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# **Appendix A – WDT773**

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## **Queue Cluster 4 Phase I Report**

**December 31, 2011**

This study has been completed in coordination with CAISO per CAISO Tariff Appendix Y Generator Interconnection Procedures (GIP) for Interconnection Requests in a Queue Cluster Window

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### Attachments:

1. Not Used
2. Not Used
3. Not Used
4. Short Circuit Calculation Study Results (see Appendix H of the Group Report)
5. Deliverability Assessment Results (see Appendix I of the Group Report)

## 1. Executive Summary

[REDACTED] has submitted a completed Interconnection Request (IR) to the Southern California Edison Company (SCE) for their proposed [REDACTED] (Project) under the terms of SCE's Wholesale Distribution Access Tariff (WDAT). The Project is full capacity comprised of photovoltaic modules with an output of 20 MW to the requested Point of Interconnection (POI) on SCE's Springville – Strathmore 66kV line. The Interconnection Customer's (IC) requested Commercial Operation Date of the Project is [REDACTED].

Pursuant to the Generator Interconnection Procedures (GIP) for Interconnection Requests in a Queue Cluster Window (CAISO Appendix Y), including Appendix 8 of the GIP (Transition of Existing SGIP Interconnection Requests to the GIP) under the terms of SCE's WDAT, the Project was grouped with the Queue Cluster 4 (QC4) Phase I study (Phase I) projects to determine the impacts of the group as well as impacts of the Project on the CAISO Controlled Grid and SCE's distribution system.

The Group Report has been prepared separately identifying the combined impacts of all Phase I projects on the CAISO Controlled Grid. This report focuses only on the impacts of the Project.

The report provides the following:

1. Transmission and Distribution system impacts caused by the Project;
2. System reinforcements necessary to mitigate the adverse impacts caused by the Project under various system conditions and;
3. A list of required facilities and a non-binding, good faith estimate of the Project's cost responsibility and time to construct these facilities.

The Phase I study was performed to determine problems for which mitigation plans may be proposed for the Project. Mitigation plans for the Project are detailed in Section 10 of this report.

The non-binding SCE cost estimates<sup>1,2</sup> to interconnect the Project are:

Interconnection Facilities <sup>3</sup>	\$ 4.081 M
Distribution Upgrades	\$18.192 M

<sup>1</sup> These upgrades are not reimbursable.

<sup>2</sup> Includes Income Tax Component of Contribution. The ITCC included in this cost estimate was computed using a 35% rate. Due to the enactment of H.R. 4853, the Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010, and upon formal acceptance by the CPUC of SCE's advice letter (filed on December 27, 2010), this rate may change for electric CIAC recorded or received after September 8, 2010 through December 31, 2011.

<sup>3</sup> The electrical facilities installed and maintained by SCE necessary to physically and electrically interconnect the Project to the SCE Distribution system from the point of change in ownership to the point of interconnection.

The cost estimate for Delivery Network Upgrades based on the CAISO methodology used as part of the QC4 Phase I studies is \$14,836,200 (20MW X \$741,810/MW)<sup>4</sup>. The cost estimate for Reliability Network Upgrades due to Full Capacity Deliverability Status is \$23,000.

The estimated costs above have been provided in 2011 constant dollars. Table 10.1 provides the estimated costs escalated to the estimated Operating Date year of the upgrade, which would be the basis for the ICs financial responsibilities.

The non-binding schedule to license, engineer, and construct the Interconnection Facilities, Distribution Upgrades, and Reliability Network Upgrades is approximately 80 months from the signing of the Generator Interconnection Agreement and from SCE specified milestones associated with applicant responsibilities. The schedule to license, engineer, and construct the Delivery Network Upgrades will be addressed in the Phase II study. Based on the Queue Cluster 3 (QC3) Phase I group report, the schedule to license, engineer, and construct the Delivery Network Upgrades that were the basis of the Delivery Network Upgrade cost estimate provided above is approximately 84 months upon authorization to proceed.

## 2. Project and Interconnection Information

Table 2-1 provides general information about the Project as shown in the customer's IR.

