



California Independent System Operator Corporation
CAISO Transmission Planning Process
Request Window Submission Form

REQUEST WINDOW SUBMISSION FORM

Please complete this submission form and the Attachment A (technical data) and send the documentation to the ISO contact listed in section 2. Please note that this form should be used for the purpose of submitting information that applies to the scope of Request Window that is a part of the ISO Transmission Planning Process only. For more information on the Request Window, please refer to the Business Practice Manual (BPM) for the Transmission Planning Process which is available at:

<http://www.caiso.com/planning/Pages/TransmissionPlanning/Default.aspx>.

The undersigned ISO Stakeholder Customer submits this request to be considered in the CAISO Transmission Plan. This submission is for (check one)¹:

- Reliability Transmission Project (refer to section 1 of Attachment A)
 - Submission is requested by a PTO with a PTO service territory
 - Submission is requested by a non-PTO, a PTO without a PTO service territory or a PTO outside its PTO service territory.
- Merchant Transmission Facility (refer to section 1 of Attachment A)
- Location Constrained Resource Interconnection Facility (LCRIF) (refer to sections 1 & 2 of Attachment A)
- Project to preserve Long-term Congestion Revenue Rights (CRR) (refer to section 1 of Attachment A)
- Demand Response Alternatives (refer to section 3 of Attachment A)
- Generation Alternatives (refer to section 4 of Attachment A)

1. Please provide the following basic information of the submission:

- a. Please provide the project name and the date you are submitting the project proposal to the ISO. It is preferred that the name of the project reflects the scope and location of the project:

Project Name: **Moraga-Potrero 230 kV Line**

Submission Date: **September 14, 2012**

- b. Project location and interconnection point(s) : **Moraga, Potrero Substations**

- c. Description of the project. Please provide the overview of the proposed project (e.g. overall scope, project objectives, estimated costs, etc.): **This project proposes to construct a new 230 kV line between Moraga and Potrero Substations. This new line will be rated to handle a minimum of 1200 Amps for summer normal and summer emergency conditions. New 230 kV circuit breakers, rated to handle the new line capacity, will be installed at Moraga and Potrero Substations. At Potrero, the 230 kV line will be terminated at the new 230 kV bus to be built as part of the Embarcadero-Potrero 230 kV Line project.**

¹ Please contact the ISO staff at requestwindow@caiso.com for any questions regarding the definitions of these submission categories in this form.



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d. Proposed In-Service Date, Trial Operation Date and Commercial Operation Date by month, day, and year and Term of Service.

Proposed In-Service date: **05 / 31 / 2020**

Proposed Trial Operation date (if applicable): / /

Proposed Commercial Operation date (if applicable): / /

Proposed Term of Service (if applicable):

e. Contact Information for the Project Sponsor:

Name:

Title: **Manager**

Company Name: **Pacific Gas and Electric Company**

Street Address:

City, State:

Zip Code:

Phone Number:

Fax Number:

Email Address:

2. This Request Window Submission Form shall be submitted to the following ISO representative:

Name: Dana Young

Email Address: requestwindow@caiso.com

3. This Request Window Submission Form is submitted by:

Check here if the information is the same as the Project Sponsor information in 1 (f) of this submission:

Name:

Title:

Company Name:

Street Address:

City, State:

Zip Code:

Phone Number:

Fax Number:



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Email Address:

Moraga-Potrero 230 kV Line Project

IN-SERVICE DATE

May 2020

PURPOSE AND BENEFIT

Reliability – NERC Compliance and Operational Flexibility. This project will increase the reliability of San Francisco's transmission system by installing a new 230 kV source into Potrero Substation. Completion of this project will diversify transmission interconnections into San Francisco and avoid potential electric load interruptions for the entire City and County of San Francisco following the loss of existing transmission imports.

PROJECT CLASSIFICATION

This project is submitted to the CAISO for Board approval at its March 2013 meeting.

