

APPENDIX F: Project Need and Description

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Name	Panoche-Oro Loma 115 kV Line Reconductoring
Brief Description	The project scope includes reconductoring 17 miles of limiting conductor on the Panoche-Oro Loma 115 kV line between Panoche Junction and Oro Loma Substation. This alternative will improve reliability, increase capacity, and address the thermal concerns in the area under outage condition.
Type	Reliability
Objectives	<p>This project is designed to address the following thermal performance requirements identified by the CAISO:</p> <ul style="list-style-type: none"> • Panoche-Oro Loma 115 kV Line overload under Category P1-2 starting in 2020 • Panoche-Oro Loma 115 kV Line overload under Category P2 starting in 2017 • Panoche-Oro Loma 115 kV Line overload under Category P3 starting in 2020 • Panoche-Oro Loma 115 kV Line overload under Category P6 starting in 2017
Project Need Date	05/01/2017
Expected In-service Date	05/31/2021
Interim Solution	Operating action are being developed to address these reliability concerns in the interim.
Project Cost	Approximately \$20 million
Alternatives Considered but Rejected	<p>The following alternatives to the Reconductoring of Panoche-Oro Loma 115kV line were considered:</p> <ul style="list-style-type: none"> • Generation Re-dispatch/Congestion Management <p>This alternative proposes to curtail roughly 500 MW of generation south of Panoche Substation and re-dispatching roughly 500 MW of generation north of Oro Loma Substation following an outage of the Panoche-Mendota 115 kV Line overlapped with Exchequer Generator outage, NERC Category P3. This option is not recommended due to the large amount of generation curtailment and re-dispatch required.</p> <ul style="list-style-type: none"> • SPS <p>This alternative involves dropping the load and generation, however it would incur a very large amount of generation drop about 500MW which is not feasible. We cannot drop load for P1 type contingencies which then will not address all of the NERC Category violations.</p>

Name	Bellota 230 kV Substation Shunt Reactor
Brief Description	The project scope includes installing a 100 MVar reactor and associated bus and line work to interconnect the reactors.
Type	Reliability
Objectives	ISO has found the project to be needed given the real-time high voltage concerns system operators were experiencing in this area as validated from real-time SCADA values. In light of the fact that the high voltage concerns are being seen in the operations, ISO is working with PG&E to potentially expedite the implementation of this project.
Project Need Date	05/01/2015
Expected In-service Date	12/31/2020
Interim Solution	Operating action are being developed to address these reliability concerns in the interim.
Project Cost	Approximately \$13-19 million
Alternatives Considered but Rejected	To reduce the voltage on the system, optimal locations were investigated. In addition dynamic reactive devices were considered.

Name	Cottonwood 115 kV Substation Shunt Reactor
Brief Description	ISO received one capital project proposal through the request window to install a new 100 MVar 115kV reactor to mitigate high voltages on the PG&E system at Cottonwood.
Type	Reliability
Objectives	ISO has found the project to be needed given the real-time high voltage concerns system operators were experiencing in this area as validated from real-time SCADA values. In light of the fact that the high voltage concerns are being seen in the operations, ISO is working with PG&E to potentially expedite the implementation of this project.
Project Need Date	05/01/2015
Expected In-service Date	12/31/2019
Interim Solution	Operating action are being developed to address these reliability concerns in the interim.
Project Cost	Approximately \$15-19 million
Alternatives Considered but Rejected	To reduce the voltage on the system, optimal locations were investigated. In addition dynamic reactive devices were considered.

Name	Delevan 230 kV Substation Shunt Reactor
Brief Description	The project scope includes installing a 200 MVar reactor and associated bus and line work to interconnect the reactors.
Type	Reliability
Objectives	ISO has found the project to be needed given the real-time high voltage concerns system operators were experiencing in this area as validated from real-time SCADA values. In light of the fact that the high voltage concerns are being seen in the operations, ISO is working with PG&E to potentially expedite the implementation of this project.
Project Need Date	05/01/2015
Expected In-service Date	12/31/2020
Interim Solution	Operating action are being developed to address these reliability concerns in the interim.
Project Cost	Approximately \$19-28 million
Alternatives Considered but Rejected	To reduce the voltage on the system, optimal locations were investigated. In addition dynamic reactive devices were considered.

Name	Ignacio 230 kV Reactor
Brief Description	The project scope includes installing a 2 step 150 MVar reactor by sectionalizing the 230kV bus with two (2) circuit breakers. Two other circuit breakers are also included in the design to switch the reactor in and out of service.
Type	Reliability
Objectives	ISO has found the project to be needed given the real-time high voltage concerns system operators were experiencing in this area as validated from real-time SCADA values. In light of the fact that the high voltage concerns are being seen in the operations, ISO is working with PG&E to potentially expedite the implementation of this project.
Project Need Date	05/01/2015
Expected In-service Date	12/31/2020
Interim Solution	Operating action are being developed to address these reliability concerns in the interim.
Project Cost	Approximately \$23-35 million
Alternatives Considered but Rejected	To reduce the voltage on the system, optimal locations were investigated. In addition dynamic reactive devices were considered.

