SYSTEM IMPACT STUDY & FACILITIES STUDY

[redacted]

May 2, 2014

SOUTHERN CALIFORNIA
EDISON
An *EDISON INTERNATIONAL*™ Company

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SOUTHERN CALIFORNIA EDISON COMPANY

EXECUTIVE SUMMARY

[redacted] applied to Southern California Edison ("SCE") for Distribution Service under the terms of SCE's Wholesale Distribution Access Tariff ("WDAT"). SCE performed a combined System Impact Study and Facilities Study as requested by [redacted] a 34.5 kV interconnection and distribution service from the existing 34.5 kV WDAT point of service [redacted] The interconnection is located approximately 1.8 miles east of SCE's Blythe City 34.5 kV Substation ("Blythe City") on the [redacted] out of Blythe City. The request is for an increase in the existing WDAT load to 18.9MW of total capacity. The initial request is for service to commence by January 1, 2015.

The increase in load to 18.9MW would continue to receive interconnection service from SCE's existing [redacted] out of Blythe City Sub via the existing overhead line service. The power would be delivered by the California Independent System Operator ("CAISO") grid at the [redacted] of SCE's U.S.B.R. Blythe 161/34.5 kV Substation ("USBR Blythe") through SCE's [redacted] continuing through various paths of [redacted] to Blythe City, and to the Ehrenberg point of delivery via the [redacted]

The purpose of this System Impact Study and Facilities Study is to determine the effect of the proposed load increase on the SCE distribution system and the portion of SCE's electrical system that is part of the CAISO controlled grid, and to identify in general additional Interconnection Facilities, Distribution Upgrades, additions or modifications, or other facilities required to provide the requested service. The study was performed in two parts: Part A (performed by SCE's Distribution Field Engineering department) examines impacts related to that part of the SCE distribution system energized at less than 161kV, while Part B (performed by SCE's Transmission and Interconnection Planning department) examines impacts to facilities related to that portion of the SCE electrical system energized at 161 kV and above (the bulk power system), and impacts to facilities associated with the CAISO controlled portion of the SCE grid. This is the Part A study report; a report of the Part B study results is included as Attachment B.

The SCE Distribution System will be impacted by the request to increase the load at the existing interconnection. The impacts will be at the [redacted] as well as Blythe City substation; this request for load increase will also will require Distribution System Upgrades to the [redacted] The estimated installed cost for the required Distribution System Upgrades and Interconnection Facilities is approximately $5.971 M including ITCC.

Given that the required Distribution Upgrades for full WDAT service are likely not feasible to complete by January 1, 2015, discussions of a temporary operating agreement and letter agreement for commencing limited service in the interim should be considered.

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[1] In clarification to the language used in the system impact study and facilities study agreement, SCE does not have a substation by the name o[redacted] is used by SCE to refer to the current 34.5kV radial service delivery point to[redacted] consisting of a[redacted]

The Part A study was performed for year 2015 through 2023 projected peak load conditions.

The Part A System Impact Study and Facilities Study consisted of a power flow analysis, and a system voltage profile analysis. The analyses were performed to determine whether the energy associated with the [redacted] load WDAT can be transmitted from the ISO grid at the [redacted] of USBR Blythe Substation through SCE's distribution system without creating the need for modifications to SCE's distribution system and/or to the ISO grid. The study showed that in 2023, with the [redacted] project on-line:

- For projected peak loading conditions, the load increase at [redacted] resulted in two violations of SCE's thermal loading criteria under base case conditions for the SCE Distribution System:
  - 0.05mi. of [redacted] substation getaway conductor overloaded (Loaded to 36MVA, conductor rated to 35MVA).
  - 1.15mi. [redacted] from SCE's Olive Lake Sub ("Olive Lake") to [redacted] is overloaded (Loaded to 18.9MVA, conductor rated to 16MVA).

- For projected peak loading conditions, the load increase at [redacted] resulted in several additional violations of SCE's thermal loading criteria under N-1 conditions for the SCE distribution System:
  - Loss of [redacted]
    - 0.05mi. [redacted] at USBR Blythe substation getaway overloaded (Loaded to 49MVA, conductor rated to 47MVA).
  - Loss of [redacted]
    - 0.05mi. of [redacted] at USBR Blythe substation getaway overloaded (Loaded to 49MVA, conductor rated to 47MVA).