DESCRIPTION AND SCOPE OF PROJECT

This project proposes to construct a new 230 kV line between Moraga Substation in the East Bay and Potrero Substation in San Francisco. Subject to final siting, environmental and regulatory approval, this new line is envisioned to be constructed overhead and underground as it passes through the East Bay and underwater as it passes through the San Francisco Bay. The first portion of the line will be constructed by utilizing the existing overhead Moraga-Claremont K 115 kV double circuit tower line. The double circuit tower line from Moraga to Claremont K will be reinforced and one side will be operated at 115 kV while the other side will be operated at 230 kV. From Claremont K, the line will span approximately 8 miles underground and 5 miles submarine into Potrero. The line will be rated to handle a minimum of 1200 Amps for summer normal and summer emergency conditions. New 230 kV circuit breakers, rated to handle the new line capacity, will be installed at Moraga and Potrero. At Potrero, the 230 kV line will be terminated at the new 230 kV bus to be constructed as part of the Embarcadero-Potrero 230 kV Transmission Project.

Specifically, the line between Moraga and Potrero would be created by constructing the following:

- 1) At Moraga substation, install a 230 kV termination including a circuit breaker for new Moraga-Potrero circuit
- 2) Reinforce the existing Moraga-Claremont 115 kV double circuit tower line (~5 miles) with a 230 kV double circuit transmission line. One side of the line will be

operated at 115 kV with 477 ACSS conductors; the other side will be operated at 230 kV with 954 ACSS conductors.

- 3) Install about 8 miles long, 230 kV, 400 MVA underground cable from near Claremont substation to a transition station along the east shore of the San Francisco Bay.
- 4) Install about 4.6 miles of 230 kV 400 MVA submarine cable across San Francisco Bay.
- 5) Install a variable line reactor (Range: 8 to 24 Ohms, 8 Ohms/step) with bypass at Potrero substation.
- 6) At Potrero substation, install a 230 kV line termination for new Moraga-Potrero circuit.

Completion of this project will add a new 230 kV transmission source to the City of San Francisco and will provide approximately 800 MW of load serving capability following loss of the existing AC transmission imports.

This project is expected to cost approximately \$450 to \$550 Million.

BACKGROUND

Peak electric demand in the City and County of San Francisco (the City) is approximately 970 MW, with an expected growth rate of 10 MW per year. The majority of the City's power needs are satisfied by importing power via AC transmission circuits from the south (capable of delivering over 2,000 MW) and 400 MW of power import capability from the DC Trans Bay Cable (TBC). After the retirement of Potrero Power Plant in 2011, San Francisco does not have any internally connected generation resources and therefore relies entirely on transmission imports. Specifically, power imported is delivered to distribution substations within the City by separate 230 kV and 115 kV systems.² TBC currently imports directly to the 115 kV system. San Francisco is geographically unique for transmission imports because the peninsula is surrounded by three sides of water. The geography has led to roughly a radial transmission system running north of San Mateo to serve the large demand in San Francisco.

For the 230 kV system, there are two 230 kV underground cables, which are each seven miles long, that import 230 kV power into the City from PG&E's Martin Substation. Specifically, this 230 kV power is imported through the underground cables to serve Embarcadero Substation. These underground cables each have a capability of 1,050 Amps (418 MVA). Current peak demand at Embarcadero Substation is approximately 270 MW with a projected annual growth rate of about 3 MW per year. Embarcadero Substation is a critical substation for the City since it supplies a large portion of the San Francisco downtown area. For the 115 kV system, there are five 115 kV underground cables that import power into the City from Martin Substation and TBC

² The Potrero-Embarcadero 230 kV Transmission Line Project, which the ISO approved in 2011, when completed by 2015 will provide a connection between the 230 kV and 115 kV systems.

terminating at Potrero Substation. The peak demand on the internal 115 kV system is approximately 620 MW and is projected to increase annually by 7 MW per year.

On March 23, 2011 the California ISO Board approved the Embarcadero-Potrero 230 kV Transmission Project that will link the internal 230 and 115 kV systems in San Francisco at Potrero Substation. The project will install a new underground or hybrid underground/underwater 230 kV cable between Embarcadero and Potrero and install a 230 kV bus and 420 MVA 230/115 kV transformer at Potrero. The new line will greatly increase the reliability of San Francisco's 230 kV system by adding a third 230 kV line into Embarcadero.