Table 2-1: [REDACTED] Project General Information

Project Location	[REDACTED] Porterville, California
SCE Planning Area	Northern
Number and Type of Generators	[REDACTED] inverter type generating units, using PV technology (each rated for 500 kW)
Interconnection Voltage	66 kV
Maximum Generator Output	20 MW
Generator Auxiliary Load	.01 MW
Maximum Net Output to Grid	20 MW
Power Factor Range	.99 Lagging to .99 Leading
Step-up Transformer	[REDACTED] transformer rated for 66kV/34.5kV (Delta/Delta) 12/16/20MVA with 7.0% impedance on a 12MVA base. [REDACTED] transformer rated for 34.5kV/0.200kV/0.200 (Delta/Wye-gnd/ Wye-gnd) 1MVA with 5.75% impedance on a 1MVA base.
Point of Interconnection	Springville – Strathmore 66kV
Commercial Operation Date	[REDACTED] (customer requested date) <sup>5</sup>

<sup>4</sup> The CAISO developed the dollar/MW value based on nominal dollars.

<sup>5</sup> The actual OD will be a function of the time to construct the required Transmission Network Upgrades, Distribution Upgrades, Interconnection Facilities, any other required facilities to interconnect the Project, and the GIA execution period.

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CEII REGULATIONS**

### 3. Study Assumptions

For detailed assumptions, please refer to the Group Report. The following assumptions are only specific to the Project.

#### A. The following SCE Distribution System Planning Criteria and Conditions were included in the Phase I study:

- The thermal rating of any conductor, connector, or apparatus should not exceed 100% of its normal rated capacity with all facilities in service (base case).
- The thermal rating of any conductor, connector, or apparatus should not exceed 100% of its emergency rating under N-1 conditions.
- Operational flexibility and reliability of the distribution system shall be maintained at all times.
- Circuit voltage profiles should be maintained to comply within CPUC's Rule 2 requirements.
- The power factor for the new generation facility was assumed to be within WDAT requirements of 0.95 lagging or leading.
- Expected loading on the distribution system as projected by the SCE 2011 - 2020 distribution system plan was used.
- Distributed Generation resources connected to the distribution system are analyzed offline and online during peak load conditions as well as during minimum daytime load conditions as to determine worst case scenario.
- The Short circuit contribution from the inverter systems was determined using inverter manufacturer datasheets.
- The Phase I study assumes the upgrades triggered by previously queued projects, including Rule 21 projects under CPUC jurisdiction as in-service, are included in the base case for the Phase I projects.

#### B. The following Facilities will be installed by SCE and are included in this Phase I Study:

- The required Retail Meters to meter the generating facility retail load.  
**NOTE:** SCE installation does not include metering voltage and current transformers. The SCE meters will be connected to the generator – owned voltage and current transformers to be installed for their CAISO metering.
- The required Remote Terminal Unit (RTU) to be installed at the generating facility which will be installed by SCE.

#### C. The following facilities are to be installed by the Interconnection Customer and are not included in this Phase I Study:

- The 66 kV generation tie line with fiber optic cable from the generating facility to the last structure outside the new tapped substation.
- The diverse telecommunications line from the new substation to the generator site.
- The required CAISO metering equipment (voltage and current transformers and CAISO meters).  
**NOTE:** The metering voltage and current transformers installed for the CAISO metering will also be used for the SCE owned retail meters.
- Line protection relays to be installed at the generating facility end of the WDT773 66 kV generation tie line.

## **4. Deliverability Assessment**

The deliverability assessment for this project was performed utilizing the alternative methodology discussed and adopted by the CAISO and the stakeholders. The details of the deliverability assessment analysis are provided in the group report.

Based on the CAISO alternative methodology, the QC3 Delivery Network Upgrades and costs were carried forward to the QC4. The Delivery Network Upgrades for the SCE Northern Bulk System include the upgrades required for peak and off-peak deliverability. The per-MW costs are \$44,470/MW for peak Delivery Network Upgrades and \$697,340/MW for off-peak Delivery Network Upgrades. The Project is assigned both peak and off-peak delivery upgrade costs. The total Delivery Network Upgrade cost assigned to the Project is \$14,836,200.

## **5. Power Flow Analysis**

### **5.1 Transmission System – 220 kV and 500 kV**

The transmission system is not sufficient to accommodate all the generation in the area. This conclusion was reached in the QC3 study. With the addition of more generation projects in QC4, system loadings will only increase thereby requiring system upgrades to address the incremental system overloads. However, the use of the Alternative Methodology limits the total output from the generators in the area to what has been studied in the QC3 Phase I study. Therefore, the same conceptual network upgrades are proposed in this study as in the QC3 Phase I study. For reference, a summary of the network upgrades is provided below. The details of the analysis and overload levels are provided in the group study.

