

# ***SYSTEM IMPACT STUDY & FACILITIES STUDY***



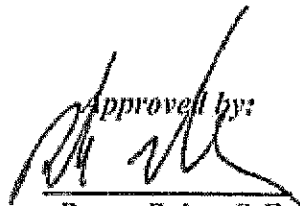
*February 9, 2015*



**EDISON**  
SOUTHERN CALIFORNIA EDISON COMPANY

*Prepared by:*

*Robert Beard  
SCE Distribution Field Engineering*

*Approved by:*  


*Roger Salas, P.E.  
Distribution Field Engineering Manager*

***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] interconnection and distribution service from the existing [REDACTED] WDAT point of service [REDACTED]<sup>1</sup>. The Point of Change of Ownership is located approximately [REDACTED]. The request is for an increase in the existing WDAT load to [REDACTED] of total capacity. The initial request is for service to commence by January 1, 2016.

The increase in load to [REDACTED] would continue to receive interconnection service from SCE's existing [REDACTED] via the existing overhead line service. The power would be delivered by the California Independent System Operator ("CAISO") grid at the [REDACTED] through SCE's [REDACTED] continuing through various paths of [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 [REDACTED] 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 [REDACTED] 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] distribution circuit level; 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 \$1.14 M, including ITCC.

The increase in load to [REDACTED] will require customer facility upgrades to accommodate system protection of the [REDACTED] system beyond the Point of Change of Ownership. Protection responsibility for the line beyond the Point of Change of Ownership will belong to [REDACTED] exclusively.

<sup>1</sup> In clarification to the language used in the system impact study and facilities study agreement, SCE does not have a substation by the name of [REDACTED] is used by SCE to refer to the current [REDACTED] consisting of a [REDACTED] and [REDACTED].

The Part A study was performed for year 2015 through 2018 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] [REDACTED] 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 with the [REDACTED] project on-line:

- For projected peak loading conditions, the load increase at [REDACTED] resulted in a planning criteria violation:
  - For N-1 (loss of one line) conditions, the [REDACTED] voltage was -6.4% of nominal and outside the acceptable range<sup>1</sup> at [REDACTED] Point of Change of Ownership in 2016.

---

<sup>1</sup> SCE's U.S.B.R. [REDACTED] and was studied with the ANSI C84.1 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	\$ 47 K
Distribution System Upgrades "A"	\$ 1.1 M
Distribution System Upgrades & Interconnection Facilities CES Environmental Study Costs	\$ 180 K
ITCC	\$ 288 K
<hr/>	
Total non-binding order of magnitude cost estimate	\$ 1.14 M

