APPENDIX H: Project Need and Description

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Name	**Coronado Island Reliability Reinforcement Phase I**
Brief Description	New underground 69 kV line from Station B to North Island Metering.
Type	Reliability
Objectives	Improve system reliability against the P1 contingencies of TL650 Station B – Coronado and TL655 Silvergate – Coronado which would overload the remaining line, and increase the load serving capability, driven by the additional US Navy load.
Project Need Date	Q3 2027
Expected In-service Date	Q3 2027
Interim Solution	None
Project Cost	$42M
Alternatives Considered but Rejected	• Build a new underground 69 kV line from Bay Boulevard to North Island Metering with a cost of $300 to $400 million and an in-service date of 2032. • Installation of energy storage at Coronado Island, but this alternative is not appropriate due to energy storage charging limitations. • Addition of flow control devices is not applicable since Coronado Island load is radial and only served by two 69 kV lines. • RAS is not suitable per ISO RAS Guidelines where involuntary load tripping is not allowed due to critical US Navy load.

Name	Coronado Island Reliability Reinforcement Phase II
Brief Description	Reconductor TL650 Station B – Coronado and TL655 Silvergate – Coronado to increase their normal rating to 150 MVA.
Type	Reliability
Objectives	• Improve system reliability against P1 contingency concerns due to the outage of TL604 Old Town – Vine, which would overload TL655 Silvergate – Coronado and the outage of TL655 would overload TL650 Station B – Coronado, driven by the additional US Navy load. • Avoid the risk of potential load drop during the construction process as the reconductoring of each 69 kV line, which is contrary to ISO Planning Standards.
Project Need Date	Q4 2028
Expected In-service Date	Q4 2028
Interim Solution	None
Project Cost	$66M
Alternatives Considered but Rejected	• Addition of series reactors/flow control devices to TL650 and TL655 or a series capacitor/flow control device to the new 69 kV line to redistribute the power flow during P1 contingencies. This alternative is unfeasible due to space limitations at existing Station B, Coronado, North Island Metering, and Silvergate substations and the lack of land to expand them. • Installation of energy storage at Coronado Island, but this alternative is not appropriate due to energy storage charging limitations. • RAS is not suitable per ISO RAS Guidelines where involuntary load tripping is not allowed due to critical US Navy load.

Name	**Downtown Reliability Reinforcement**

Brief Description	• Energize Silvergate 230/69 kV spare bank.
	• Upgrade Sampson 69 kV circuit breakers (CBs).
	• Expand existing Vine 69/12 kV substation to 230/69/12 kV.
	  o Loop TL23029 Old Town – Mission into Vine substation.
	  o Install a 230/69 kV 350 MVA bank at Vine substation.

Type	Reliability
Objectives	• Improve system reliability against the P1 and P4 contingencies of any of the Old Town 230/69 kV banks, overloading the remaining bank. Additionally, the P1 outages of any of the Silvergate 230/69 kV banks and some P3 contingencies that include them would also overload TL604 Old Town – Vine 69 kV transmission line.
Project Need Date	2029 and 2037
Expected In-service Date	2029 for first two upgrades and 2037 for Vine substation expansion
Interim Solution	None
Project Cost	$400-500M
Alternatives Considered but Rejected	• Energize Silvergate 230/69 kV spare bank, upgrade Sampson 69 kV CBs, rebuild Old Town substation to GIS and replace the existing Old Town 230/69 kV banks with 350 MVA banks. This alternative has a similar cost compared to the proposed project but would be difficult to build since it is not expected to have a time window during the year to perform the scheduled outages at Old Town substation, which would be contrary of the ISO Planning Standards. • Addition of flow control devices in series with the Old Town 230/69 kV banks, rebuild Old Town substation to GIS, energize Silvergate 230/69 kV spare bank, upgrade Sampson 69 kV CBs, reconductor TL602 Silvergate – Station B, and TL699 Silvergate – Station B. This alternative has a total cost estimate of $512-630 M. • Installation of energy storage in the 69 kV load pocket, but this alternative is not appropriate due to energy storage charging limitations and also could lead to downstream 69 kV transmission line overloads while discharging.