As previously mentioned, the majority of San Francisco's demand is served by importing power from AC transmission circuits from the south. The remaining power is imported through TBC which can transfer up to 400 MW via DC to Potrero Substation. The inverter at Potrero requires a robust high AC voltage provided by San Francisco's transmission system to operate appropriately (TBC cannot operate on a dead bus situation). Therefore, if the AC transmission imports cannot supply power to the internal transmission system then TBC cannot supply power. Due to San Francisco's unique geography and the location of existing transmission lines there is concern of a single failure event for AC transmission imports. In the event of a Category D contingency resulting in the loss of imports (extreme event resulting in the loss of two or more bulk electric system elements), TBC would become unavailable along with the AC system. With no transmission, AC and DC, and no adequate sized generation in San Francisco, there would be no short term option to serve San Francisco load. This situation will result in the curtailment of up to 970 MW of San Francisco load as well as up to 80 MW of customers at Daly City in San Mateo County. This potential load curtailment is expected to increase in magnitude as electric demand continues to grow in the future. Service to this load will only be restored after the existing transmission source is restored which could last many days or weeks.

The proposed project to add a new 230 kV transmission source into Potrero from the East Bay will significantly reduce the risk of curtailing San Francisco load. The new line will provide support for TBC to operate in the event when the San Francisco's supply is interrupted and allow over 800 MW of San Francisco load to be served.

STUDY CRITERIA

NERC Transmission Planning Reliability Standards
WECC Transmission Planning System Performance Criterion
California ISO Planning Standards

BASE CASE ASSUMPTIONS

PG&E used base cases and assumptions approved in the CAISO Unified Planning Assumptions and Study Plan for the 2012/2013 Transmission Planning Process cycle.

Specifically, this project was analyzed utilizing the approved base cases for the Greater Bay Area system that assumed the following planned transmission and generation assumptions for the San Francisco system:

- Trans Bay Cable HVDC Project in-service
- Potrero Power Plant retired
- Embarcadero-Potrero 230 kV Transmission Project completed

OTHER ALTERNATIVES CONSIDERED

Alternative 1: Status Quo

This alternative is not recommended because it does not address the potential loss of San Francisco load due to an interruption of transmission imports.

Alternative 2: East Shore-Potrero 230 kV Line

This alternative would construct a new 230 kV submarine cable between East Shore and Potrero substations. This alternative may be simpler to construct because it does not traverse underground urban developments in the East Bay. However, even with the new Russell City Energy Center, the East Shore 230 kV source is not strong enough to meet the needs of both the south Oakland 115 kV system and San Francisco's 230 & 115 kV systems. The East Shore-Potrero 230 kV Line would effectively remove the benefits associated with PG&E's approved East Shore-Oakland J 115 kV Reconductor project. Strengthening the source from East Shore substation would also require line swapping near Pittsburg and Contra Costa and reconductoring of the long 230 kV lines.

Alternative 3: Newark-Potrero 230 kV Line

This alternative would construct a new 230 kV submarine cable between Newark and Potrero substations. The submarine cable would be significantly longer than the other alternatives would increase the flow on already heavily loaded lines from Contra Costa to Newark.

PROJECT SCHEDULE

The overall project duration is expected to be as long as 7 years assuming that the indicated activities are sequenced as shown below. Assuming approval in 2013 the construction completion would be around May 2020. In the event of a longer approval time then the associated activities will be delayed as such and the project would continue to have roughly 7 year duration.

- Engineering studies – Years 1-2
- Environmental and Permitting Processes – Years 2-3

- Design – Engineering design – Years 2-4
- PTC/Pre-coms requirement – Year 5
- Major Equipment Procurement – Year 6
- Construction – Years 6-7
- Operation Date – Year 7

KEY ISSUES

- Land-Use Restrictions and Environmental Concerns – This project will require a CPCN.
- Special Metering or Protection – None
- Common Mode Exposure Items – None