#### **5.1.1 QC3 Recommended Mitigations Used to Derive Dollar-per-MW Value**

- North and South of Magunden 230 kV T/L upgrades
- Kramer-Windhub 500 kV T/L
- Mesa 500 kV Upgrades
- PG&E Upgrades Allocated to Northern Bulk System Projects

See the Group Report for additional details.

### **5.2 Subtransmission System – 66 kV**

The Subtransmission system is sufficient to accommodate all the new QC4 generation projects in the area. The QC4 Phase I study has identified no Subtransmission level overloads contributed by the Project.

### 5.3 Distribution System – 34.5kV or Below

The Phase I distribution study indicated that the Project contributes to the following distribution facility overloads:

#### 5.3.1 Overloaded Distribution Facilities

- None

#### 5.3.2 Recommended Distribution Mitigations

- None

## 6. Short Circuit Analysis

Short circuit studies were performed to determine the fault duty impact of adding the Phase I projects to the transmission and distribution system and to ensure system coordination. The fault duties were calculated with and without the projects to identify any equipment overstress conditions. Each project in Phase I will be responsible for its share of the upgrade cost based on the rules set forth in CAISO Tariff Appendix Y.

### 6.1 Short Circuit 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 SCD parameters, then SCE utilized the manufacturer data of the inverter model specified by the IC in the application in the SCD study. Otherwise, SCE utilized the parameters provided by the IC. The IC should verify with the manufacturer the appropriate SCD contributions of the inverter prior to commencement of the Phase II study and should update the application to reflect the appropriate data. The data provided by the IC for this project did not match the technical data obtained from the inverter manufacturer.

The following input data was used in this study:

Short Circuit Data @ 20 MVA Base on 66kV:

- Positive Sequence subtransient reactance ( $X''1$ ) = 1.0 p.u.
- Negative Sequence subtransient reactance ( $X''2$ ) = 1.0 p.u.
- Zero Sequence subtransient reactance ( $X''0$ ) = 1.0 p.u.

Generation Step-up Transformer(s)

**Main Transformer Data (total of [REDACTED])**

One transformer, three-phase 66/34.5 kV (Delta/Delta) rated for 12/16/20MVA with the following impedance information:



- H-X Impedance Value: 7.0 % @ 12 MVA

**Individual Padmount Transformer Data (total of [REDACTED])**

Each transformer is three-phase 34.5/0.200 kV (Delta/Wye-gnd) rated for 1MVA with the following impedance information:

- H-X Impedance Value: 5.75 % @ 1MVA

**6.2 Results**

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

The responsibility to finance short-circuit duty related Distribution Upgrades and 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. In addition, the SCD impact of the associated proposed Distribution and Network Upgrades was allocated to each Generating Facility using the same percentage assigned for the triggered Distribution and Network Upgrade.

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

SCD Mitigation – Table of Network Breaker Upgrades

Project	Valley 500kV		Antelope 220kV		Colorado River 220kV		Kramer 220kV		Redondo 220kV		Vista 220kV	
	%	Cost (x1000)	%	Cost (x1000)	%	Cost (x1000)	%	Cost (x1000)	%	Cost (x1000)	%	Cost (x1000)
WDT773	0.02	\$0	0.12	\$1	0.01	\$0	0.1	\$5	0.18	\$13	0.08	\$3

SCD Mitigation – Table of Distribution Breaker Upgrades

Project	Garnet 115 kV		Inyokern 115 kV		Lancaster 12 kV		Piute 12 kV		Victorville 4 kV		Vista 66 kV	
	%	Cost (x1000)	%	Cost (x1000)	%	Cost (x1000)	%	Cost (x1000)	%	Cost (x1000)	%	Cost (x1000)
WDT773	0.02	\$0	0.04	\$0	0.08	\$1	0.06	\$0	0	\$0	0	\$0

### **6.3 Preliminary Protection Requirements**

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

The applicant is responsible for the protection of its own system and equipment and must meet the requirements in the SCE Interconnection Handbook provided as an attachment to the group report.

## **7. Reactive Power Deficiency Analysis**

### **7.1 Group Study Reactive Power Deficiency Results**

Following the alternative methodology, the reactive power deficiency conclusions were based on the analysis performed for the QC3 Phase I Projects.

