required to mitigate the power flow impacts of the Project described above.

   A [redacted] is needed for loss of an A-bank transformer at the [redacted] and/or the contingencies listed above in the thermal overloads section. The [redacted] provides continuous monitoring of specified/identified contingencies in which the charging/negative generation component of [redacted] facilities contribute to. From the monitored data of both SCE facilities & IC facilities calculated charging capacity limits are generated and transmitted to the IC to stay within. If the IC does not comply with the provided limits SCE will mitigate for the identified contingencies at its discretion.

   Refer to Attachment 1 and Attachment 2 for scope description and associated project cost responsibility of these Distribution Upgrade(s).

   Please note that operational flexibility to charge at any time may not be attainable even with substation and distribution system upgrades due to limitations that may exist further upstream on SCE's Transmission systems. Furthermore, the results included utilize historical data to make a projection of possible charging profiles. As is typically the case with utilizing historical data to make projections, past performance is not guaranteed to be an indicator of future performance. For example, this can be the case due to changes in system topology on the distribution system, which can occur more frequently than on the Transmission System.

E. Short Circuit Duty Results

Short circuit studies were performed to determine the maximum fault duty impact of adding the QC8 Phase I 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 caused by the inclusion of the QC8 projects and/or queued ahead generation, were identified, the fault current contribution from each individual project in QC8 Phase I were 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 IC provided technical data for the identified inverter (specified in Section 2). SCE compared the technical data provided against manufacturer data, if the manufacturer Short Circuit Duty (SCD) information for the specific inverter was available. If the technical data provided by the IC differed from the inverter manufacturer data, then SCE utilized the manufacturer data in the SCD analysis. Based on the comparison, the technical data provided by the IC is consistent with the manufacturer data.

   "Battery Energy Storage System (BESS) Gen"
   Max Fault Current for each generation unit: [redacted]

   Generation tie-line:

Length:	[redacted]
Conductor:	[redacted]
Z_1(p.u.) conductor impedance information:	[redacted]
Z_0(p.u.) conductor impedance information:	[redacted]

   Main Generation Step-Up Transformer
   Technical details are provided above in Table A-1.

   As the IC did not provide a resistance value associated with the Main Step-Up and pad-mount transformer, a value was derived by using a "typical" X/R ratio for similar equipment. Please note, an [redacted] was applied for the Main Step-Up transformer for this study, and an [redacted] was applied for the pad-mount transformer for this study. Validation of these values will be required, or updated values submitted, prior to commencement of Phase II.

2. Short Circuit Duty Study Results

   All bus locations where the QC8 Phase I 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 QC8 Phase I Area Report (Appendix H). These values have been used to determine if any equipment is overstressed as a result of the inclusion of QC8 Phase I 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 IRs in that Group Study pro rata on the basis of SCD contribution of each Generating Facility.

Please refer to the QC8 Phase I Area Report for the QC8 Phase I breaker evaluation which did not identify any additional overstressed circuit breakers triggered with the inclusion of QC8 Phase I without ADNUs.

3. SCE Substations with Ground Grid Duty Concerns

   The short circuit studies flagged for further review a total of twenty-seven (27) existing substations where the QC8 Phase I Projects increased the substation ground grid duty by at least [redacted] Additional review will be performed as part of Phase II to determine if any of these locations will require a detailed ground grid analysis performed as part of project execution once GIAs are in place and projects proceed forward towards interconnection.

4. Preliminary Protection Requirements

   Protection requirements are designed and intended to protect the Distribution Provider's Distribution 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 Distribution Provider's Interconnection Handbook provided in Attachment 4.

F. Transient Stability Evaluation

1. Area Study Transient Stability Results – 220 kV and above

   With the Project providing [redacted] 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 in the QC8 Phase I report package, for the QC8 PI transient stability evaluation criteria, and assessment results, respectively, at the 220 kV and above voltage level.

2. Area Transient Stability Results – 66 kV or below

   At the 66 kV and below voltage level this study is not performed.

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 synchronous generators. 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. Required Mitigations

   No Delivery Network Upgrades are required.