Name	**Tortilla 115kV Capacitor Replacement**
Brief Description	Replace the existing two (2) 14.4 MVAR 115 kV capacitors at the Tortilla 115/33 kV substation with two (2) new 28.8 MVAR 115 kV capacitors. The capacitor replacement will complement the Kramer-Coolwater 115 kV line looping into the Tortilla 115 kV substation, which primarily addresses thermal overload concerns, while the capacitor project focuses on mitigating low voltage issues.
Type	Reliability
Objectives	• To mitigate low voltage and voltage collapse issues in the NOL area under N-1 conditions resulting from various outages.
Project Need Date	2029
Expected In-service Date	June 30, 2029
Interim Solution	None
Project Cost	$5M
Alternatives Considered but Rejected	• Looping the Kramer-Coolwater 115 kV line into the Tortilla 115 kV Substation was considered by itself. While this option mitigates thermal overloads and provides some additional VAR support, it does not fully resolve the low voltage issues expected in the coming years. • An 80MW Battery Energy Storage System (BESS) was considered to mitigate the low voltage and voltage collapse concerns. However, low voltages were identified when charging the large BESS in the 2029 Summer OP case, which would likely prohibit fully recharging the batteries during extended transmission contingency conditions.

Name	**Kramer-Coolwater 115kV Line Looping into Tortilla 115kV Substation**
Brief Description	Utilize the existing Kramer-Coolwater 115 kV transmission line to loop in the Tortilla 115/33 kV substation via an approximate 11.5-mile double-circuit line extension and switchrack expansion at the Tortilla 115/33 kV substation.
Type	Reliability
Objectives	• To mitigate thermal overloads and reduce the risk of voltage collapse due to N-1 loss of the Coolwater-SEGS-Tortilla, Kramer-Accelerate, or Accelerate-Tortilla 115 kV lines.
Project Need Date	2029
Expected In-service Date	June 30, 2034
Interim Solution	None
Project Cost	$37M
Alternatives Considered but Rejected	• Constructing a new 11.4-mile 115 kV circuit from Coolwater to Tortilla (a double-circuit tower alongside the existing Coolwater-SEGS-Tortilla 115 kV line) was considered. However, this solution would result in Tortilla being supported by only three lines instead of four. Additional work at the Coolwater Substation would be required to accommodate the new line position, and the Coolwater-SEGS-Tortilla 115 kV line would face long outages during the construction phase. • An 80MW Battery Energy Storage System (BESS) was considered to mitigate thermal overloads and voltage collapse concerns. However, low voltages were identified when charging the large BESS in the 2029 Summer OP case, which would likely prohibit fully recharging the batteries during extended transmission contingency conditions.

Name	**Julian Hinds-Mirage 230kV Advanced Reconductor Project**
Brief Description	Reconductor approximately 47 miles of the Julian Hinds-Mirage 230kV Line with high-temperature, low-sag advanced conductors to achieve ratings of 1,525 A (normal) and 1,625 A (4-hr emergency). Additionally, select towers will be upgraded to support the new conductor and modifications to the existing Blythe RAS will be necessary to accommodate the increased line rating.
Type	Reliability
Objectives	• To address the thermally constrained Julian Hinds-Mirage 230 kV line, which has been subject to the Blythe Energy Remedial Action Scheme (RAS) and has activated ten times between 2019 and 2023. • To facilitate the integration of more renewable energy along parallel transmission corridors, improving overall transmission reliability for neighboring systems. • An evaluation of the potential impact of ambient adjusted ratings (AARs) as required by FERC Order 881 indicates that at higher temperatures the line could be subject to operational derates as low as the historical minimum of 87% of the 895A static rating. The proposed project to reconductor the existing 230kV line with higher capacity advanced conductors could increase the range of AARs minimizing, if not entirely eliminating, exposure to AARs below the existing 895A static rating. • Without considering potential derates, 35 hours and 111 hours of congestion was identified on the Julian Hinds-Mirage 230 kV line in the 2034 and 2039 Base portfolio production cost models respectively. With the proposed project, this congestion would be eliminated.
Project Need Date	Currently needed
Expected In-service Date	April 1, 2030
Interim Solution	Continue using the Blythe Energy RAS.
Project Cost	$76M (These upgrade costs are expected to be partially subsidized by the U.S. Department of Energy GRIP grant funding awarded through the CHARGE 2T project.)
Alternatives Considered but Rejected	• Continue using the Blythe Energy RAS.