Name	Los Esteros 230 kV Shunt Reactor
Brief Description	The project scope includes installing a 250 MVar reactor and associated bus and line work to interconnect the reactors.
Type	Reliability
Objectives	An area-wide high voltage was observed in the Greater Bay Area transmission system under the 2020 light load conditions. The ISO determined that the project is needed to mitigate high voltages identified in the San Jose area.
Project Need Date	05/01/2015
Expected In-service Date	12/31/2020
Interim Solution	Operating action are being developed to address these reliability concerns in the interim.
Project Cost	Approximately \$24-36 million
Alternatives Considered but Rejected	To reduce the voltage on the system, optimal locations were investigated. In addition dynamic reactive devices were considered.

Name	Wilson 115 kV SVC
Brief Description	The project is to replace the existing 115 kV capacitor at Wilson with a 100MVAR SVC at Wilson 115kV.
Type	Reliability
Objectives	High voltages on the Bulk Electric System have been observed in recent years, these observations have been made system wide, however the most severe and frequent occurrences have been in the North area. This project proposal is for Wilson Substation located in PG&E's South area, in Merced County. The voltage levels served by this Substation are 230 kV and 115 kV. Wilson 230 kV and 115kV buses have been identified as exceeding normal high operating limits in the 2020 minimum load base case, and further confirmed through the review of real-time data.
Project Need Date	05/01/2015
Expected In-service Date	12/31/2020
Interim Solution	Operating action are being developed to address these reliability concerns in the interim.
Project Cost	Approximately \$35-45 million
Alternatives Considered but Rejected	To reduce the voltage on the system, optimal locations were investigated. In addition 230 kV and 115 kV reactors were considered.

Name	15 MVAR Capacitor at Basilone Substation
Brief Description	The project will install one 15 MVAR shunt capacitor at SDG&E's Basilone substation to address low voltages at substations along the Oceanside corridor.
Type	Reliability
Objectives	<p>This project is designed to address the voltage performance concerns identified by the CAISO at 69 kV substations along the Oceanside corridor including Stuart, Las Pulgas, Japanese Mesa, Basilone, Talega and Cristianitos under the following contingencies:</p> <ul style="list-style-type: none"> • Talega 69/230 kV transformer bank (Category P1); • Basilone – Talega 69 kV (Category P1); • Oceanside Tap – Stuart Tap 69 kV line (Categories P2);
Project Need Date	05/01/2017
Expected In-service Date	06/30/2016
Interim Solution	Existing Special Protection Scheme (SPS) to open TL695, Load Shedding at substations along the Oceanside corridor
Project Cost	\$1.5-2 million
Alternatives Considered but Rejected	No comparable alternatives identified

Name	30 MVAR Capacitor at Pendleton Substation
Brief Description	The project will install one 30 MVAR shunt capacitor at SDG&E's Pendleton substation to address voltage deviation issue in the Fallbrook load pocket
Type	Reliability
Objectives	This project is designed to address the voltage performance requirements identified by the CAISO at the Pendleton 69 kV substation under the following contingency: <ul style="list-style-type: none"> • San Luis Rey – Pendleton 69 kV line (Category P1);
Project Need Date	05/01/2017
Expected In-service Date	06/30/2017
Interim Solution	Load Shedding at Pendleton 69 kV substation
Project Cost	\$2-3 million
Alternatives Considered but Rejected	No comparable alternatives identified

Name	Bay Boulevard Third 230/69 kV Transformer Bank
Brief Description	This project proposes to add third transformer banks 230/69 kV in the planned Bay Boulevard substation. The project addresses all the reliability concerns on the two transformer banks in the Bay Boulevard substation. Although some of the thermal concerns could be eliminated by re-arranging the 230 kV lines and the banks positions in the substation, a third transformer is still needed to mitigate the residual Category P6 thermal overload concern to comply with the ISO’s High Density Urban Load Area Standard.
Type	Reliability
Objectives	This project is designed to address the following thermal overload concerns identified by the CAISO to meet performance requirements in the CAISO’s high density urban load area: <ul style="list-style-type: none"> • Bay Boulevard 230/69 kV Transformer #1 overloads under Category P2, P4, and P6, starting in 2018; • Bay Boulevard 230/69 kV Transformer #2 overloads under Category P2, P4, and P6, starting in 2018;
Project Need Date	06/01/2018
Expected In-service Date	06/01/2018
Interim Solution	Not Applicable
Project Cost	Approximately \$13-18 million
Alternatives Considered but Rejected	Following alternatives to the Bay Boulevard Third 230/69 kV Transformer Bank Project were considered: <ol style="list-style-type: none"> 1. adding 2nd Silvergate-Bay Blvd 230 kV line rated in 912/1176 MVA by upgrading existing TL13815 underground section between Bay Boulevard and Silvergate along with associated need to reconfigure a section of TL13815 and the 138/69 kV system from Silvergate to Mission via Grant Hill. The estimated cost of the alternative project is \$ \$70~\$76 million 2. adding a new 138 kV bus and a transformer bank 230/138 kV in the Bay Boulevard substation, looping the new Telegraph Canyon - Grant Hill 138 kV line into the substation 3. adding a total of 75 MW preferred resource and energy storage in the area 4. relying on operation procedure by re-configuring the 69 kV system in the area