I. Interconnection Facilities, Network Upgrades, and Distribution Upgrades

Please see **Attachment 1** for the Distribution Provider's Interconnection Facilities (IF), Reliability Network Upgrades (RNUs), Delivery Network Upgrades (DNUs) and Distribution Upgrades (DUs) allocated to the Project. Please note that SCE will not "reserve" the identified IF for the proposed POI. The identified scope/facilities will be allocated to the Project upon the successful execution of the GIA and SCE has completed the detailed design and engineering of the facilities according to tariff timelines.

J. Cost and Construction Duration Estimates

To determine the cost responsibility of each generation project in QC8 Phase I, the CAISO developed cost allocation factors (Attachment 3) for RNUs, Local Delivery Network Upgrades (LDNUs) and Area Delivery Network Upgrades (ADNUs). Attachment 2[3] provides the 'constant' 2015 dollars and their escalation to the estimated COD year for IF, RNUs, DNUs, and DUs which the Project was allocated cost.

For the QC8 Phase I Study, the estimated COD is derived by taking into account time requirements to complete the QC8 Interconnection Process to tender a GIA. A GIA is not scheduled to be tendered until after completion of the QC8 Phase II Studies, Reassessment and Transmission Planning Deliverability (TPD)[4] Allocation Study Process. The QC8 Phase II Study is scheduled to start on May 2016 and be completed by November 2016. Subsequently, the CAISO's Annual Reassessment effort and TPD Allocation Study does not commence until late January or early February 2017. The TPD Allocation Study is scheduled to be completed by April 2017. If the CAISO and SCE can make a determination that the TPD Allocation Study Process outcomes do not change the scope requirements, a letter will be provided at the end of April 2017[5] informing the IC that there are no changes to Network Upgrade requirements and initiating the GIA negotiation process. Otherwise, further re-assessment will be performed for the Project. Any updates to scope, cost and schedule are developed and updated Interconnection Study reports will be issued by the end of July 2017. The GIA negotiations commence after either the issuance of the letter of no change to Network Upgrade requirements at the end of April 2017 or upon issuance of the updated reports at the end of July 2017. Provided the Project does not elect to Park for one (1) year, the letter issued by the CAISO and/or the updated Interconnection Study reports will be used as the basis to proceed with the GIA negotiations. Assuming a three (3) month timeframe for GIA negotiations after the draft GIA has been issued to the IC, an executable GIA is not expected until either early August 2017 or early November 2017 depending on TPD Allocation Study Process results, which requires a decision from the IC to Park or proceed and will determine if the Project needs to complete the CAISO's Reassessment Study. QC8 Phase I assumed the duration of the work element begins in December 2017, which accounts for the GIA and submittal of required funds by the IC.

Based on the above, the requested IC ISD of January 1, 2018 cannot be met due to the estimated 27 month timeline identified as required to construct the Plan of Service upgrades. Following the standard interconnection process, the ISD should be modified to reflect March 2020 but may be later advanced to

[3] For [redacted] the Attachment 2 includes upgrade(s) identified from the "Charging" analysis.
[4] Transmission Plan Deliverability: Deliverability supported by the CAISO's Transmission Plan
[5] The TPD Allocation Process is estimated to complete in April 2017. The actual date may vary

December 2019 depending on TPD Allocation Study Process results. Note that this date may be impacted by timelines corresponding to installation of the third Johanna A-Bank.

The IC should note that any LDNUs and ADNUs allocated to the Project may be assessed 35% Income Tax Component of Contribution (ITCC) pending the results of the TPD Allocation Study Process several months after the QC Phase II Study Reports are released, in addition to the 35% ITCC assessed for the IF, DUs, and RNUs above the $60K/MW repayment cap allocated to the Project. For your information, Attachment 2 contains a potential ITCC estimate[6] based on the Phase I 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 GIA development phase once the IC submits the TP Deliverability Allocation Study Process options form used to confirm the acceptance, waiver (parking), or denial of the awarded deliverability assigned to the Project.