## CONTENTS

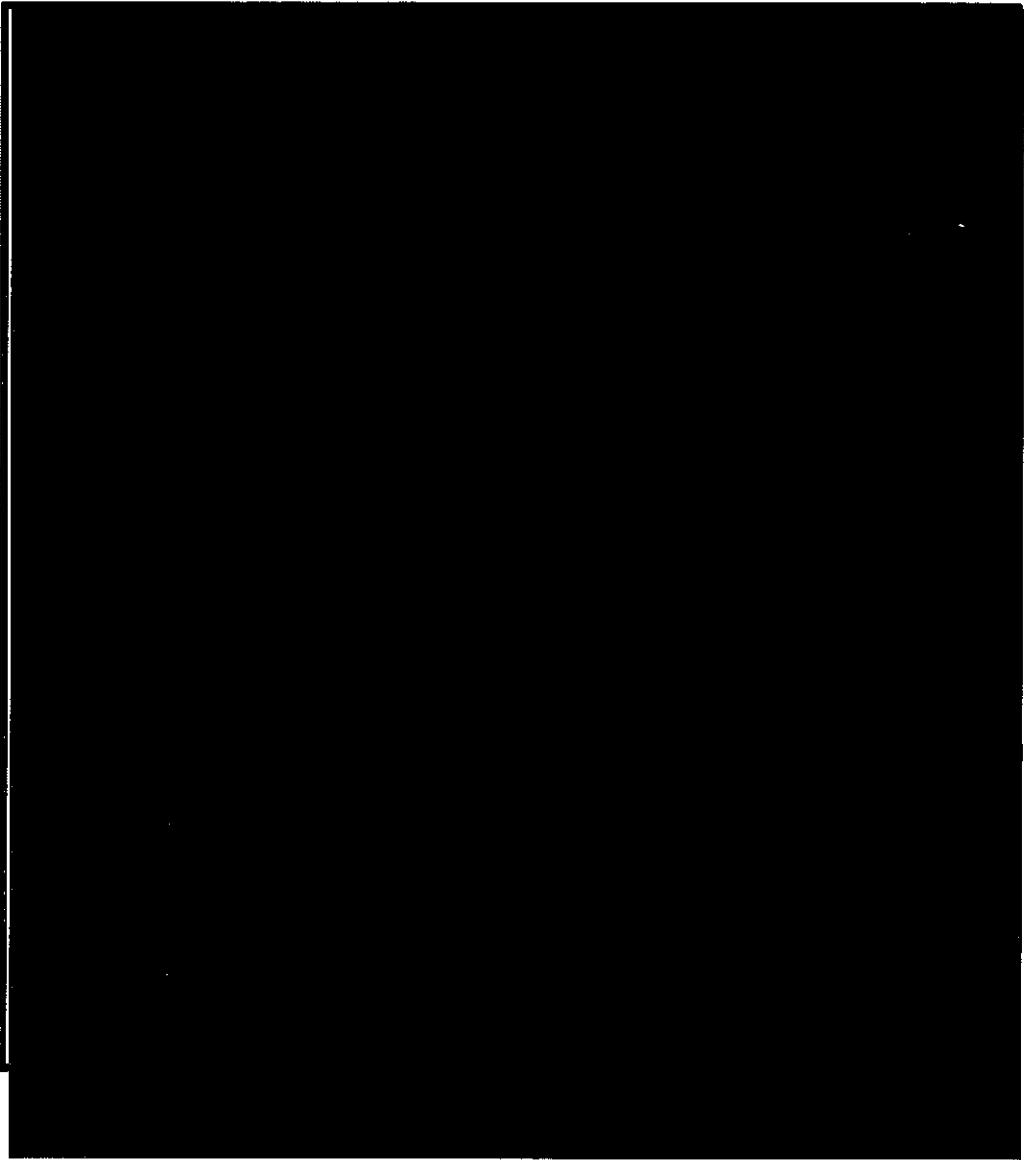
	<u>PAGE</u>
<b>I. INTRODUCTION TO PART A</b>	6
<b>II. PART A: SYTEM IMPACT STUDY CONDITIONS &amp; METHODOLOGY</b>	8
<b>III. PART A: SYSTEM IMPACT STUDY RESULTS</b>	9
<b>IV. PART A: GENERAL DESCRIPTION OF IDENTIFIED UPGRADES</b>	10
<b>V. PART A: DETAILED DESCRIPTION OF IDENTIFIED UPGRADES</b>	13
<b>VI. PART A: NON-BINDING ORDER OF MAGNITUDE COST ESTIMATE</b>	14
<b>VII. PART A: SUMMARY</b>	15
<b>VIII. PART A: PROJECT SCHEDULE</b>	16
APPENDIX – ATTACHMENT B	17
APPENDIX – N-1 STUDY WITHOUT IDENTIFIED UPGRADES	18
APPENDIX – N-1 STUDY WITH IDENTIFIED UPGRADES	19

## 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 [REDACTED] interconnection and distribution service from the existing [REDACTED] WDAT point of service [REDACTED]. The Point of Change of Ownership is located approximately 4.7 circuit miles east of SCE's [REDACTED]. [REDACTED] The request is for an increase in the existing WDAT load to [REDACTED] of total capacity. The initial request is for service to commence by January 1, 2016.

The increase in load to [REDACTED] would continue to receive interconnection service from SCE's existing [REDACTED] 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 [REDACTED] continuing through various paths of [REDACTED].

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 2018 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 Distribution Customer is required to maintain its power factor within a range of [REDACTED] to [REDACTED] pursuant to Good Utility Practice. Furthermore, the expectation is that power factor correction equipment is to be furnished by [REDACTED] to maintain adequate power factor within these limits.