Name	Serrano 500 kV SCD Mitigation
Brief Description	Replace the 40 kA-rated 500 kV GIS bus positions No. 1 through No. 3 with 63 kA-rated equivalent equipment
Type	Reliability
Objectives	Address the short circuit duty concerns at Serrano 500 kV Substation in conjunction with the previously approved projects at Serrano in the 2022-2023 transmission plan, that exacerbate the short-circuit duty at the Serrano 500 kV bus
Project Need Date	December, 2029
Expected In-service Date	December, 2029
Interim Solution	None
Project Cost	$183M
Alternatives Considered but Rejected	None

Name	Serrano 230 kV SCD GIS Bus Split Project
Brief Description	Split the Serrano 230 kV bus by installing two (2) 230 kV and sectionalizing circuit breakers during the construction work with the previously CAISO approved TPP projects at Serrano
Type	Reliability
Objectives	Address the short circuit duty concern at the neighboring Villa Park 230 kV substation which exceeds 100% capacity in the long-term planning scenario of 2039
Project Need Date	2039
Expected In-service Date	December, 2029 (performing the construction work with the previously approved projects to gain cost saving efficiencies)
Interim Solution	None
Project Cost	$28M
Alternatives Considered but Rejected	None

Name	Alamitos 230 kV SCD Upgrade
Brief Description	Upgrade six (6) 230 kV circuit breakers at Alamitos A and B 230 kV to 63 kA
Type	Reliability
Objectives	Address the short circuit duty concern at the Alamitos 230 kV substation which exceeds 100% of the circuit breaker capacity in the long-term planning cases of 2034 and 2039.
Project Need Date	By 2034
Expected In-service Date	December 31, 2032
Interim Solution	None
Project Cost	$5M
Alternatives Considered but Rejected	None

Name	West Fresno 115 kV Voltage support Project
Brief Description	Install 75 MVar voltage support at West Fresno substation
Type	Reliability
Objectives	• Address low voltage issues in West Fresno and California Avenue 115 kV substations starting near-term
Project Need Date	2026
Expected In-service Date	2031
Interim Solution	Transfer distribution loads to prevent low voltage issues
Project Cost	$30M-$60M
Alternatives Considered but Rejected	• Battery storage interconnection: Not recommended due to higher interconnection cost.

Name	**Cortina #3 60 kV Reconductoring Project**
Brief Description	• Reconductor about 6.0 miles between the Cortina Substation and Wadham Jct on the Cortina #3 60 kV to achieve minimum conductor rating of 1014 AMPS for summer normal rating and 1127 AMPS for summer emergency rating. • Reconductor about 1.5 miles between the Wadham Jct and Wescot (007/125) on the Cortina #3 60 kV to achieve minimum conductor rating of 1014 AMPS for summer normal rating and 1127 AMPS for summer emergency rating • Reconductor about 1.5 miles between the Wescot (007/125) and Willaims Substation on the Cortina #3 60 kV to achieve minimum conductor rating of 1014 AMPS for summer normal rating and 1127 AMPS for summer emergency rating. • Install a 15 MVAR shunt capacitor at Meridian 60 kV substation. • Upgrade any limiting components as necessary to achieve full conductor capacity
Type	Reliability
Objectives	• Address the thermal overload on Cortina #3 60 kV line under normal conditions and following an outage (Under P0 violation) of the Wadham Co-Gen and addresses the low voltage issues at Colusa and Meridian substations
Project Need Date	2026
Expected In-service Date	May 2031
Interim Solution	Non-Consequential Load Curtailment
Project Cost	$27.8M - $55.5M
Alternatives Considered but Rejected	• Battery storage interconnection