K. 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's Interconnection Handbook provided in Attachment 4.

L. Sub synchronous 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. Subsynchronous Interaction evaluations include Subsynchronous Resonance (SSR) and Subsynchronous Torsional Interactions (SSTI) for conventional generation units, and Subsynchronous Control Instability (SSCI) for inverter based generators using power electronic devices (e.g. Solar PV and Wind Turbines).

For projects interconnecting at the 220 kV voltage level and above in close electrical proximity of series capacitor banks on the transmission system a study will need to be performed to evaluate the SI between generating facilities and the transmission system.

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 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.

[6] The maximum ITCC exposure applies ITCC (35%) to assigned IF and DU facilities. For Network upgrades, costs that are not subject to transmission credits and/or exceed the $60k/MW cap will be subject to ITCC (35%). For Option A facilities: The maximum ITCC exposure is calculated by applying the following formula: (IF*35%) + ((RNU Costs – (Project MW*($60k/MW)))*35%) + (DU*35%). For Option B facilities: The maximum ITCC exposure is calculated by applying the following formula: (IF*35%) + ((RNU Costs – (Project MW*($60k/MW)))*35%) + (LDNU*35%) + (ADNU*35%) + (DU*35%)

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.

M. Environmental Evaluation, Permitting, and Licensing

Please see Appendix K of the QC8 Phase I Area Report.

N. Affected Systems Coordination

Please see Section H of the QC8 Phase I Area Report.

O. 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 POS and are not sufficient for permitting of facilities. The POS is subject to change as part of detailed engineering and design.

2. IC's Technical Data

   The study accuracy and results for the QC8 Phase I 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 QC8 Phase I 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 QC8 Phase I Bulk 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's Interconnection Handbook

The IC shall be required to adhere to all applicable requirements in the Distribution Provider's 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 QC8 Phase I Study does not address any requirements for standby power or temporary construction power that the Project may require prior to the ISD of the Interconnection Facilities. Should the Project require standby power or temporary construction power from Distribution Provider prior to the ISD of the IF, the IC is responsible to make appropriate arrangements with Distribution Provider to receive and pay for such retail 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 GIA, 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 QC8 Phase I, 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 QC8 Phase I 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 QC8 Phase I Study for the Project. Nothing in this report is intended to supersede or establish terms/conditions specified in fully executed GIAs.

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 seven (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) the financial responsibility for such upgrades may fall to the IC. 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 Study 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 QC8 Phase I 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.