- For projected peak loading conditions, the load increase at [redacted] resulted in the 34.5kV voltage outside acceptable limits[1] at the following locations during normal conditions:
  - SCE's Olive Lake Sub
    - -5.6%
  - [redacted] service delivery point
    - -6.3%

[1] SCE's U.S.B.R. Blythe "33kV" System is operated at 34,500V and was studied with the [redacted]1 Range A application limits for this voltage class (+/-5%).

Non-binding order of magnitude cost estimates for the required interconnection facilities and system upgrades are as follows:

Interconnection Facilities	$ 164 K
Distribution System Upgrade "A"	$ 448 K
Distribution System Upgrade "B"	$ 234 K
Distribution System Upgrade "C"	$ 39 K
Distribution System Upgrade "D"	
Distribution Elements	$ 64 K
Substation Elements	$ 3.341 M
Distribution System Upgrades & Interconnection Facilities CES Environmental Study Costs	$ 180 K
ITCC	$ 1.501 M
Total non-binding order of magnitude cost estimate	$ 5.971 M

CONTENTS

I. INTRODUCTION TO PART A

[redacted] applied to Southern California Edison ("SCE") for Distribution Service under the terms of SCE's Wholesale Distribution Access Tariff ("WDAT"). SCE performed a combined System Impact Study and Facilities Study as requested by [redacted] for a 34.5 kV interconnection and distribution service from the existing 34.5 kV WDAT point of service [redacted] The interconnection is located approximately 1.8 miles east of SCE's Blythe City 34.5 kV Substation ("Blythe City") on the [redacted] out of Blythe City. The request is for an increase in the existing WDAT load to 18.9MW of total capacity. The initial request is for service to commence by January 1, 2015.

The increase in load to 18.9MW would continue to receive interconnection service from SCE's existing [redacted] on the [redacted] out of Blythe City Sub via the existing overhead line service. The power would be delivered by the California Independent System Operator ("CAISO") grid at the [redacted] of SCE's U.S.B.R. Blythe 161/34.5 kV Substation ("USBR Blythe") through SCE's [redacted] continuing through various paths of [redacted] to Blythe City, and to the [redacted] point of delivery via the [redacted]