Name	**Gold Hill-El Dorado Reinforcement**
Brief Description	• Serve Diamond Springs 115 kV Substation from Missouri Flat – Gold Hill #1 115 kV Line • Convert Shingle Springs Substation 115 kV bus to BAAH • Reconductor ~8.8 circuit miles between El Dorado and 008/062 of the El Dorado – Missouri Flat #2 115 kV Line with larger conductor to achieve minimum 577 Amps of summer emergency rating. • Remove any limiting components as necessary to achieve full conductor capacity
Type	Reliability
Objectives	• This project would eliminate the overload and low voltage issue under P2-1 contingency in the Gold Hill – El Dorado area and provide enough transmission capacity to meet future local demand on this line section. This project will increase operating flexibility, load serving capability, and customer reliability
Project Need Date	2026
Expected In-service Date	May 2032
Interim Solution	• Dispatch up El Dorado • If needed, curtail load in the Gold Hill – El Dorado area
Project Cost	$63.5 M – $127 M
Alternatives Considered but Rejected	• Battery storage interconnection • Convert Missouri Flat to Ring Bus and reconductor MISSOURI FLAT-GOLD HILL #2 115 kV line • Serving Shingle Spring and Apple Hill on #2 line and Placerville and Diamond Springs on #1 line; Reconductor EL DORADO-MISSOURI FLAT #1 and install shunt capacitor (30 Mvar) both at Shingle Springs and Diamond Springs substations • Install 40 MWx2 (30 MW plus 10 MW margin) Battery at Shingle Springs and 50 MW x2 (40 MW plus 10 MW margin) at Diamond Springs and Shunt Capacitors are also needed at Shingle Springs and Diamond Springs

Name	Jefferson-Stanford 60 kV Menlo to SLAC Tap Recabling Project
Brief Description	Install temporary overhead shoo-fly transmission line to bypass existing underground cable section between Menlo Substation and SLAC 60 kV Tap for continuous electric customer service. Replace 0.9 mile of existing 800 kcmil AL underground cable with larger size cable of at least 1000 Amp. normal capacity
Type	Reliability
Objectives	• To reduce radial Jefferson-Stanford 60 kV cable overloads
Project Need Date	Real-time need
Expected In-service Date	2029
Interim Solution	Load transfer in distribution
Project Cost	$20M- $40M
Alternatives Considered but Rejected	• **Replace UG cable with OH line.** Not recommended for potential violations on city ordinance and local opposition. • **Power Flow Control Device**. Not applicable for radial systems • **RAS.** Not applicable as it's a P0 issue. • **BESS.** Not feasible to install at the Stanford substation, the university campus, or the nearby residential area due to the limited land availability.

Name	**Konocti – Eagle Rock 60 kV Line Reconductoring**
Brief Description	Reconductor Konocti – Eagle Rock 60 kV Line and upgrade limiting elements to achieve full conductor capability
Type	Reliability
Objectives	• To eliminate overloads on Konocti – Eagle Rock 60 kV Line for loss of Geysers 3-Cloverdale 115 kV line; and prevents customers at Konocti, Middletown, Clearlake, Hartley and Upper Lake substations being dropped during summer peak loading.
Project Need Date	2026
Expected In-service Date	May 2030 or earlier.
Manual	Manual Load Curtailment
Project Cost	$16.2M - $32.5M
Alternatives Considered but Rejected	• RAS. Not applicable per ISO RAS Guidelines where involuntary load tripping is not allowed under N-1 scenario.

Name	**Moraga 230/115 kV Transformer Bank Addition Project**
Brief Description	Install a new 230/115 kV transformer bank at Moraga Substation with minimum 420 MVA for summer normal rating and 462 MVA for summer emergency rating.
Type	Reliability
Objectives	• To eliminate overloads on Moraga banks for P2 and P6 contingencies
Project Need Date	2026
Expected In-service Date	2031
Interim Solution	Generation redispatch
Project Cost	$20M- $40M
Alternatives Considered but Rejected	• **BESS**. Not recommended due to insufficient capacity in the charging window. • **Power Flow Control Device.** Not recommended due to the multiple power flow controllers required • **RAS**. Not applicable per ISO RAS Guidelines where involuntary load tripping is not allowed in high density load areas

Name	**San Miguel New 70kV Line Project**
Brief Description	Build new 70kV line from the loop-in point on the future Union-Paso Robles 70 kV line to San Miguel Substation.
Type	Reliability
Objectives	• This project protects against the NERC TPL-001-5 Category P1 violations. It will mitigate the low voltage issues. • This project will also increase load serving capability, improve customer reliability, and reduce losses.
Project Need Date	2026
Expected In-service Date	May 2032
Interim Solution	• Normally open Coalinga-San Miguel during summer to reduce fire risk and avoid LV violation. • Manually restore San Miguel load as allowed if San Miguel-Paso Robles line has a forced outage.
Project Cost	$15.5M - $30M
Alternatives Considered but Rejected	• Voltage Support at San Miguel. Not recommended despite comparable cost ($11.5M - $22M) because limited load serving capacity is provided, which is insufficient for projected load growth. • Flow Control Device. Not recommended because system is radial after the loss of San Miguel-Union 70kV line. • Energy Storage. Not recommended because deliverability is not available at San Miguel and Coalinga-San Miguel 70kV line has insufficient capacity to acommodate additional power flow caused by adding energy storage.