Name	Reconductor TL 605 Silvergate-Urban
Brief Description	The project will re-conductor SDG&E's TL 605 Silvergate-Urban line to a minimum of 137 MVA to address thermal violation issue of TL 605
Type	Reliability
Objectives	This project is designed to address the thermal performance concerns identified by the CAISO under the following contingency: <ul style="list-style-type: none"> • Silvergate – Station B 69 kV line No. 1 and 2 (TL 699 and TL 602 under Category P6);
Project Need Date	05/01/2017
Expected In-service Date	06/30/2018
Interim Solution	Load Shedding at Urban 69 kV substation
Project Cost	\$5-6 million
Alternatives Considered but Rejected	Load Shedding at Urban 69 kV substation, 2 nd Urban-Silvergate 69 kV line

Name	Second Miguel – Bay Boulevard 230 kV Transmission Circuit
Brief Description	This project proposes to add a new 10 mile 230 kV overhead circuit utilizing a vacant position on the existing double-circuit 230kV structures between Miguel and Bay Boulevard 230 kV substations. The project addresses Category P2, P4, P6, and P7 thermal overload concerns on the Mission – Old Town, Mission – Old Town Tap, and Miguel – Bay Boulevard 230 kV transmission circuits.
Type	Reliability
Objectives	<p>This project is designed to address the following thermal overload concerns identified by the CAISO to meet performance requirements in the CAISO's high density urban load area:</p> <ol style="list-style-type: none"> 1. planned Miguel-Bay Boulevard 230 kV transmission circuit #1 overloaded for Category P2, P4, or P7 outage that results in the loss of both Miguel-Mission 230 kV lines (TL23022 and TL23023), starting in 2020; 2. Mission-Old Town (TL23027) or Mission-Old Town Tap (TL23028) 230 kV line overloaded for various Category P6 outages of the Miguel-Bay Boulevard 230 kV line along with TL23028 or TL23027, starting in 2020; 3. The project would also mitigate the worst Category P6 contingency resulting in a thermal overload concern on Sycamore – Scripps 69 kV line (TL6916) without generation support from the Cabrillo II, Miramar GT units.
Project Need Date	06/01/2018
Expected In-service Date	06/01/2019
Interim Solution	Operational procedure and/or temporary special protection system shedding load as needed
Project Cost	Approximately \$20-45 million
Alternatives Considered but Rejected	<p>Following alternatives to the Second Miguel – Bay Boulevard 230 kV Transmission Circuit Project were considered:</p> <ol style="list-style-type: none"> 1. reinforcement of the southern SDG&E 230 kV system project, which involves following upgrades. Total of estimated cost of the project about \$140 ~ \$151 million <ul style="list-style-type: none"> • adding 2nd 230kV line from Miguel to Bay Blvd rated in 1175 MVA rating • adding 2nd Silvergate-Bay Blvd 230 kV line rated in 912/1176 MVA by upgrading existing TL13815 underground section between Bay Boulevard and Silvergate • re-conductoring about 8 miles 230 kV lines from Mission to Fanita Junction • reconfigure the rest section of TL13815 and the 138/69 kV system from Silvergate to Mission via Grant Hill 2. adding a new 138 kV bus and a transformer bank 230/138 kV in the Bay Boulevard substation, looping the Telegraph Canyon - Grant Hill 138 kV line into the substation

Name	TL600: “Mesa Heights Loop-in + Reconductor”
Brief Description	The project will loop-in SDG&E’s Clairemont Tap – Kearny line (TL600C) into Mesa Heights 69 kV substation. It will also re-conductor 2.2 miles of Claremont – Mesa Heights line to a minimum of 150 MVA and 0.7 mile of Clairemont Tap - Clairemont line (TL600B) to a minimum of 102 MVA to address thermal violation issue of TL 600B and TL 600C
Type	Reliability
Objectives	This project is designed to address the thermal performance concerns identified by the CAISO of TL600B and TL 600C under the following contingency: <ul style="list-style-type: none"> • Mission – Mesa Heights 69 kV line & Mission – Kearny 69 kV line (Category P6);
Project Need Date	05/01/2017
Expected In-service Date	06/30/2018
Interim Solution	Load Shedding at Mesa Heights 69 kV substation
Project Cost	\$15-20 million
Alternatives Considered but Rejected	Keep Kearny generators for congestion management, Load Shedding at Mesa Heights 69 kV substation