Projected peak loading on the SCE's 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

SCE's interface [REDACTED]  
Currently, [REDACTED] protects SCE from faults downstream of the Point of Change of Ownership including those that occur within [REDACTED] maintained electrical system. Since [REDACTED] currently has not installed any protective device at the location they receive distribution service, [REDACTED] inadvertently provides protection to portions of [REDACTED] system and by default protects the [REDACTED] system lines beyond the Point of Delivery.

The increase of [REDACTED] load triggers additional protective requirements for [REDACTED]. Therefore, an upgrade to the protection of the [REDACTED] electrical system was identified as a requirement. The [REDACTED] load increase will require that [REDACTED] provide overcurrent protection beyond the Point of Delivery. [REDACTED] owned and operated overcurrent protection at the Point of Change of Ownership allows [REDACTED] greater flexibility to exercise greater control over the protection of the portions of their system served by [REDACTED] and relieves [REDACTED] of the burden of protecting portions of [REDACTED] system that SCE does not maintain nor is intended to protect.

Once [REDACTED] has furnished such equipment to adequately protect the [REDACTED] system, SCE will remove [REDACTED] pursuant to the terms of the existing Interconnection Facilities Agreement.

#### Substation Thermal Loading

As studied, no substation upgrades will be triggered by the load increase to [REDACTED] by 2018 by [REDACTED] for the study period.

#### Distribution Thermal Loading

The incremental addition of load to a total of [REDACTED] by 2018 by [REDACTED] did not cause any conductor thermal capacity overloads on the SCE system.

#### Distribution Voltage Control

The WDAT Point of Change of Ownership is roughly [REDACTED]. This is approximately [REDACTED] which is the source station for [REDACTED]. Addition of load at [REDACTED] causes voltage drop on the [REDACTED] as well as the [REDACTED] and affects delivered voltage to [REDACTED]. Additional voltage mitigation is expected to be required in association with additional [REDACTED] loads.

Upgrades are necessary to correct the voltage violations for all [REDACTED] loading levels up to and including [REDACTED] in 2018. To maintain adequate voltage and reliability on the [REDACTED] network, alternatives were explored. The required project identified was to upgrade conductor on the [REDACTED]. Reconductor was selected as the most feasible and cost effective alternative with the least scope and it is identified herein as Interconnection Facilities and Distribution Upgrades.

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

##### Distribution System Upgrades

██████████ *in 2015:*

In order to accommodate firm service of up to ██████████ load no upgrades were identified as studied.

██████████ *in 2016:*

In order to accommodate firm service of up to ██████████ load, upgrades are required to address the N-1 study criteria violation resulting in a voltage drop of 6.4% to ██████████

Reconductoring approximately ██████████ has been identified as the required project in 2016 to correct the low voltage condition at ██████████. If started at the appropriate time, this project likely can be completed prior to summer of 2016. This cost is detailed as Distribution Upgrade "A."

██████████ *in 2017:*

With required upgrades identified complete in 2016, no additional service upgrades, facility additions or modifications were identified in order to continue firm service of up to ██████████ of ██████████ in 2017.

██████████ *in 2018:*

With required upgrades identified complete in 2016, no additional service upgrades, facility additions or modifications were identified in order to continue firm service of up to ██████████ of ██████████ in 2017.

### Interconnection Facilities

Interconnection facilities upgrades were identified as a result of the [REDACTED] load increase. [REDACTED] will be required to be upgraded to [REDACTED].

Please note, customer owned interconnection facilities will also be required.

### Customer Equipment

[REDACTED] is required to provide their own overcurrent protection beyond the [REDACTED] Point of Delivery.

Currently SCE's interface with [REDACTED] device has become the de facto protection for portions of the [REDACTED] system. SCE has no written agreement to provide a protection service to [REDACTED] nor is it congruent with to SCE's Electrical Service Requirements. Due to increases in load, and changes to the [REDACTED] it is determined that [REDACTED] shall provide the protection for the line they maintain within their service territory. It is recommended that [REDACTED] protection device be within one span of the Point of Change of Ownership. This change allows [REDACTED] greater flexibility and control of the system protection beyond the Point of Change of Ownership.

