

***WDAT  
SYSTEM IMPACT STUDY***

***April 30, 2015***



**SOUTHERN CALIFORNIA  
EDISON**  
An EDISON INTERNATIONAL<sup>SM</sup> Company

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## EXECUTIVE SUMMARY

[REDACTED] applied to Southern California Edison ("SCE") for interconnection and wholesale distribution service for its proposed [REDACTED] pursuant to SCE's Wholesale Distribution Access Tariff ("WDAT"). SCE performed a System Impact Study as requested by [REDACTED] for a [REDACTED] interconnection from an [REDACTED]. The request is for a WDAT with a total capacity of [REDACTED]. The initial request is for service to commence by July 1, 2016<sup>1</sup>.

The purpose of this System Impact Study is to determine the effect(s) of the proposed generating facility on the SCE distribution system and to identify the Interconnection Facilities, Distribution Upgrades, additions or modifications, and/or other facilities required to provide the requested service. The study was performed in two parts: Part A examines impacts related to the SCE distribution, while Part B examines impacts and facilities related to the bulk power system. This is the Part A study report; a detailed report covering the Part B study results is included as Attachment B.

The Part A study was performed projected peak load and minimum load conditions for year 2015 through 2024. The study showed that, with the [REDACTED] on-line:

- For both peak load and light load conditions, the addition of the Project did not result in any violation of SCE's thermal loading criteria under both base case and N-1 conditions for the SCE distribution system under peak loading and light loading conditions. However, due to the dynamic distribution system configurations, SCE may deem it necessary to isolate this project during N-1 conditions until the distribution system returns to normal conditions.
- The Project did result in a voltage rise exceeding allowable Rule 2 limits. To mitigate this, approximately [REDACTED].
- The Project does not require changes to the protection system of the SCE electrical system.
- The Project did result in the [REDACTED] or more at one (1) distribution substation.
  - The circuit breaker interrupting capabilities were reviewed at this substation and it was determined that [REDACTED] to be upgraded.

<sup>1</sup> Date as requested in the application. The actual operating date depends on design and construction requirements.

## NON-BINDING ORDER OF MAGNITUDE COST ESTIMATE

Non-binding order of magnitude cost estimates<sup>1,2</sup> for the required interconnection facilities and system upgrades are as follows:

The following is the cost estimate for Interconnection Facilities which are required to interconnect the proposed project to the [REDACTED]

### Cost Estimate:

#### Distribution Upgrades

Electrical Facilities	\$ 400.0 k
• [REDACTED]	
Substation	\$ 84.7 k
• [REDACTED]	
Real Properties	\$ 0.8 k
Corporate Environmental Health and Safety Review	\$ 111.3 k

#### Interconnection Facilities

Electrical Facilities	\$ 167.5 k
• [REDACTED]	
• [REDACTED]	
• [REDACTED]	
• [REDACTED]	
• [REDACTED]	
• [REDACTED]	
Real Properties	\$ 10.0 k
Corporate Environmental Health and Safety Review	\$ 65.3 k
Telemetry Requirements	\$ 14.5 k <sup>3</sup>
ITCC (35%)	\$ 293.9 k

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<b>Total non-binding order of magnitude cost estimate</b>	<b>\$ 1,148.0 k</b>
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<sup>1</sup> The cost estimate does not include the costs required for civil work completed by the customer.

<sup>2</sup> The cost estimate is in 2015 constant dollars.