Name	Eagle Mountain Shunt Reactors
Brief Description	The project will install two shunt reactors at SCE's Eagle Mountain Substation to address high voltages at Julian Hinds and Eagle Mountain Substations. One 34 MVAR reactor will be connected to the 12 kV tertiary winding of the existing 5A Bank and one 45 MVAR reactor will be connected to the 230 kV bus.
Type	Reliability
Objectives	This project is designed to address the voltage performance concerns identified by the CAISO at Julian Hinds and Eagle Mountain 230 kV substations under the following contingencies: <ul style="list-style-type: none"> • Julian Hinds – Mirage 230 kV (Category P1); • Julian Hinds – Mirage 230 kV and Julian Hinds shunt reactor (Categories P6);
Project Need Date	01/01/2017
Expected In-service Date	12/31/2018
Interim Solution	Disconnect Blythe generation tie to decrease voltage at Julian Hinds and Eagle Mountain 230 kV substations
Project Cost	\$10 million
Alternatives Considered but Rejected	No comparable alternatives identified. Disconnecting the Blythe generation tie impacts the availability of the generation.

Name	Lugo – Victorville 500 kV Upgrade (SCE portion)
Brief Description	The project was submitted by Southern California Edison. The Lugo-Victorville 500 kV transmission line is jointly owned by SCE and the Los Angeles Department of Water and Power (LADWP). The upgrade will be performed for facilities owned by each respective party. This project increases the rating of the 500 kV line by upgrading terminal equipment at both substations and removing ground clearance limitations. SCE’s portion includes upgrading four transmission towers and replacing terminal equipment at the Lugo substation. The exact scope of LADWP’s portion of upgrade was not provided but the cost of LADWP’s portion was provided as part of the RW submission.
Type	Reliability
Objectives	<p>1) This project is designed to address the thermal overload on Lugo-Victorville 500 kV transmission line identified by the CAISO for the following contingencies:</p> <ul style="list-style-type: none"> • N-1 of Eldorado – Lugo 500 kV • N-1-1 of Eldorado – Lugo 500 kV line and Adelanto – Rinaldi 500 kV line No. 2 • N-1-1 of Eldorado – Lugo 500 kV line and Adelanto – Toluca 500 kV line • N-1-1 of Eldorado – Lugo 500 kV line and Lugo - Mohave 500 kV line • N-1-1 of Eldorado – Lugo 500 kV line and Palo Verde – Colorado River 500 kV line • N-1-1 of Eldorado – Lugo 500 kV line and Victorville – Rinaldi 500 kV line • N-1-1 of Eldorado – Lugo 500 kV line and Adelanto – Rinaldi 500 kV line No. 2 <p>2) The 33% RPS policy-driven studies also identified Lugo-Victorville 500 kV line as a limiting constraint for delivering resources from multiple renewable zones.</p> <p>3) The accrued congestion cost of Lugo-Victorville 500 kV constraint since January 2013 was found to be ~43 million.</p>
Project Need Date	06/01/2020
Expected In-service Date	12/31/2018
Interim Solution	Congestion management will be adequate for N-1-1 issues until 2020.
Project Cost	Approximately \$34 million (\$18 million – SCE portion; \$16 million – LADWP portion)
Alternatives Considered but Rejected	<p>The following alternatives to the Lugo-Victorville 500 kV Upgrade were considered:</p> <p>1) Congestion Management</p>

	<p>This alternative involves dispatching LA Basin generation (pre-contingency for N-1 and after the first N-1 contingency for N-1-1). The alternative will work until 2020. Beyond 2020, with the retirement of the bulk of OTC generating units in the western LA Basin, as well as potential retirement of generating units in the eastern LA Basin due to its age (i.e., more than 40 years old), congestion management on this path will become much more challenging. The accrued congestion cost of Lugo-Victorville 500 kV constraint since January 2013 was found to be ~43 million. The cost of the recommended project is ~\$34 million.</p> <p>2) Bypassing series capacitors on LADWP lines as described in Operating Procedure 6610 This alternative involves relying on an existing operating procedure to bypass series capacitors on LADWP lines if Lugo-Victorville 500 kV overload persists after generation re-dispatch. In 2025 case with baseline load (not the high CEC load forecast), this mitigation was inadequate to reduce the loading below 100% for the N-1-1 contingency of Lugo – Mohave and Lugo – Eldorado 500 KV lines.</p>
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