GEPSELF MODELING INFORMATION

```
#####  
# Macro change file to model the proposed Moraga-Potrero 230 kV Line  
#  
#  
# This changefile will model a 230 kV line from Moraga Substation to a substation near Oak C in  
# downtown Oakland and then an underwater connection into Potrero Substation in SF  
# The 230 kV lines will be a combination of overhead / UG from Moraga to sub near Oak C  
# and then UG / underwater from sub near Oak C to Potrero  
#  
# NOTE: This changefile assumes that the Embarcadero-Potrero 230 kV line is already  
# modeled in the case  
#  
# 1) Create new Near C 230 kV bus and  
#  
# NEWBUSD BUSNO, "NAME=", BASKV=, BUSTYPE=, VSCHED=1, AREA=, ZONE=, VMAX=, VMIN=,  
# NEWBUSD 30439 "NearC 230" BASKV=230.0 BUSTYPE=1 VSCHED=1.000 AREA=7 ZONE=307 VMAX=1.05 VMIN=.95  
  
# 2) Delete the existing Moraga - Claremont No. 2 115 kV Line  
#  
# OLDSECDD 33020,32780,2,-1,,,,,,,,,  
  
#  
# 3) Create the new overhead section (section 1 of the secdd) assuming  
# Length is 5.1 miles from Moraga to Claremont (Station K)  
# Conductor is 795 ACSS (interior ratings)  
# Aspen model is 2A_795ACSS with impedance R = 0.1284 ; X = 0.70843 ; B = 0.016104  
#  
# 4) Create the new UG section (section 2 of the secdd) assuming  
# Length of the UG cable is 5.7 miles of paralleled 2500 CU cables and  
# Using the PSLF model for the Los Esteros XLPE UG cables as the basis for this 230 kV UG line  
#  
# NEWSECDD FBUS TOBUS CKT SEC= RPU= XPU= BPU= MVA1= MVA2= MVA3= MVA4= STATUS=  
# OWN=  
# NEWSECDD 30439 30550 1 SEC=1 RPU=.004952 XPU=.027319 BPU=0.00410 MVA1=604 MVA2=604 MVA3=660  
# MVA4=660 STATUS=1 OWN=90  
# NEWSECDD 30439 30550 1 SEC=2 RPU=.000169 XPU=.001837 BPU=1.04467 MVA1=800 MVA2=900 MVA3=800  
# MVA4=900 STATUS=1 OWN=90  
  
#  
# Install a 420 MVA 230/115 kV Bank 1 at Station C  
#  
# NEW_TRAN FBUS TOBUS CKT ZR= ZX= BMAG MVA1 MVA2 MVA3 MVA4 VNOMF VNOMT MVABASE STAT  
# TYPE TAPF ANGLP "REG=", VMAX, VMIN, STEPP= TMAX TMIN, TAPFP=1, TAPFS=1, GMAG=, AREA=, ZONE=  
# NEW_TRAN 32786 30439 1 .008836 .056007 -.000206 420 420 420 420 117.5 230.0 252 1 1 1.0 0 32786 1.05  
# 0.95 0.00625 1.1 0.99 1 1.000 .000331 7 307
```



```
#
#-----
#
# Station C - Potrero 230 kV Line
#
# (Potrero is bus number 30698)

#
# 1) Create the new UG section (section 1 of the secdd) assuming
#   Length of the UG cable is 2.9 miles
#
NEWSECDD 30439, 30698, CKT=1, SEC=1, STATUS=1, RPU=0.000982, XPU=0.004809, BPU=1.0772,+
MVA1=480, MVA2=480, MVA3=480, MVA4=480, AREA=7, ZONE=307, OWN=390

#
# 2) Create the new underwater section (section 2 of the secdd) assuming
#   Length of the underwater cable is 3.7 miles
#
NEWSECDD 30439, 30698, CKT=1, SEC=2, STATUS=1, RPU=0.00035, XPU=0.002131, BPU=0.38960,+
MVA1=480, MVA2=480, MVA3=480, MVA4=480, AREA=7, ZONE=307, OWN=390

#
# 3) Install a 16-ohm series reactor (section 3 of the secdd) on
#   the Potrero side of the line
#-----
NEWSECDD 30439, 30698, CKT=1, SEC=3, STATUS=1, RPU=0.00030, XPU=0.030246, BPU=0.00000,+
MVA1=796.7, MVA2=796.7, MVA3=796.7, MVA4=796.8, AREA=7, ZONE=307, OWN=390
```