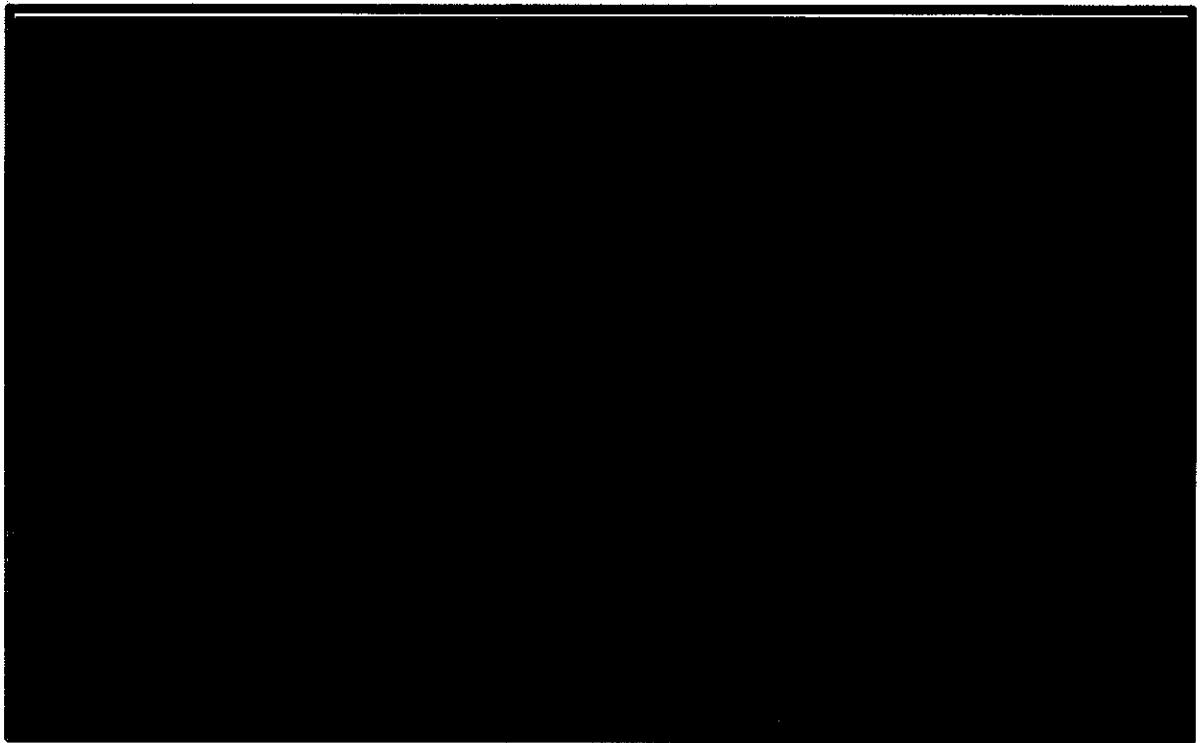
<sup>3</sup> The cost estimate is based on the [REDACTED] the cost and scope of telemetry may significantly increase to include a [REDACTED] as required by SCE's Interconnection Handbook with an approximate cost of \$155,000 in the event that the [REDACTED] is not feasible for this project.

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## I. INTRODUCTION TO PART A

[REDACTED] applied to Southern California Edison ("SCE") for interconnection and wholesale distribution service for its proposed [REDACTED] pursuant to SCE's Wholesale Distribution Access Tariff ("WDAT"). SCE performed a System Impact Study as requested by [REDACTED]. This project has originally been studied on the [REDACTED] but after a field visit of the proposed generating facility, it has been determined that the point of interconnection for this project is the [REDACTED]. The interconnection point is at an [REDACTED] which will be located approximately [REDACTED]. The request is for a WDAT with a total capacity of [REDACTED] synchronous generation. The initial request is for service to commence by July 1, 2016<sup>1</sup>.



The new proposed generation, consisting of [REDACTED] will receive interconnection service from SCE's existing [REDACTED] where their protective device will be installed. The generated power would be delivered to the California Independent System Operator ("CAISO") grid at the [REDACTED].

<sup>1</sup> Date as requested in the application. The actual operating date depends on design and construction requirements.

The purpose of this System Impact Study is to determine the effects of the proposed generating facility on the SCE distribution system and to identify the Interconnection Facilities, Distribution Upgrades, additions or modifications, and/or other facilities required to provide the requested service. This study was performed for expected year 2015 through 2024 peak load conditions as well as low demand conditions.

Part B, performed by SCE's Transmission & Interconnection Planning department, examines impacts and facilities related to the bulk power system and is included in Attachment B.