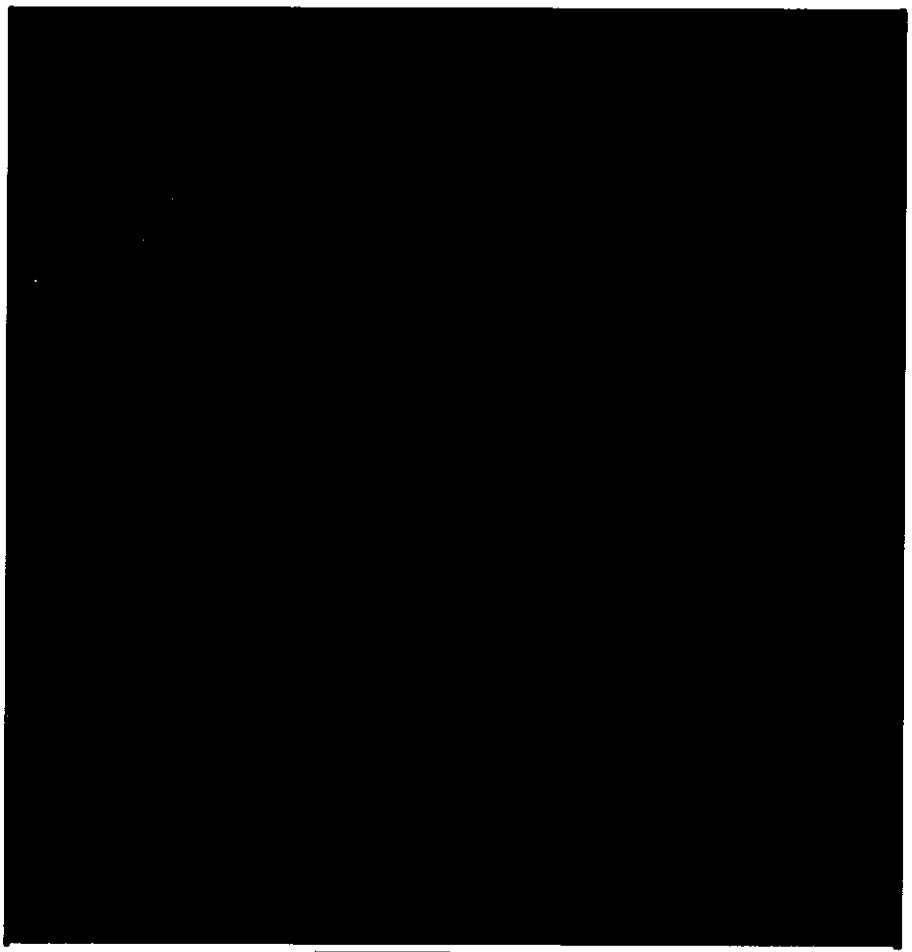

Figure 1 [redacted] Current Method of Service

The purpose of this System Impact Study is to determine the impact of the proposed load addition on the SCE distribution system and to identify additional Interconnection Facilities, Distribution Upgrades, additions or modifications, or other facilities required to provide the requested service. This study was performed for year 2015 through 2023 projected peak load conditions.

II. PART A: SYSTEM IMPACT STUDY CONDITIONS & METHODOLOGY

Planning Criteria

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 rated capacity under single loss of line ("N-1") conditions.

Circuit voltage profiles should be maintained to comply within CPUC's Rule 2 requirements and ANSI C84.1 Range A requirements.

System Conditions

The power factor for the load was assumed to be within WDAT requirements of 0.95 lagging or leading. Furthermore, the expectation is that power factor correction equipment is to be furnished by APS to maintain adequate power factor within these limits.

Projected peak loading on the distribution system as detailed in the SCE 2014 - 2023 Distribution Substation Plan/Transmission Substation Plan was used.

Distributed generators connected to the SCE system were assumed offline for the purposes of this study.

III. PART A: SYSTEM IMPACT STUDY RESULTS

System Protection Considerations

With the proposed method of service, a change to the protection of the [redacted] electrical system was identified. Currently SCE's [redacted] with [redacted] is [redacted] and this device protects the [redacted] system lines beyond the Point of Delivery. As [redacted] is adding additional protective requirements to this [redacted] the [redacted] load increase will require that [redacted] provide overcurrent protection beyond the Point of Delivery. This allows [redacted] greater flexibility to exercise greater control over the protection of the portions of their system served by [redacted] and relieves SCE of the burden of protecting even greater portions of [redacted] system.

Substation Thermal Loading

The substation transformer banks at U.S.B.R. Blythe 161/34.5kV Substation are not projected to be overloaded as a result of the load increase to 18.9MW by the [redacted] WDAT for the study period.

Distribution Thermal Loading

The incremental addition of load to a total of 16.9MW in 2016 by [redacted] causes a 5.6% overload of 1.15 miles of [redacted] on the [redacted]. The required upgrade to mitigate this overload is to reconductor the line to [redacted] as detailed as Interconnection Facilities and the portions of this work involving SCE's Distribution Facilities are listed as Distribution Upgrade "A."

[redacted] out of SCE's U.S.B.R. Blythe Substation are networked and serve as sources for SCE's Blythe City switching station. Blythe City switching station serves as the source for [redacted]
Beginning in 2016 and escalating through the study period, conductor overloads occur on the networked system during normal and N-1 conditions as a result of the additional [redacted] load. These upgrades are detailed as Distribution Upgrades "A," "B," and "C" and are categorized based on geographical location.