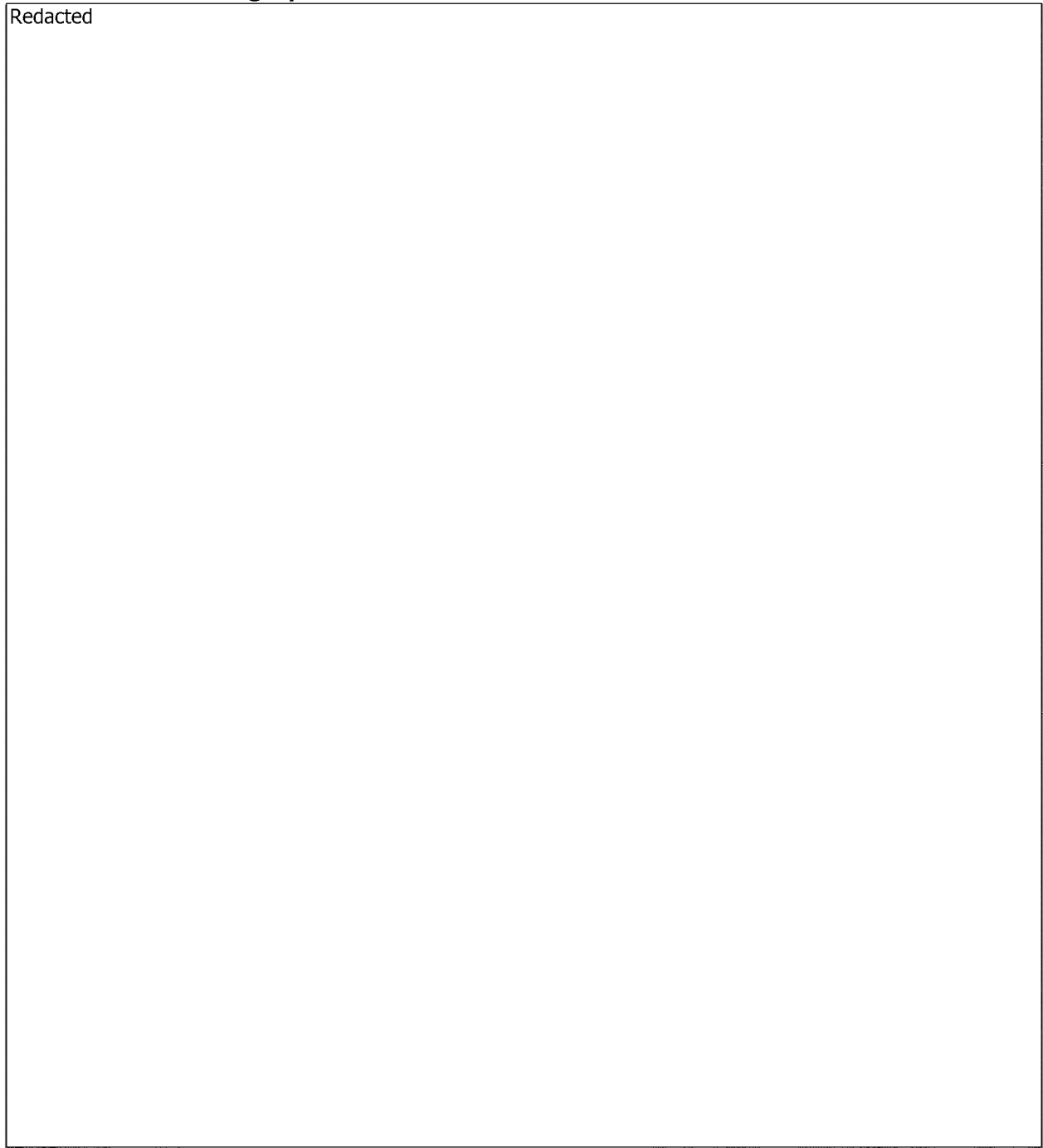
MISCELLANEOUS DATA

- PG&E will construct, own, and finance the project
- PG&E will be the planned operator of the project