## **II. PART A: SYSTEM IMPACT STUDY CONDITIONS & METHODOLOGY**

### **Planning Criteria**

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

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

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

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

### **System Conditions**

The power factor for the new generation facility was assumed to be within WDAT requirements of [REDACTED]

Expected loading on the distribution system as projected by the SCE 2015 -2024 plan was used.

The generation system must be designed to accommodate a VAR schedule that may be provided by SCE. SCE will determine if the VAR schedule is necessary, based on future re-arrangements of SCE's distribution system.

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

## **III. PART A: SYSTEM IMPACT STUDY RESULTS**

### **Short Circuit Analysis**

Using the short circuit models from the synchronous generation system being utilized in this Biomass generation system it was calculated that the addition of the [REDACTED] did result in the increase of [REDACTED] or more require review of the substation circuit breakers.

The circuit breaker interrupting capabilities were reviewed at the substation and it was determined that [REDACTED] will be required to be upgraded as a result of the [REDACTED]

### **System Protection Considerations**

With this proposed method of service, changes to the protection system of the SCE electrical system will not be required.

### **Thermal Loading**

Under Base case conditions, no thermal overloads were triggered by the Project.

However, with the [REDACTED] Substation, during minimum load conditions, is expected to experience an aggregate total reverse power flow of approximately [REDACTED]. Of that, approximately [REDACTED] is expected to flow back into the [REDACTED]. Due to the reverse flow, a [REDACTED] will need to be installed at [REDACTED].

Under emergency (N-1) conditions, no thermal overloads were triggered by the [REDACTED]. However, due to the dynamic distribution system configurations, SCE may deem it necessary to isolate this project during N-1 conditions until the distribution system returns to normal conditions.

### **Distribution Voltage Control**

With the addition of the [REDACTED] under the generating facility conditions of maximum generation and unity power factor, the section of [REDACTED] near the project area is expected to experience a voltage rise of 2.4%, which is beyond the allowable CPUC Rule 2 requirements. To mitigate this, approximately [REDACTED]. Future distribution system configurations may require the generation facility to operate at [REDACTED] as required by the WDAT Tariff. In the event of an N-1 condition, the [REDACTED] will be switched off, if SCE deems it necessary, until the distribution system returns to normal.

### **Harmonic Impact**

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

## IV. PART A: GENERAL DESCRIPTION OF IDENTIFIED UPGRADES

### Distribution Upgrades

Distribution Upgrades will be required to interconnect the system. The distribution upgrades include [REDACTED]

[REDACTED] Real Properties, and Corporate Environmental Health and Safety review.

### Interconnection Facilities

#### Electrical Systems

Interconnection Facilities will be required to interconnect the system. The interconnection facilities include the [REDACTED]

[REDACTED] Real Properties, and Corporate Environmental Health and Safety review.

### Telemetry Requirements

Real-time telemetry will be required. To meet the telemetry requirements, SCE is planning to utilize [REDACTED]. The cost estimate to comply with the telemetry requirements using this method is \$14.5 k<sup>1,2</sup>.

### Customer Equipment

The interface protection will be provided by the applicant and will include a [REDACTED] which is to be installed in an [REDACTED]. The applicant's protection must be coordinated with SCE's protective device(s) to provide adequate protection for the distribution system. The relay settings are subject to SCE approval prior to setting and certified timed trip testing report results using primary injection will need to be provided to SCE to verify relay and circuit breaker performance prior to energizing the service.

[REDACTED] must meet SCE's published Electrical Service Requirements ("ESR") to the extent applicable. Drawings required by the ESR shall be submitted, reviewed, and approved by SCE prior to release for fabrication/purchase of the equipment. Each medium voltage service is an individually engineered application at SCE.

Applicant generation interconnection equipment must comply with SCE's Interconnection Handbook in regards to generation protection and lockable, visible open disconnecting means at the point of interconnection. Additionally, the applicant will be responsible for the installation and costs of certain underground facilities (i.e. ducts, structures, etc.) to the extent required by the final design. The construction of the underground facilities will be as per SCE's project drawings.

<sup>1</sup> The cost estimate does not include 35% ITCC.