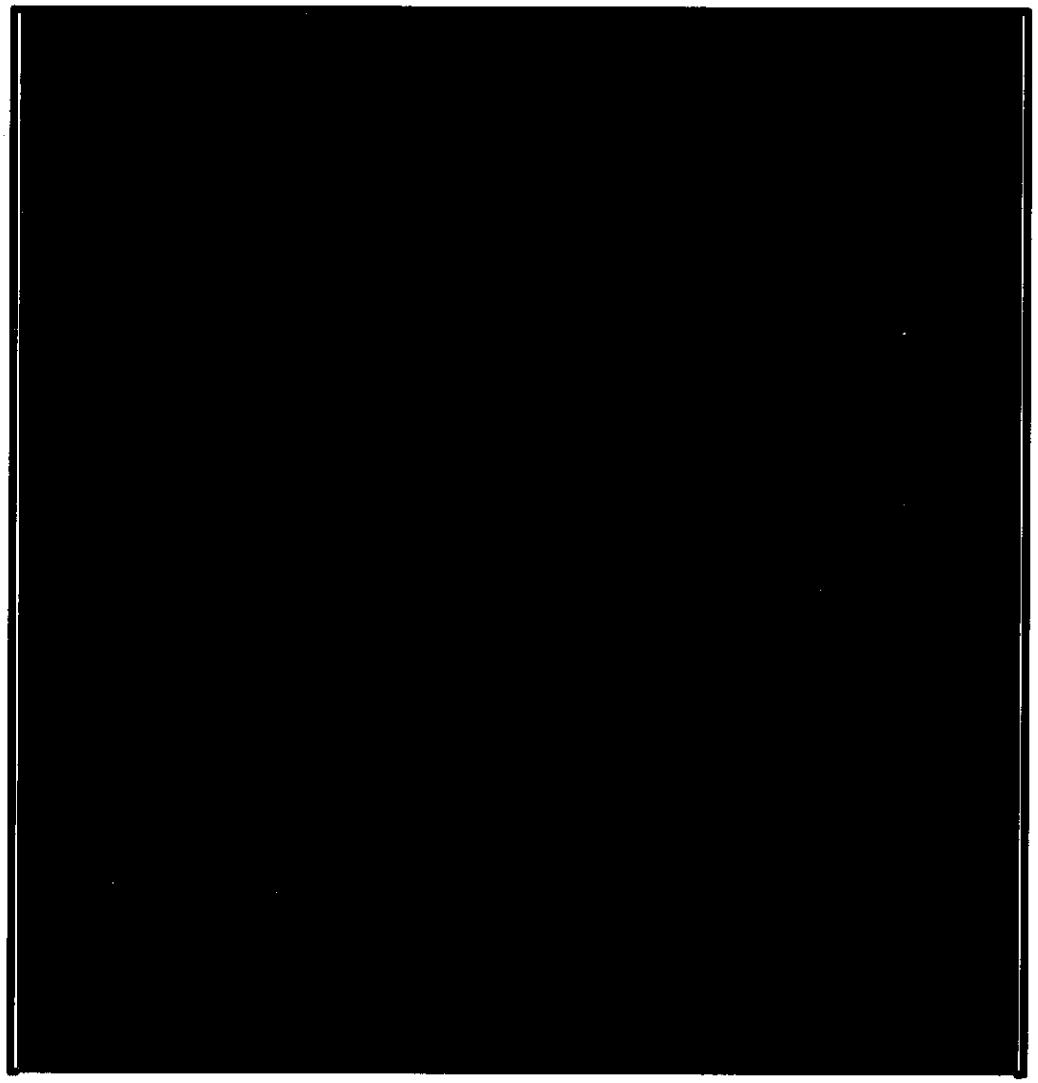

Figure 2 Distribution Thermal Overloads and Related Concerns (in red)

Distribution Voltage Control

The WDAT location is roughly 3.6 circuit miles from SCE's Blythe City switching station along th[redacted] This is approximately 8.6 circuit miles outside of SCE's U.S.B.R. Blythe Substation, which is the source station for[redacted] Addition of load at[redacted] causes voltage drop on the U.S.B.R. Blythe networked 34.5kV system as well as the[redacted] and affects delivered voltage to[redacted] and SCE's Olive Lake Substation, potentially adversely affecting current SCE customers served by SCE's Olive Lake Substation. Additional voltage mitigation is expected to be required in association with additional[redacted] loads.