The QC3 Phase I study demonstrated that the QC3 Phase I Projects collectively contribute to reactive power deficiencies in the transmission system under base case and contingency conditions, and voltage criteria violations under contingency conditions. The study concluded that construction of a combination of additional transmission facilities and reactive support devices will be required.

It is expected that the addition of the QC4 projects will further exacerbate the problematic system conditions identified in the QC3 Phase I study. These issues will be fully evaluated in a more detailed reactive power deficiency analysis to be performed as part of the Phase II study.

### **7.2 Individual Project Power Factor Requirements**

The project is required to provide 0.95 leading/lagging power factor regulation at the POI. Applicant must be design interconnection facility to accept an SCE's VAR Schedule in accordance with the VAR requirements of the SCE's electrical distribution system configuration. The VAR schedule may change in the future as a function of distribution system reconfigurations.

### **7.3 Distribution**

Limited reactive power deficiency analysis was performed. In the base case study, no serious voltage and VAR issues were identified based on system VAR requirements for power flow convergence. This project, therefore, did not cause any adverse voltage impacts on the SCE Subtransmission System with the proposed upgrades in place under base case conditions.

This Project did not contribute to any reactive power deficiencies in the Springville 66kV System for QC4.

## **8. Transient Stability and Post-Transient Evaluations**

Please see Section 9 and 10 of Group Report.

## **9. Environmental Evaluation/Permitting**

Please see Section 12 of Group Report.

## **10. Upgrades, Cost Estimates and Construction schedule estimates**

To determine the cost responsibility of each generation project in Phase I, the CAISO developed cost allocation factors based on the individual contribution of each project. The cost allocation for the Interconnection Facilities, Network Upgrades, and Distribution Upgrades for which the Project is solely responsible is as follows:

### **PTO'S INTERCONNECTION FACILITIES**

#### **1. Sub-Transmission:**

##### **WDT773 66 kV Generation Tie Line**

Install one steel pole, approximately 200 circuit feet of 954 SAC conductor, and one automated pole switch.

#### **2. Substation:**

##### **Tapped Substation**

Install a 66 kV a single circuit breaker tapped substation to terminate the new WDT773 66 kV generation tie line.

The interconnection facilities will be installed as follows:

- One dead-end structure
- Three voltage transformers
- Line protection relays

#### **3. Telecommunications**

Install circuit cross connections to support SCADA.

#### **4. Metering Services Organization**

Install revenue metering cabinet for the SCE revenue meters required to meter the retail load at the generating facility. The SCE meter will be installed in tandem with the ISO meter circuit.

The customer will provide the required metering equipment (voltage and current transformers and meter enclosure).

#### **5. Power System Control**

Install one RTU at the generating facility to monitor typical elements such as MW, MVAR, terminal voltage, and circuit breaker status at each generating unit and

the plant auxiliary load and to transmit this information to the SCE grid control center.

**6. Real Properties, Transmission Projects Licensing, Corporate Environmental Health & Safety Organization**

Obtain easements and / or acquire land, obtain licensing and permits and perform all required environmental activities for the installation of the following project elements if applicable:

- Segment of 66 kV generation tie line within the new substation property

It is assumed that all SCE facilities will be included within the Generator's Environmental Licensing and Permits. There may be a need to include additional Edison Facilities within the permitting process, once Edison starts the design.

**PLAN OF SERVICE RELIABILITY NETWORK UPGRADES**

There were no Plan of Service Reliability Network Upgrade costs allocated to the Project.

**RELIABILITY NETWORK UPGRADES**

**Transmission Network Circuit Breaker Upgrades (SCD)**

Upgrade transmission network circuit breakers (pro-rata share of upgrade based on project contribution to SCD at each location).

- Install [REDACTED] sets of 500 kV TRV capacitors at Valley Substation
- Install [REDACTED] sets of 220 kV TRV capacitors at Antelope Substation
- Install [REDACTED] sets of 220 kV TRV capacitors at Colorado River Substation
- Replace [REDACTED] 220 kV CB's at Kramer Substation
- Replace [REDACTED] 220 kV CB's at Redondo Substation
- Install [REDACTED] sets of 220 kV TRV capacitors at Vista Substation

See the Group Report for additional details

**DELIVERY NETWORK UPGRADES**

**QC3 Recommended Mitigations Used to Derive Dollar-per-MW Value:**

- North and South of Magunden 230 kV T/L upgrades
- Kramer-Windhub 500 kV T/L
- Mesa 500 kV Upgrades
- PG&E Upgrades Allocated to Northern Bulk System Projects

See the Group Report for additional details.