<sup>2</sup> The cost estimate is based on the [REDACTED] the cost and scope of telemetry may significantly increase to include a [REDACTED] as required by SCE's Interconnection Handbook with an approximate cost of \$155,000 in the event that the [REDACTED] is not feasible for this project.



**System Study**

A Facilities Study may be performed to conclusively determine the detailed scope and cost of facilities required to interconnect the project.

**V. NON-BINDING ORDER OF MAGNITUDE COST ESTIMATE**

Non-binding order of magnitude cost estimates<sup>1,2</sup> for the required interconnection facilities and system upgrades are as follows:

The following is the cost estimate for Interconnection Facilities which are required to interconnect the proposed project to the [REDACTED]

**Cost Estimate:**

**Distribution Upgrades**

**Electrical Facilities** **\$ 400.0 k**

- [REDACTED]

**Substation** **\$ 84.7 k**

- [REDACTED]

**Real Properties** **\$ 0.8 k**

**Corporate Environmental Health and Safety Review** **\$ 111.3 k**

**Interconnection Facilities**

**Electrical Facilities** **\$ 167.5 k**

- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]

**Real Properties** **\$ 10.0 k**

**Corporate Environmental Health and Safety Review** **\$ 65.3 k**

<sup>1</sup> The cost estimate does not include the costs required for civil work completed by the customer.

<sup>2</sup> The cost estimate is in 2015 constant dollars.

Telemetry Requirements	\$ 14.5 k <sup>1</sup>
ITCC (35%)	\$ 293.9 k
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<b>Total non-binding order of magnitude cost estimate</b>	<b>\$ 1,148.0 k</b>

## VI. PART A: SUMMARY

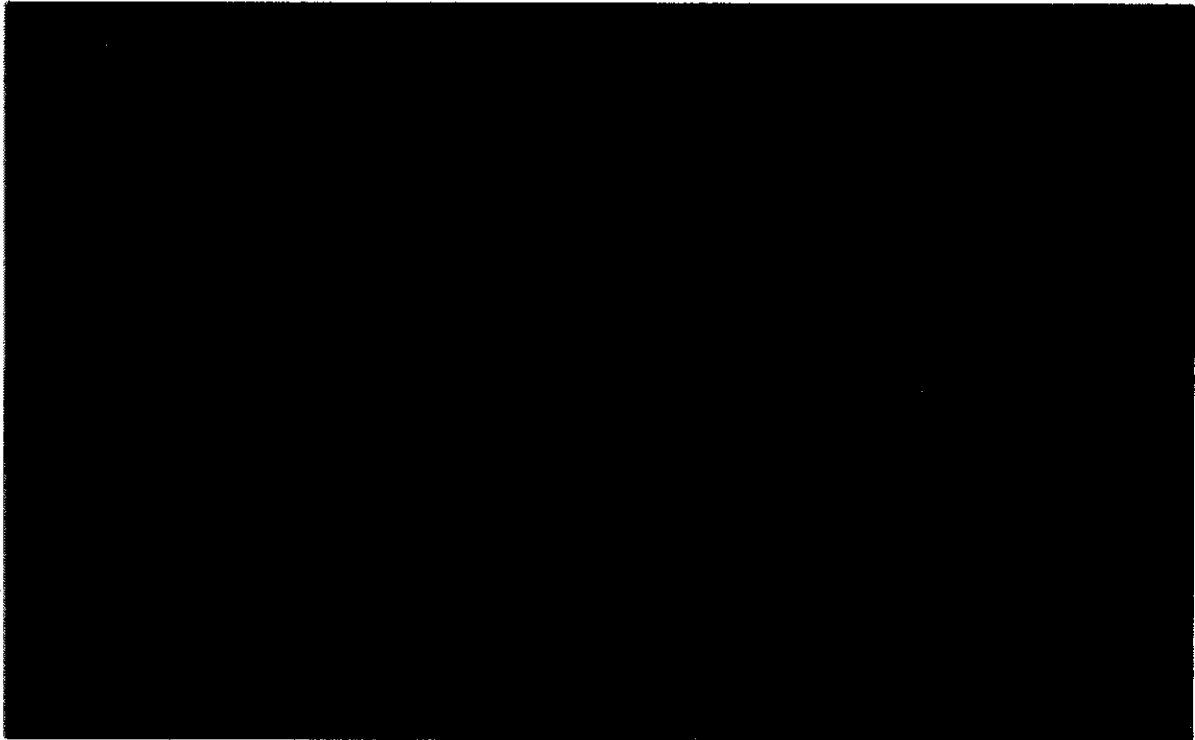
The Part A System Impact Study showed:

1. Distribution Upgrades will be required to interconnect the system. The Distribution Upgrades include [REDACTED] Real Properties, and Corporate Environmental Health and Safety review.
2. Interconnection Facilities will be required to interconnect the generating facility to the SCE system. The Interconnection Facilities include the installation of [REDACTED] Real Properties, and Corporate Environmental Health and Safety review.
3. Real time telemetry will be required for this project to provide Watt and VAR flow data from the generation facility to the SCE distribution system.
4. The time required to design and construct the Interconnection Facilities directly assigned to this project is approximately 18 months from execution of Generation Interconnection Agreement ("GIA") and the completion of the required milestones within it.
5. Upgrades identified are general and preliminary descriptions only. The costs indicated are non-binding order of magnitude only. The schedule is projected and preliminary.
6. Applicant is responsible for the installation of Underground Structures and conduits needed for the interconnection in accordance with SCE design.
7. A Facilities Study detailing required scope and cost of the identified upgrades may be completed prior to proceeding with the project.

<sup>1</sup> The cost estimate is based on the [REDACTED] the cost and scope of telemetry may significantly increase to include a [REDACTED] as required by SCE's Interconnection Handbook with an approximate cost of \$155,000 in the event that the [REDACTED] is not feasible for this project.

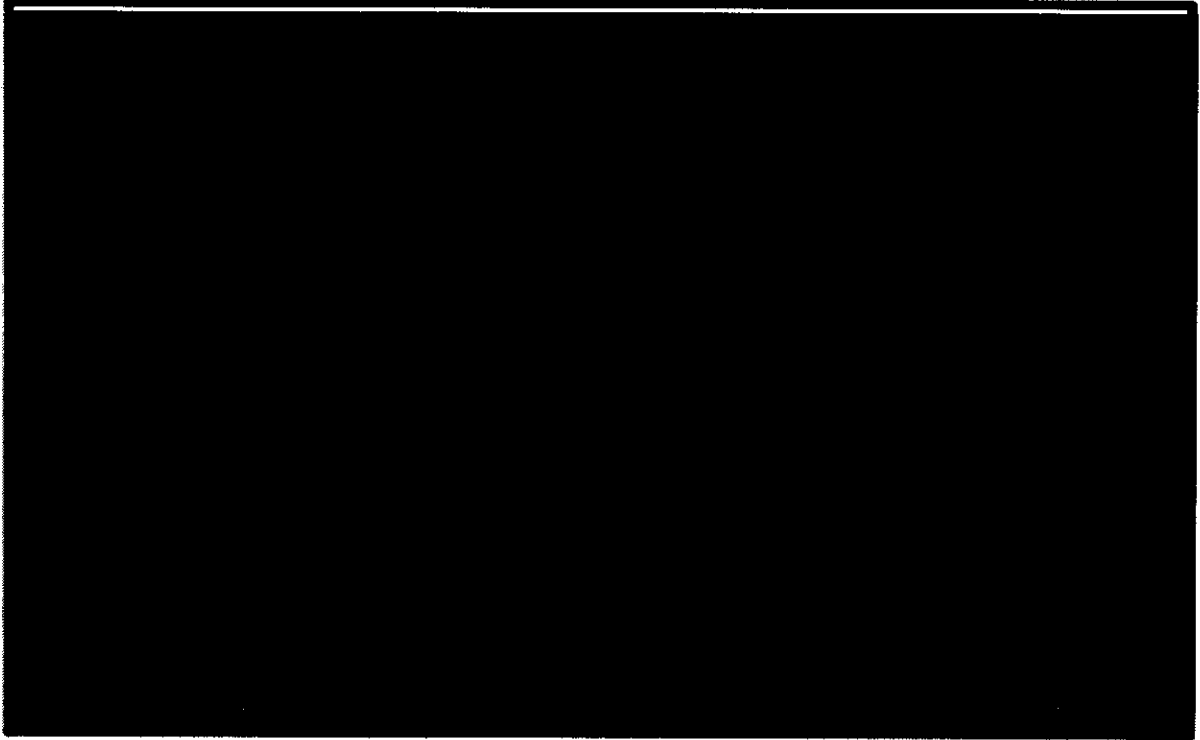
8. This System Impact Study is based on various technical data previously provided by the applicant. If any of that information changes significantly, as determined by SCE, the results of this study may no longer be appropriate and may necessitate a new study.
9. Current distribution standards are being updated to address generation interconnection systems. The proposed method of service on this report may change according on final design to comply with the updated distribution design standards.
10. For SCE facilities and scope of work not subject to CPUC's GO 131-D, SCE will follow the requirements of all applicable environmental laws and regulations and issue an in-house Environmental Clearance before commencement of construction activities. The cost estimates provided assume that SCE will provide oversight on facilities and scope of work on the customer's property and/or SCE will perform all required environmental activities for SCE facilities and scope of work, located outside of the customer's property, from the siting through the post-construction phases. However, it is recommended for SCE facilities and scope of work to be included in the Generator's Environmental Licensing and Permitting documents to streamline the environmental process and avoid unnecessary delays in construction. The responsibilities for performing certain environmental activities may be negotiated during or after the Interconnection Agreement process.