The required upgrades necessary to address thermal overloads do not correct the voltage violations for al[redacted] loading levels up to and including 18.9MW. To maintain adequate voltage and reliability on the 34.5kV network, alternatives were explored. The required project identified was the installation of line voltage regulation at Blythe City for both the[redacted] Line voltage regulation was selected as the most feasible and cost effective alternative with the least scope; It is identified herein as Distribution Upgrade "D."

IV. PART A: GENERAL DESCRIPTION OF IDENTIFIED UPGRADES

Distribution System Upgrades

13.9MW in 2015:
In order to accommodate firm service of up to 13.9MW of [redacted] load, upgrades are required to address the normal case and N-1 case voltage drop to [redacted]

Reconductoring 1.15 miles of [redacted] is the required project in 2015 to correct the low voltage condition at [redacted] and likely can be completed prior to summer of 2015. This cost is detailed as Distribution Upgrade "A."

It should be noted that the current method of feeding the [redacted] via the [redacted] at Olive Lake can no longer be facilitated with the increase in [redacted] load to 13.9MW. The [redacted] will trip on overload at Olive Lake when attempting to perform this operation. [redacted] must be installed outside of Olive Lake so that the [redacted] can bypass Olive Lake Sub and serve as an alternate source to [redacted] This is the least scope distribution upgrade required to maintain today's N-1 reliability and maintenance flexibility for Ehrenberg and Olive Lake. This cost is detailed as Distribution Upgrade "B."

16.9MW in 2016:

In order to accommodate firm service of up to 16.9MW of [redacted] load, upgrades are required to address the N-1 case voltage drop of 6.3% to [redacted] Line voltage regulation must be installed (Upgrade "D") to maintain appropriate voltage support for [redacted]

16.9MW in 2017:

In order to accommodate firm service of up to 16.9MW of [redacted] load no further upgrades are required.

16.9MW in 2018:

In order to accommodate firm service of up to 16.9MW of [redacted] load no further upgrades are required.

17.3MW in 2019:

In order to accommodate firm service of up to 17.3MW of [redacted] load, upgrades will be required. 0.05mi of [redacted] is overloaded during an N-1 loss of the [redacted] and will need to be reconductored to [redacted] These costs are included in Distribution Upgrade "C."

17.7MW in 2020:

In order to accommodate firm service of up to 17.7MW o[redacted] load no further upgrades are required.

18.0MW in 2021:

In order to accommodate firm service of up to 18.0MW of [redacted] load, upgrades are required. 0.05mi of [redacted] is overloaded during the N-1 loss of the [redacted] line and will need to be reconductored to [redacted] These costs are included in Distribution Upgrade "C."

18.5MW in 2022:

In order to accommodate firm service of up to 18.5MW of [redacted] load no further upgrades are required.

18.9MW in 2023:

In order to accommodate firm service of up to 18.9MW of [redacted] load no further upgrades are required.

Interconnection Facilities

Interconnection facilities upgrades were identified as a result of the [redacted] load increase. Currently SCE's [redacted] with [redacted] is [redacted] and this device protects portions of the [redacted] system. This allows [redacted] greater flexibility to exercise greater control over the protection of the portions of their system served by [redacted] 1.15mi. of [redacted] will also be required to be upgraded to [redacted]

Customer Equipment

[redacted] is required to provide overcurrent protection beyond the [redacted] Point of Delivery. [redacted] shall coordinate all downstream protection with SCE's upstream protective devices at Blythe City and demonstrate this to SCE in a coordination study. Additional customer equipment may be required for coordination with this device.