**DISTRIBUTION UPGRADES**

1. **Sub-Transmission:**  
**WDT773 Tap Line**

Install five steel poles, three automated pole switches, and approximately 500 circuit feet of 954 SAC conductor.

**2. Substation:**

**Tapped Substation**

Install a 66 kV a single circuit breaker tapped substation to terminate the new WDT773 66 kV generation tie line.

The distribution upgrade facilities are as follows:

- [REDACTED] steel dead end structure
- [REDACTED] 66 kV circuit breaker
- [REDACTED] sets of disconnect switches
- Relays
- MEER to house relays

**3. Power System Control**

Install one RTU at the new looped substation to monitor typical elements such as MW, MVAR, terminal voltage, and circuit breaker status at each generating unit and the plant auxiliary load and to transmit this information to the SCE grid control center.

**4. Telecommunications**

Construct approximately 1 mile of fiber optic cable into the new substation.

Also, install lightwave and channel equipment the new substation and adjacent/affected substations.

**5. Real Properties**

It is assumed that applicant will provide all rights of way, and easements satisfactory for installation of SCE facilities without cost to SCE, based on Edison's design.

**6. Corporate Environmental Health & Safety Organization**

Obtain easements and / or acquire land, obtain licensing and permits and perform all required environmental activities for the installation of the following project elements if applicable:

- New substation property
- Tap line
- Telecommunication requirements

It is assumed that all SCE facilities will be included within the Generator's Environmental Licensing and Permits. There may be a need to include additional Edison Facilities within the permitting process, once Edison starts the design.

**7. Distribution Circuit Breaker Upgrades (SCD):**

Upgrade distribution circuit breakers (pro-rata share of upgrade based on project contribution to SCD at each location).

- Replace [REDACTED] 15 kV CB's at Garnet Substation
- Replace [REDACTED] 15 kV CB's at Inyokern Substation

- Replace [REDACTED] 66 kV circuit breakers at Vista Substation
- Replace [REDACTED] 12 kV circuit breakers at Lancaster Substation
- Replace [REDACTED] 12 kV circuit breakers at Piute Substation
- Replace [REDACTED] 4 kV circuit breakers at Victorville Substation

See the Group Report for additional details

**Table 10.1: Upgrades, Estimated Costs, and Estimated Time to Construct Summary**

Each Upgrade category may contain multiple scope durations. The longest duration is shown under the Estimated Time to Construct.

Type of Upgrade	Upgrade (May include the following)	Description	Estimated Cost x 1,000 Constant Dollar (2011) (Note 4)	Estimated Cost x 1,000 Constant Dollar (OD Year) (Note 4)	Estimated Time to Construct
<b>PTO's Interconnection Facilities</b> (Note 1, 3, 5)	See Section 10 – PTO's Interconnection Facilities	Non-network facilities needed to enable interconnection	\$4,081	\$4,603	27 Months
<b>Plan of Service Reliability Network Upgrades</b> (Note 6)	See Section 10 – Plan of Service Reliability Network Upgrades	Direct Assigned Network Upgrades needed to enable interconnection.	\$0	\$0	n/a
<b>Reliability Network Upgrades</b> (Note 6)	See Section 11.2 – Reliability Network Upgrades in the Group Report	Allocated Network Upgrades needed to maintain system Reliability	\$0	\$0	n/a
<b>Reliability Network Upgrades</b> (Note 6)	See Section 11.2 - Reliability Network Upgrades for SCD in the Group Report	SCD Mitigation Allocated to maintain system Reliability	\$23	\$26	24 Months
<b>Delivery Network Upgrades</b> (Note 6)	See Section 11.3 - Delivery Network Upgrades in the Group Report	Network Upgrades needed to support Full Delivery, if requested		\$14,836.20	84 Months
<b>Distribution Upgrades</b> (Note 2, 5, 6)	See Section 10 – Distribution Upgrades	Non-CAISO SCE Distribution Facilities	\$18,196	\$22,729	80 Months
<b>Distribution Upgrades</b> (Note 2, 5, 6)	See Section 10 – Distribution Upgrade for SCD Mitigation	SCD Mitigation Allocated to maintain system Reliability	\$2	\$2	24 Months
<b>Total Cost</b>				<b>\$42,196.20</b>	<b>84 Months</b>

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

Note 2: These upgrades are not part of CAISO Controlled Grid, and are not reimbursable. Allocated costs may change if all projects responsible for these upgrades do not execute GIAs.