[REDACTED] shall coordinate all downstream protection with SCE's upstream protective devices up to [REDACTED] and demonstrate this to SCE in a coordination study. Additional customer equipment may be required for coordination with this device.

Once [REDACTED] has furnished such equipment to adequately protect the [REDACTED] system, SCE will remove [REDACTED] pursuant to the terms of the existing Interconnection Facilities Agreement.

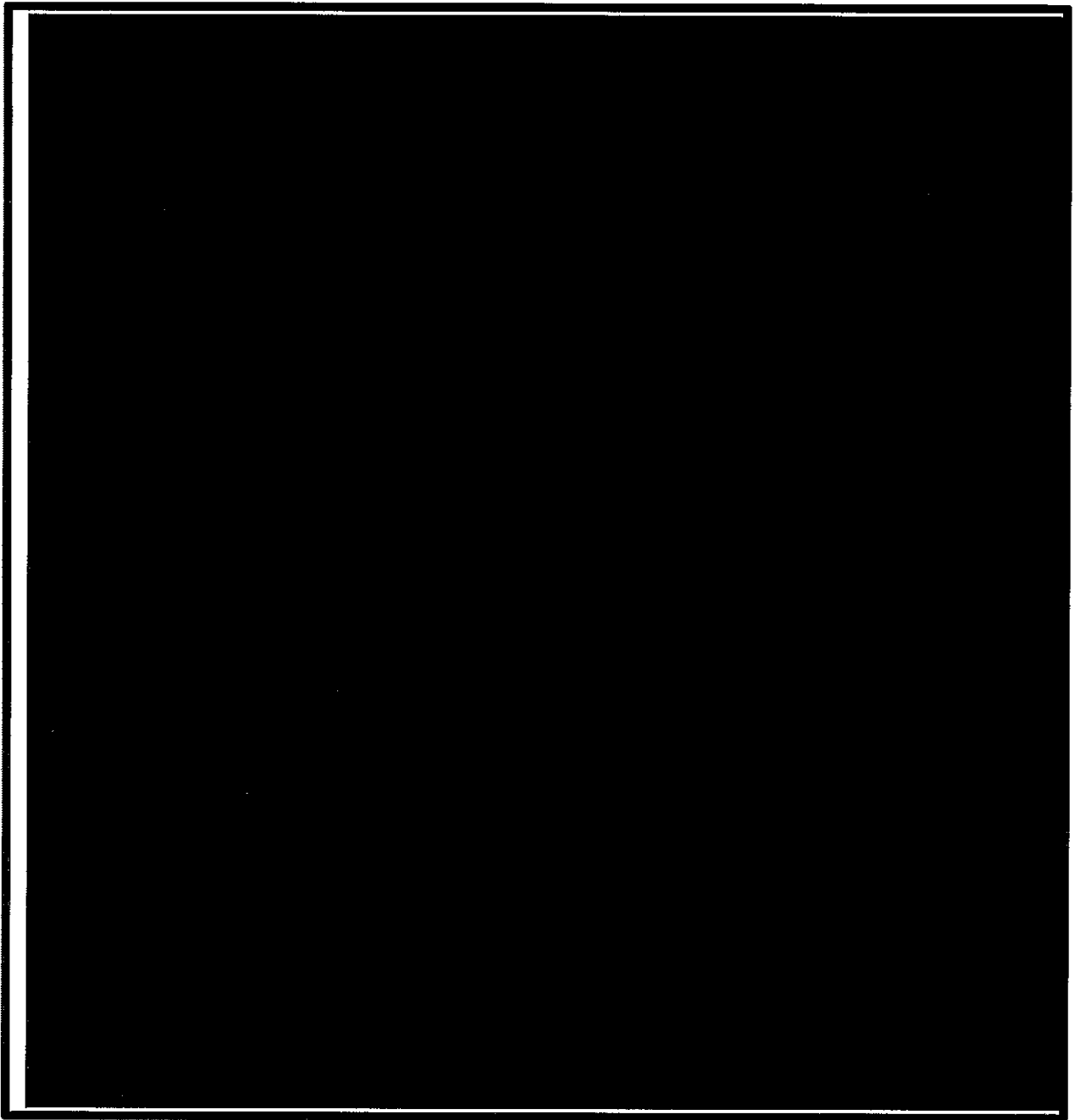


Figure 2 Distribution Upgrades and Interconnection Facilities Overview

**V. PART A: DETAILED DESCRIPTION OF IDENTIFIED UPGRADES**

**Interconnection Facilities Upgrades**

- [REDACTED]