11. This study does not consider potential milestone setbacks that could result from the local jurisdiction requiring underground construction of distribution facilities. SCE encourages the Interconnection Customer to consult with the local jurisdiction to identify existing underground ordinance to reduce the risk of complication associated with said ordinance.
12. This study assumes that the Interconnection Customer's generating facility will include all equipment, software, and appropriate controls necessary to maintain the generator output profile per SCE requirements. The Interconnection Customer will be responsible for maintaining designated voltage levels under all conditions, including but not limited to the conditions identified above. Upon execution of the GIA, SCE will provide the Interconnection Customer with the [REDACTED] [REDACTED] will be a function of the generation penetration on the distribution system, as well as SCE's distribution system configuration (additional parameters maybe considered, as need). Changes to the [REDACTED] may be required as determined by increased generation, changes in the distribution system topology, or other changes in the distribution system.
13. Applicable to projects requesting primary service: This study does not include analysis related to coordination of system protection equipment. A coordination study may be required during final engineering. The coordination study may identify additional interconnection requirements such as installing new protection equipment, reprogramming and/or relocating existing protection equipment. The additional scope of work may have an effect on the Interconnection Customer's requested in-service date.

# Attachment A – A1



System without proposed project

# Attachment A – A2



System with proposed method of service

# Attachment B – B1

## Transmission Assessment

### **[REDACTED] System Impact Study Subtransmission Results**

A power flow study was performed to evaluate impacts on the [REDACTED]. The study determined that this project will not have any adverse impacts on the [REDACTED]. The recent QC7 Phase 1 Study included [REDACTED] of existing and queued ahead generation, as well as an additional [REDACTED] of new generation requesting interconnection into the [REDACTED]. Projects have since withdrawn and the amount of QC7 generation has decreased to [REDACTED]. As part of the QC7 Phase 1 Study, a QC7 project was identified to drive a need for a local upgrade. The proposed mitigation when implemented will be sufficient to accommodate the [REDACTED] project. Additional studies were performed to evaluate the possibility that the QC7 project will not materialize or that [REDACTED] desires an in-service date that is prior to the QC7 project. These additional studies did not find a need for mitigation or upgrades to allow for interconnection. In addition, based on the size and point of interconnection of this project, no Short Circuit Duty issues on the existing subtransmission system were identified.