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

No Network Upgrade costs were assigned to the Project

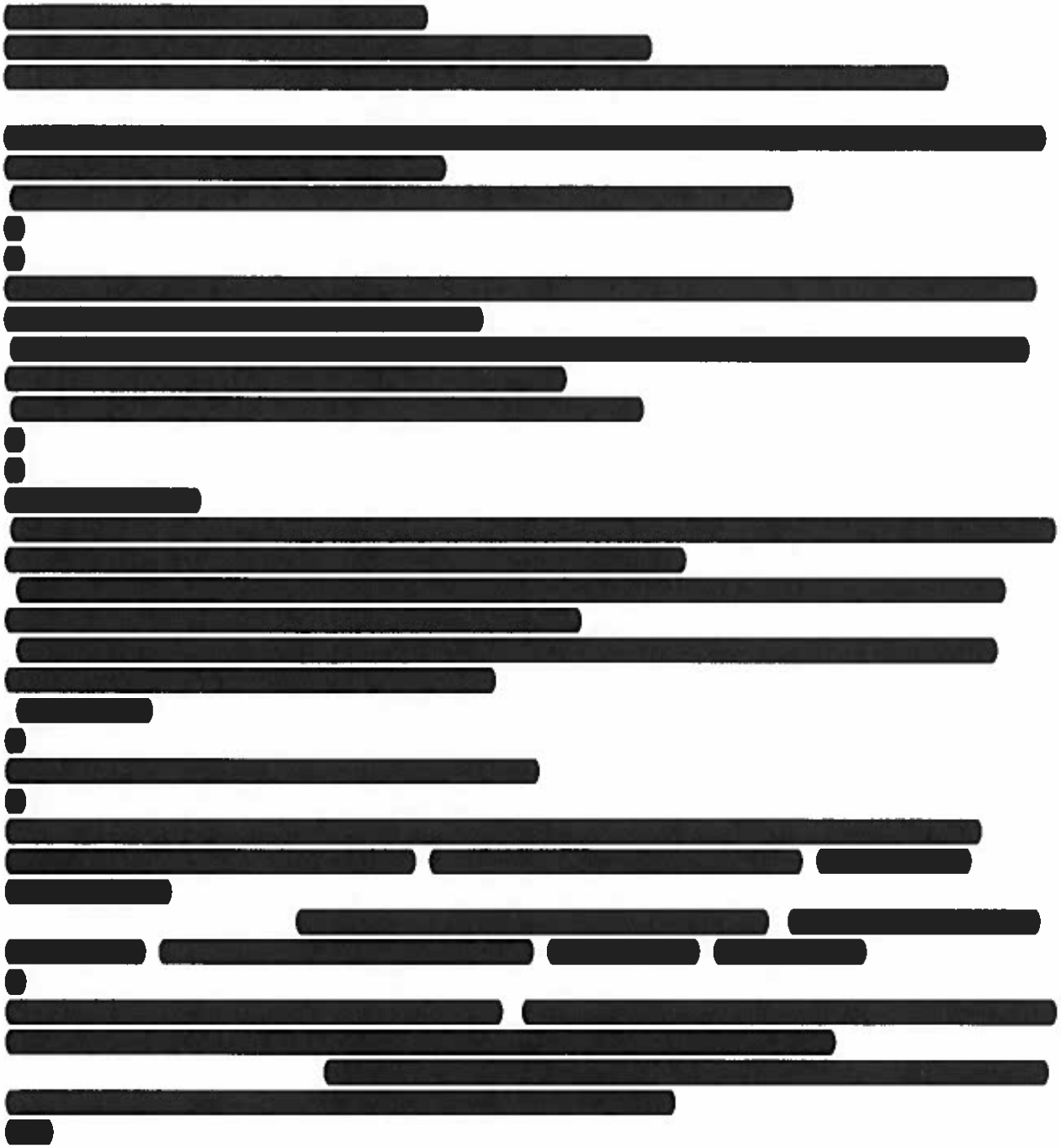
Attachment 4
Distribution Provider's Interconnection Handbook

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

Attachment 5
Short Circuit Duty Calculation Study Results

Please refer to the Appendix H of the Bulk Area Report

Attachment 6
Interconnection Customer Provided Dynamic Data
The following data were submitted by the IC for Dynamic simulation:



Attachment 7
Not Used

Attachment 8
Subtransmission Assessment Report
Please refer to separate document

Queue Cluster 8 Phase I - Attachment 1

WDT1290– [redacted]

Interconnection Facilities, Network Upgrades and Distribution Upgrades

Attchment 1 to QC8 PI Appendix A Report

Interconnection Facilities, Network Upgrades and Distribution Upgrades [1]

To determine the cost responsibility of each generation project in QC8, the California Independent System Operator Corporation (CAISO) developed cost allocation factors (Attachment 3) for Reliability Network Upgrades and Local Delivery Network Upgrades. The CAISO developed the $/MW cost rate for incremental Area Delivery Network Upgrades. The cost rate multiplied by the requested deliverable MW capacity provides the cost estimate for the Area Delivery Network Upgrades. The Interconnection Facilities are the sole cost responsibility of the Project. The Interconnection Facilities and Network Upgrades are listed below.

1. Interconnection Facilities.

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

(i) Install a [redacted]

(ii) Install [redacted] from the 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 [redacted] The right-of-way for [redacted] shall extend up to the edge of the [redacted] property line.

(Note: The [redacted] name is subject to change by the Distribution Provider based upon its transmission line naming criteria. Should the [redacted] name be changed, this LGIA 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] and the emergency (four-hour) rating is [redacted]

(iv) Install All Dielectric Self Supporting (ADSS) fiber optic cable on [redacted] to a point designated by the Distribution Provider 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

[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.

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

(v) Install appropriate ADSS fiber optic cable from the Facility to a point designated by the Distribution Provider 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 Facility, which terminal equipment 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 Distribution Provider's 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 Distribution Provider's Interconnection Handbook.