**Distribution System Upgrades**

- [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	\$ 47 K
• [REDACTED]	
Distribution System Upgrade "A"	\$ 1.1 M
• [REDACTED]	
Distribution System Upgrades & Interconnection Facilities CES Environmental Study Costs	\$ 180 K
ITCC	\$ 288 K
<hr/>	
Total non-binding order of magnitude cost estimate	\$ 1.14 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 these upgrades, excluding ITCC and CES costs, is \$1.14 M.
2. Interconnection facilities upgrades are required to serve the increase in [REDACTED] load. It is required to upgrade [REDACTED]. The total cost of this upgrade, excluding ITCC and CES costs, is \$47 K.
3. Customer equipment upgrades are required. The costs indicated above do not include the cost of customer protection equipment required immediately beyond the Point of Change of Ownership pursuant to the study. SCE's [REDACTED] will be removed under the terms of its respective interconnection facilities agreement.
4. After the execution of an Interconnection Facilities Agreement, Interconnection facilities and Distribution Upgrades 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. (See Figure 4)
5. Non-binding order of magnitude cost estimates for the required interconnection facilities and distribution system upgrades is \$1.14 M including ITCC and CES costs.
6. The costs indicated in the above tables are preliminary estimates in 2015 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.
7. 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

Non-Binding Project Schedule [REDACTED] Executed Agreement

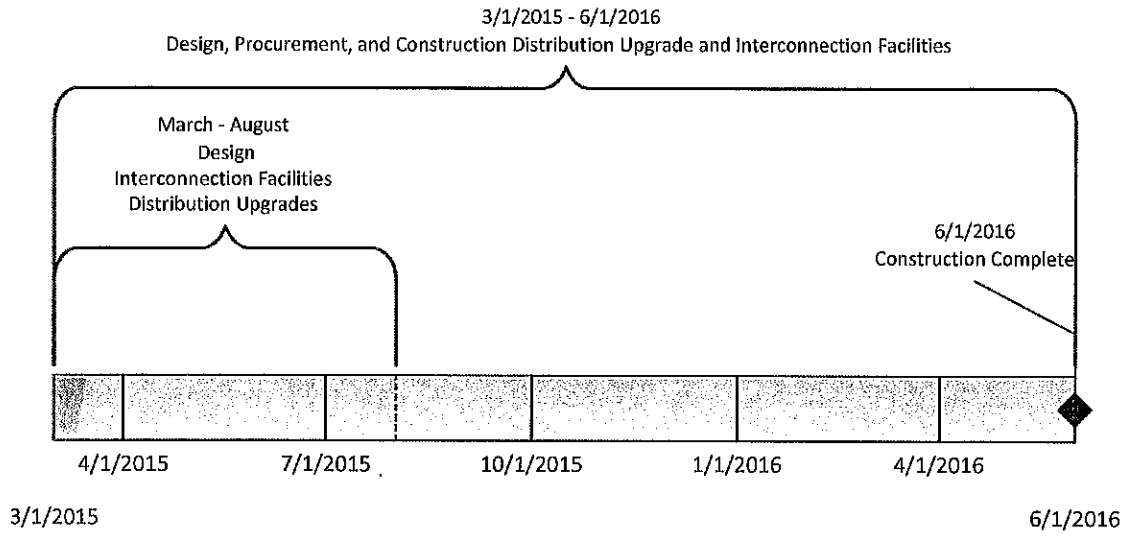


Figure 3 [REDACTED] Project Schedule



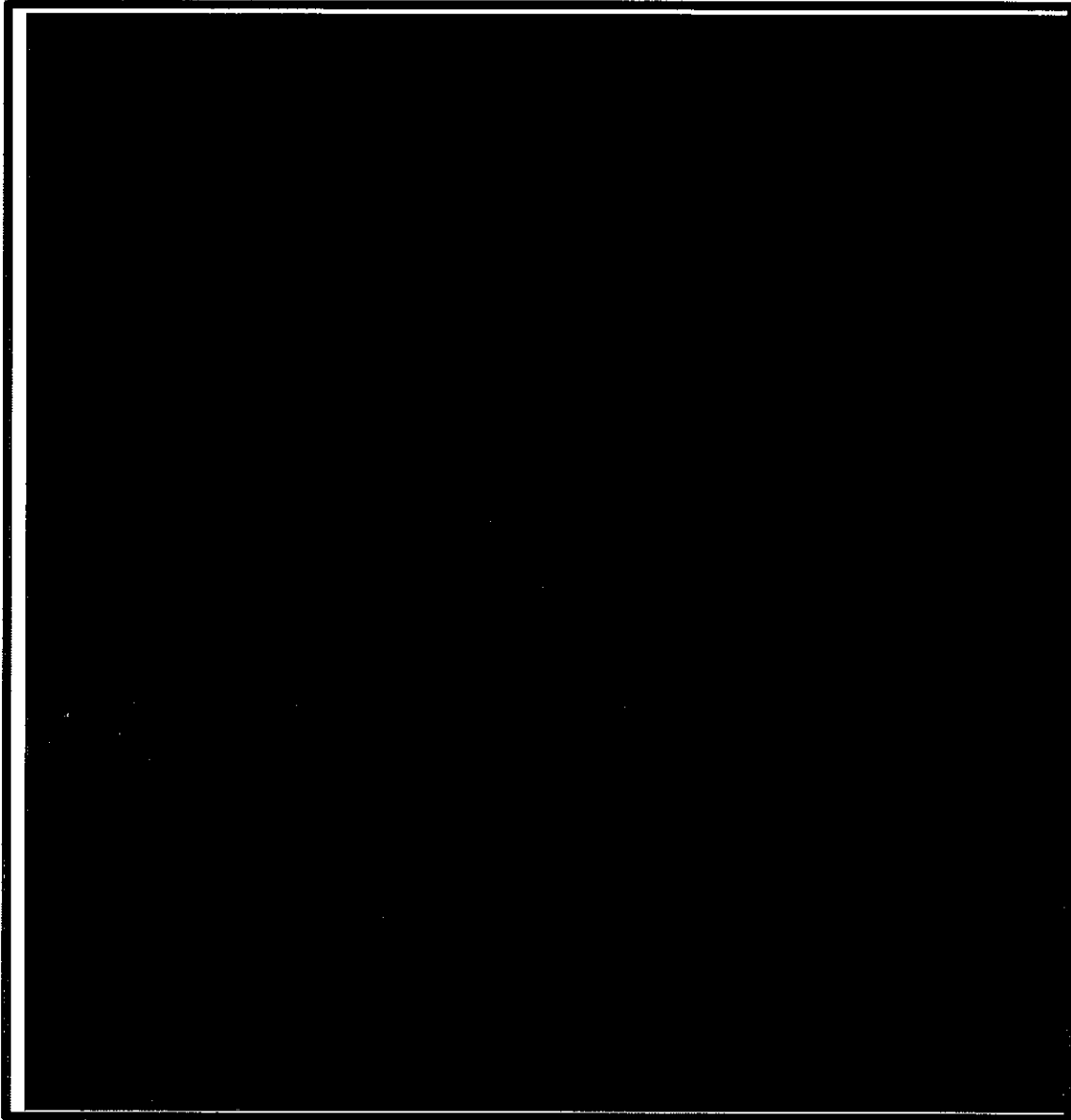
## **ATTACHMENT B – BULK POWER SYSTEM IMPACT STUDY REPORT**

### **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 [REDACTED] did not provide system impact to SCE's bulk power system.

N-1 STUDY WITHOUT IDENTIFIED UPGRADES in 2016



**N-1 STUDY WITH IDENTIFIED UPGRADES in 2018**