Note 3: The estimated time to construct (ETC) is for a typical project; schedules duration may change due to number of projects approved and release dates.

Note 4: SCE's Phase I cost estimating is done in 'constant' dollars 2011 and then escalated to the estimated O.D. year. For the QC4 Phase I study, the estimated O.D. is derived by assuming the duration of the work element will begin in January 2013, which is the CAISO tariff scheduled completion date of the QC4 Phase II study plus 90 days for the GIA signing period. For instance, if a work element is estimated to take a total of 24 months (permitting, design, procurement, and construction), then the estimated O.D. would be January 2015. If an IC's requested O.D. (in-service) is beyond the estimated O.D. of a work element, the IC's requested O.D. is used.

Note 5: Includes 35% ITCC.

Note 6: The estimated time to construct (ETC) is for a typical project; schedules duration may change due to number of projects approved and release dates. Stacked projects impact resources, system outage availability, and environmental windows of construction. Assumption is SCE will need to obtain CPUC licensing and regulatory approvals prior to design, procurement and construction of the proposed facilities required to serve the interconnection customer and prerequisite facilities are in service.

**Cost Estimate Summary (2011 Dollars)**

Scope: Interconnect 20 MW on the [redacted] line via new tapped substation

No.	ELEMENT	INTERCONNECTION FACILITIES (Subject to ITCC)	ITCC** (35%)	TOTAL	TOTAL CONSTANT \$ (ESTIMATED YEAR O.D.)***
					2015
<b>Sub - Transmission</b>					
1	Tap Line	\$	\$	\$	
2	Gen Fe	\$ 409,000	\$ 143,000	\$ 552,000	
<b>Substations</b>					
1	New tap substation - BF Parion	\$ 409,000	\$ 141,000	\$ 544,000	
2	New tap substation - Distribution Parion	\$	\$	\$	
<b>Telecom</b>					
1	Install RTU circuit cross connections supporting SCADA	\$ 12,000	\$ 4,000	\$ 16,000	
Install FID cable, signage, channel, & associated equipment supporting diverse Protection and SCADA					
2	Environmental Health and Safety	\$	\$	\$	
<b>CEH &amp; S - Primary Telecom. Provide control cables "passed through the fence" to WDT773 Substation - N/A</b>					
1	CEH & S - Secondary (Diverse) Telecom. No IF diverse telecom identified - N/A	\$	\$	\$	
2	CEH & S - Install a new tap line to support tapping the 66-kV line and the BCE portion of the 66-kV gen-to line.	\$	\$	\$	
3	CEH & S - Install a new segment of 66 kV gen-to line between the generator-owned structure and the WDT773 Substation.	\$	\$	\$	
4	CEH & S - Construct a new 66 kV tapped interconnection substation, referred to as the WDT773 Substation.	\$ 503,000	\$ 197,000	\$ 700,000	
5	CEH & S - Secondary (Diverse) Telecom. Install diverse taps (< 1 mil) from existing fiber optic cable #14022 to WDT773 Substation.	\$	\$	\$	
<b>Real Properties</b>					
1	RP - activities to support project telecom, gen to, loop in acquisition, access easement	\$ 1,514,000	\$ 530,000	\$ 2,044,000	
2	RP - activities to support project substation, diverse taps acquisition, access easement	\$	\$	\$	
<b>Transmission Project Licensing</b>					
1	ITL - activities to support project	\$	\$	\$	
<b>Metging</b>					
1	Retain Meter at the Generation Facility	\$ 29,000	\$ 10,000	\$ 39,000	
<b>Power System Control</b>					
1	RTU at the generation facility	\$ 93,000	\$ 33,000	\$ 126,000	
2	RTU at the new tap substation	\$	\$	\$	
3	RTU PIs. Names relabeling at Spangville S/S and Strathmore S/S	\$	\$	\$	
<b>Totals</b>		<b>\$ 3,023,000</b>	<b>\$ 1,056,000</b>	<b>\$ 4,081,000</b>	<b>\$ 4,603,000</b>