(x) Extend the 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 CAISO-approved compliant metering equipment at the Facility, in accordance with Section 10 of the CAISO Tariff.

(xii) Install a revenue metering cabinet and revenue metering equipment (typically, voltage and current transformers) at the Facility to meter the Facility retail load, as specified by the Distribution Provider. The metering cabinet must be placed at a location that would allow twenty-four hour access for the Distribution Provider's metering personnel.

(xiii) Install a revenue metering cabinet and revenue metering equipment (typically, voltage and current transformers) at the Facility to meter the Facility wholesale load, 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.

(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 the retail load at the Facility.

(xv) Allow the Distribution Provider to install, in the revenue metering cabinet provided by the Interconnection Customer, revenue meters and appurtenant equipment required to meter the wholesale load at the Facility.

(xvi) Install relay protection to be specified by the Distribution Provider to match the relay protection used by the Distribution Provider at [redacted] in order to protect the [redacted] as follows:

1. [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.

(xvii) Install all equipment necessary to comply with the power factor requirements of Article 9.6.1 of the GIA, including the ability to automatically regulate the power factor to a schedule (VAR schedule) in accordance with the Distribution Provider's Interconnection Handbook.

(xviii) 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 the interconnection facilities portion for a new [redacted] to terminate the [redacted] This work includes the following:
   a. [redacted]
   b. [redacted]
   c. [redacted]
2. Install the following relays to protect the [redacted]
   a. [redacted] connected via diversely routed dedicated digital communications channels to the Facility.

(ii) [redacted]
Install an appropriate number of [redacted] 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 I Interconnection Study assumed [redacted] and the generation side.

(iii) **Telecommunications.**

1. Install all required lightwave, channel banks, and associated equipment (including terminal equipment), supporting protection and Supervisory Control and Data Acquisition (SCADA) requirements at the Facility and [redacted] for the interconnection of the 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 diverse telecommunications 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, Permits, and Licensing.**

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 [redacted]

(v) **Metering.**

Install revenue meters and appurtenant equipment required to meter the retail load at the 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.

Install revenue meters and appurtenant equipment required to meter the wholesale load at the 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 Facility to monitor typical [redacted] elements such as MW, MVAR, terminal voltage and circuit breaker status for the 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 I Study.

(b) **Other Network Upgrades.**

(i) **Distribution Provider's Reliability Network Upgrades.**
None identified in the Phase I Interconnection Study.

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

1. **Area Delivery Network Upgrades.**
None identified in the Phase I Study.
2. **Local Delivery Network Upgrades.**
None identified in the Phase I Study.

3. **Distribution Upgrades.** The Distribution Provider shall

(a) [redacted]

(i) Install the interconnection facilities portion for a new [redacted] This work includes the following:

a. [redacted]
b. [redacted]

(b) **Power Systems Controls.**

(i) [redacted] to accommodate new relay, protection, status, and alarm.

(c) **Storage Control System**

(i) Power System Control

1. Create [redacted] program in Energy Management System (EMS) to support charging aspect of energy storage project.

(ii) Substation

1. Service and test [redacted]

(d) **Short Circuit Duty (SCD) Mitigation – DU.**
None identified in the Phase I Interconnection Study.

4. **Affected System Upgrades**
Not used.

5. **Point of Change of Ownership.**

(a) [redacted] The Point of Change of Ownership shall be the point where the conductors of the [redacted] are attached to the Last Structure, which will be connected on the side of the Last Structure facing [redacted] 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 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 ADSS fiber optic cable: The Point of Change of Ownership shall be the point where the ADSS fiber optic cable for the [redacted] is attached to the Last Structure.

(c) Telecommunication diverse fiber optic cable: The Point of Change of Ownership shall be the point at an Interconnection Customer installed and owned pole located at a position designated by the Distribution Provider outside the Distribution Provider's substation, or a Distribution Provider owned vault, where the Interconnection Customer's fiber optic cable is connected to the Distribution Provider's fiber optic cable.

6. **Point of Interconnection.** The Distribution Provider's [redacted]

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