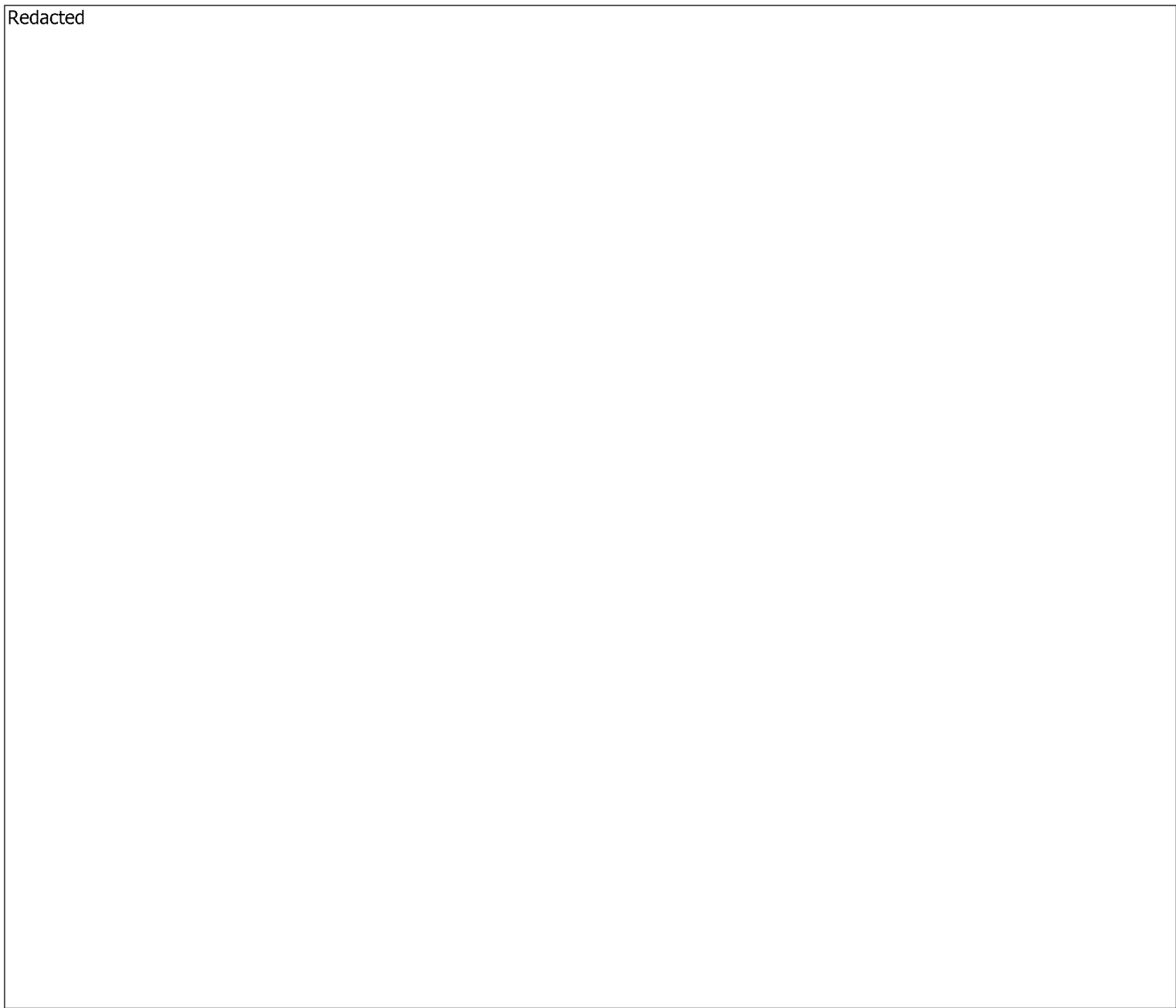
ATTACHMENTS

1. Geographical Location
2. Scope Diagrams
3. Pre and Post Project Power Flow Plots

Attachment 1: Geographical Location



Redacted



**Figure 1: Existing San Francisco Area including completion of approved Embarcadero-Potrero
230 kV Line**

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