\* Pursuant to FERC Order 2003A, ITCC is not collected on Reliability Upgrades and One Time Costs.  
 \*\* ITCC cost may be satisfied with a letter of credit in accordance with the tax provisions of the LGMA.  
 \*\*\* The ITCC included in this cost estimate was developed using a 35% rate. Because of recent enactment of H.R. 4853, the Tax Relief, Unemployment Insurance Reauthorization and Job Creation Act of 2010, and upon formal acceptance by the CPUC of SCE's advice letter (dated December 27, 2010), this rate may change for certain GIAC requests of record after September 8, 2010 through December 31, 2011.  
 Cost estimate is only an estimate based on 2011 constant dollars and actual cost is subject to change depending on project construction rate, and inflation.  
 \*\*\*\* SCE's Phase I cost estimating is done in 'constant' dollars 2011 and then escalated to the estimated O.D. year. For the QC4 Phase I study, the estimated O.D. is derived by assuming the duration of the work element will begin in January 2013, which is the CAISO tariff scheduled completion date of the QC4 Phase II study plus 90 days for the GIA signing period. For instance, if a work element is estimated to take a total of 24 months (permitting, design, procurement, and construction), then the estimated O.D. would be January 2015. If an IC's requested O.D. is beyond the estimated O.D. of a work element, the IC's requested O.D. is used.

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## 11. Items Not Covered In This Study

### 11.1 Conceptual Method of Service

The results provided in this study are based on conceptual engineering and a preliminary plan of service and are not sufficient for permitting of facilities. The Plan of Service is subject to change as part of the Phase I Interconnection Study.

### **11.2 Customer's Technical Data**

Additional technical data related to the Project may be required as part of the Phase I Study. The study accuracy and results for the Phase I Study are contingent upon the accuracy of the technical data provided by the Interconnection Customer. Any changes from the data provided could void the study results.

### **11.3 Study Impacts on Neighboring Utilities**

This generation project interconnection may require additional studies, facility additions, and/or operating procedures to address impacts to neighboring utilities. For example, impacts may include but are not limited to WECC Path Ratings, short circuit duties outside of the CAISO Controlled Grid, and sub-synchronous resonance (SSR).

### **11.4 Relocations and Other Use of SCE Facilities**

The Interconnection Customer is responsible for all costs associated with necessary relocation of any SCE facilities as a result of this project and acquiring all property rights necessary for the Interconnection Customer's Interconnection Facilities, including those required to cross SCE facilities and property. The relocation of SCE facilities or use of SCE property rights shall only be permitted upon written agreement between SCE and the Interconnection Customer. Any proposed relocation of SCE facilities or use of SCE property rights may require a separate study and/or evaluation to determine whether such use may be accommodated, and any associated cost would be non-refundable.

### **11.5 SCE Interconnection Handbook**

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

### **11.6 Western Electricity Coordinating Council (WECC) Policies**

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

### **11.7 System Protection Coordination**

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

### **11.8 Standby Power and Temporary Construction Power**

The Phase I study does not address any requirements for standby power or temporary construction power that the Project may require prior to the in-service date of the interconnection facilities. Should the Project require standby power or temporary construction power from SCE prior to the in-service date of the interconnection facilities, the IC is responsible to make appropriate arrangements with SCE to receive and pay for such retail service.



### **11.9 Construction Schedule**

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

### **11.10 Network/Non-Network Classification of Telecommunication Facilities**

The cost for telecommunication facilities that were identified as part of the IC's Interconnection Facilities was based on an assumption that these facilities would be sited, licensed, and constructed by SCE as opposed to the IC doing this work (IC may own, operate, maintain, and construct diverse telecommunication paths associated with the IC's gen tie, excluding terminal equipment at both ends). In addition, the telecommunication requirements for SPS were assumed based on tripping of the generator breaker as opposed to tripping the circuit breakers at the SCE substation. Due to uncertainties related to telecommunication upgrades for the numerous projects in queue ahead of 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 Phase I may be reduced. Any changes in these assumptions may affect the cost and schedule for the identified telecommunication facilities.

**Attachment 1**

**(Not Used)**

**Attachment 2**

**(Not Used)**

**Attachment 3**

**(Not Used)**

## **Attachment 4**

### **Short Circuit Calculation Study Results**

Please refer to Appendix H of the Group Report.

## **Attachment 5**

### **Deliverability Assessment Results**

Please refer to the Appendix I of the Group report.