Name	**Pittsburg-Kirker 115kV Line Section Limiting Elements Upgrade Project**
Brief Description	Upgrade the limiting elements on the Pittsburg-Kirker-Columbia Steel 115 kV transmission line (Pittsburg-Kirker section) to achieve the full conductor rating of 1126 Amps summer normal rating.
Type	Reliability
Objectives	• To reduce radial line overload due to limiting elements on Pittsburg-Kirker-Columbia Steel 115 kV line
Project Need Date	2026
Expected In-service Date	2028
Interim Solution	Load transfer
Project Cost	$0.1M-$0.2M
Alternatives Considered but Rejected	• **Power Flow Control Device**. Not applicable for radial systems • **RAS.** Cost is higher than the limiting elements upgrade • **BESS**. Interconnection cost is higher than the limiting elements upgrade alternative

Name	Sobrante 230 kV Bus Upgrade Project
Brief Description	Expand Sobrante 230 kV bus and split to two sections, section D and section E by adding two sectionalizing breakers and one bus-tie breaker.
Type	Reliability
Objectives	• To prevent overloads caused by loss of bus tie breaker at Sobrante 230 kV bus
Project Need Date	2034
Expected In-service Date	2033
Interim Solution	NA
Project Cost	$7.5 M - $15 M
Alternatives Considered but Rejected	• **BESS**. Not recommended due to insufficient capacity in the charging window. • **Power Flow Control Device.** Not recommended due to the multiple power flow controllers required • **RAS**. Not applicable per ISO RAS Guidelines where involuntary load tripping is not allowed in high density load areas

Name	**San Mateo 230/115 kV Transformer Bank Addition Project**
Brief Description	Install a new 230/115 kV transformer bank at the San Mateo Substation, which will have a minimum summer normal rating of 420 MVA and a summer emergency rating of 462 MVA.
Type	Reliability
Objectives	• To eliminate overloads on San Mateo banks for P6 contingencies
Project Need Date	2034
Expected In-service Date	2032
Interim Solution	NA
Project Cost	$55 M - $110 M
Alternatives Considered but Rejected	• **BESS**. Not recommended due to insufficient capacity in the charging window. • **Power Flow Control Device.** Not recommended due to the multiple power flow controllers required • **RAS**. Not applicable per ISO RAS Guidelines where involuntary load tripping is not allowed in high density load areas

Name	**North Oakland Reinforcement Project**
Brief Description	Rebuilding the two Sobrante-Grizzly-Claremont #1 and #2 115 kV lines into four lines, each with a summer normal rating of at least 1714 Amps. Two of these lines will bypass Claremont Substation and connect to Oakland D and Oakland L Substations through new underground (UG) cable sections. Rerouting the Moraga-Oakland X #4 line to bypass the Oakland X Substation and instead connect to Oakland C via a new UG cable section. Converting Oakland C to Gas-Insulated Switchgear (GIS). Replacing the Oakland C-Oakland X UG cable with a larger size cable.
Type	Reliability
Objectives	• To eliminate overloads on multiple 115 kV transmission lines in the Oakland North pocket under P2 and P6 contingencies and address the high growth demand in North Oakland without relying on thermal generation • To improve system reliability by diversifying the sources serving North Oakland, including the Sobrante Substation as an additional source and reducing dependence on the Moraga side.
Project Need Date	2026
Expected In-service Date	2032
Interim Solution	Generation redispatch
Project Cost	$564 M - $1.127 B
Alternatives Considered but Rejected	• New 230 kV source. Not recommended due to the limited load serving capability in the 115 kV side • New 115 kV source from the San Francisco area. Not recommended due to the limited load serving capability in the 115 kV side • 115 kV grid upgrade. Not recommended due to the maximum achievable capacity on the cables, which limited the load serving capability