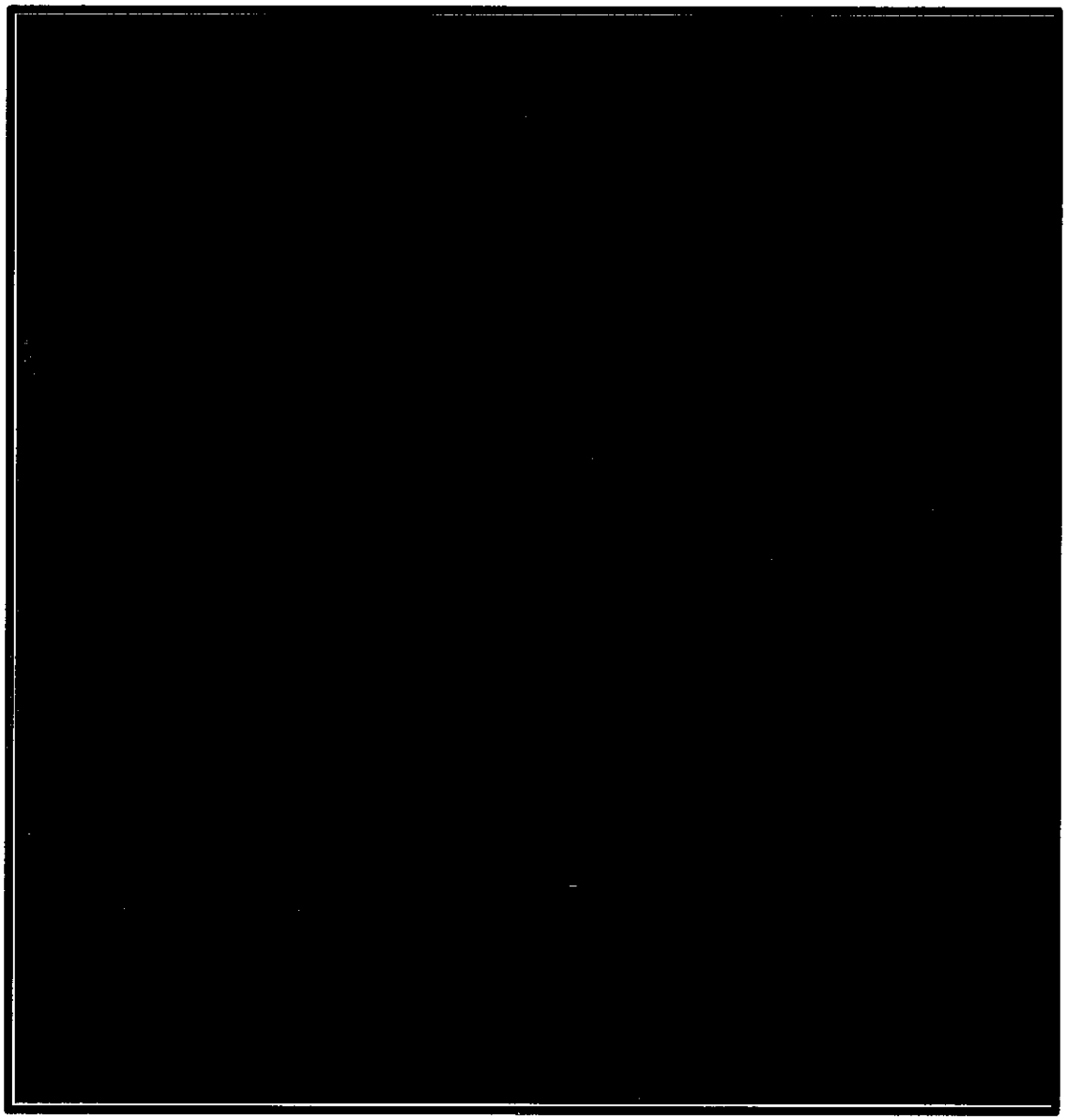

Figure 3 Distribution Upgrades Overview

V. PART A: DETAILED DESCRIPTION OF IDENTIFIED UPGRADES

Interconnection Facilities Upgrades

- [redacted]

Distribution System Upgrades

Distribution Upgrade "A"

- Replace approximately [redacted] and transfer SCE equipment to accommodate [redacted]

Distribution Upgrade "B"

- [redacted]

Distribution Upgrade "C"

- [redacted]
- [redacted]

Distribution Upgrade "D"

- Reconfigure distribution lines in Blythe City Sub to accommodate [redacted]
- [redacted]

VI. NON-BINDING ORDER OF MAGNITUDE COST ESTIMATE

Non-binding order of magnitude cost estimates for the required interconnection facilities and system upgrades are as follows:

Interconnection Facilities/Automation	$ 164 K
• [redacted]	
Distribution System Upgrade "A"	$ 448 K
• [redacted]	
Distribution System Upgrade "B"	$ 234 K
• [redacted]	
Distribution System Upgrade "C"	$ 39 K
• [redacted]	
• [redacted]	
Distribution System Upgrade "D"	
Distribution Elements	$ 64 K
• Reconfigure distribution lines in Blythe City Sub	
Substation Elements	$ 3.341 M
• [redacted]	
Distribution System Upgrades & Interconnection Facilities CES Environmental Study Costs	$ 180 K
ITCC	$1.501 M
Total non-binding order of magnitude cost estimate	$5.971 M

VII. PART A: SUMMARY

The Part A Independent System Impact Study and Facilities Study showed:

1. Distribution upgrades will be required to serve the increase in [redacted] load. The total cost of theses upgrades, excluding ITCC and CES costs, is $4.13 M.

2. Interconnection facilities upgrades are required to serve the increase in [redacted] load. It is required to upgrade 1.15mi of [redacted] The total cost of this upgrade, excluding ITCC and CES costs, is $164 K.

3. After the execution of an Interconnection Facilities Agreement, Interconnection facilities and Distribution Upgrades "A," "B," and "C" will require SCE a lead time of approximately 5 months for engineering and design, and an additional 5 months to procure the required equipment, schedule the appropriate manpower, and construct. Distribution Upgrade "D" will require SCE a lead time of approximately 27 months for engineering, design, procurement of the required equipment, scheduling the appropriate manpower, and construction. (See Figure 4)

4. Non-binding order of magnitude cost estimates for the required interconnection facilities and distribution system upgrades is $5.971 M including ITCC and CES costs.

5. The costs indicated in the above tables are preliminary estimates in 2014 dollars and are not firm. These cost estimates are based on conceptual engineering and system unit costs, and are subject to change based on final design and actual material costs. This Facilities Study and cost estimates as presented are valid for a period of 90 days.

6. This Combined System Impact Study and Facilities 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.

VIII. PART A: PROJECT SCHEDULE

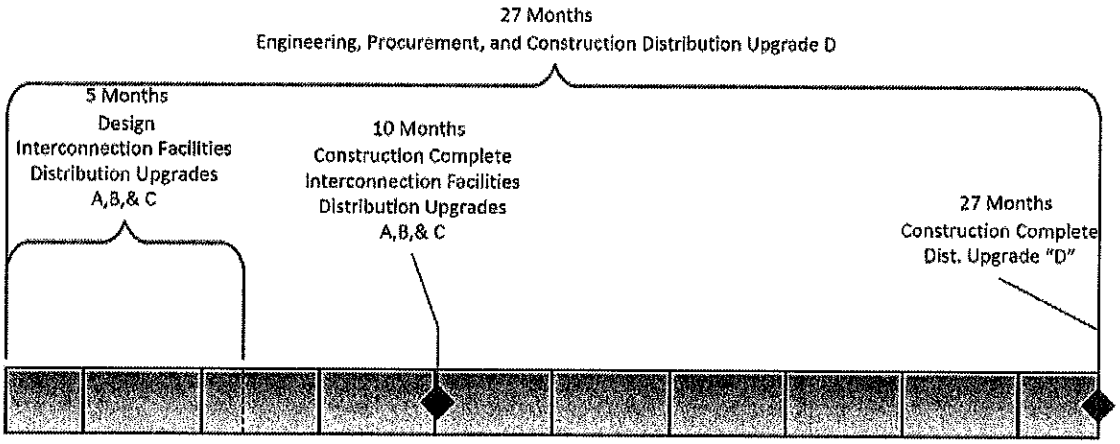

Figure 4 [redacted] Project Schedule

ATTACHMENT B – BULK POWER SYSTEM IMPACT STUDY REPORT

CAISO Controlled Bulk System

Power Flow Study:

The power flow study analysis focused on identifying system thermal overload problems within SCE bulk system. The power flow study results identified that the project in connection with SCE's Eagle Mountain 220 kV A Station didn't provide system impact to SCE's bulk power system.