Name	South Oakland Reinforcement Project
Brief Description	Reconductor the Moraga-San Leandro #1, #2, and #3 115 kV lines to achieve a minimum capacity of 2288 Amps or higher, reconductor the Moraga-Oakland J 115 kV line to achieve a minimum capacity of 2288 Amps or higher, reconductor the San Leandro-Oakland J 115 kV line to achieve a minimum capacity of 2288 Amps or higher.
Type	Reliability
Objectives	• To eliminate overloads on multiple 115 kV transmission lines in the Oakland South pocket under P1 to P7 contingencies and address the high growth demand in South Oakland.
Project Need Date	2026
Expected In-service Date	2032
Interim Solution	Oakland J and San Leandro RAS and operational solutions such as sectionalizing the South Oakland grid under P3 and P6 contingencies.
Project Cost	$125 M – $250 M
Alternatives Considered but Rejected	• New 230 kV source. Not recommended due to the limited load-serving capability on the 115 kV side • 115 kV topology changes. Not recommended as they do not eliminate the long-term need to reconductor most lines, making this solution cost-ineffective.

Name	**Greater Bay Area 500 kV Transmission Reinforcement**
Brief Description	Rebuild Panoche-Las Aguillas-Metcalf 230 kV DCTL to a Manning-Las Aguillas-Moss Landing 500 kV line. Convert Las Aguillas 230 kV to 500/230 kV station, with two 500/230 kV transformers. Build a new 500 kV line from Moss Landing to Metcalf. Or Build a new 500 kV line from Maning to Metcalf.
Type	Reliability
Objectives	• Reduce the LCR need in the Bay Area and address the high growth demand in the South Bay. • Prevent the overloads on the Panoche-Las Aguillas-Moss Landing 230 kV path • Increase the transmission capability between the South and North systems.
Project Need Date	2034
Expected In-service Date	2032
Interim Solution	NA
Project Cost	$500 M – $700 M
Alternatives Considered but Rejected	• HVDC line from Warnerville to Newark. proved to be less effective in alleviating the loading on the multiple overloaded lines and also showed minimal benefit in relieving congestion on the Panoche-Las Aguillas-Moss Landing 230 kV path • Tesla – Newark area new 500/230 kV station. Not recommended for the same reason described in above alternative

Name	**Metcalf 500/230 kV Transformer Bank Addition Project**
Brief Description	Install a new 500/230 kV transformer bank at the Metcalf Substation, which will have a minimum summer normal and emergency rating of 1122 MVA.
Type	Reliability
Objectives	• To eliminate overloads on the Metcalf 500/230 kV transformer banks for P6 contingencies
Project Need Date	2034
Expected In-service Date	2034
Interim Solution	NA
Project Cost	$91 M - $182 M
Alternatives Considered but Rejected	• Build a new 500/230 kV substation or expand another 230 kV substation in the region with a 500/230 kV transformer bank. These alternatives were found to be ineffective in alleviating the load on the Metcalf transformer banks and were not economically viable. • Installation of a new 500/115 kV transformer bank at the Metcalf substation. Not recommended, as it would create unbalanced flows on the 230/115 kV side, leading to increased overload issues downstream and raising the short circuit duty on the already stressed 115 kV bus at this substation.

Name	New San Jose B-NRS 230 kV line
Brief Description	Build a new 230 kV line between the new San Jose B 230 kV (to be created as part of the Metcalf-San Jose B HVDC project) and Silicon Valley Power (SVP) NRS 230 kV station.
Type	Reliability
Objectives	• To complement the scope changes that have been made to the San Jose area HVDC lines and provide further load serving capability in the area.
Project Need Date	2028
Expected In-service Date	2028
Interim Solution	NA
Project Cost	$150 M - $175 M
Alternatives Considered but Rejected	• The alternative analysis was assessed in the San Jose area HVDC lines rescope assessment. Since this is a complementary component of the project, no alternatives were evaluated.

Name	South Bay Reinforcement Project
Brief Description	Reconductor the 115 kV transmission lines and components to higher capacity: San Jose B – Trimble, Kiefer – FMC,San Jose A – El Patio, Mountain View – Monta Vista, Whisman – Monta Vista, and Los Esteros – Metcalf 230 kV. Additionally, it includes the loop-in of the Los Esteros – Montague 115 kV line at Ringwood substation.
Type	Reliability
Objectives	• To ensure enough transmission capacity and reliability in the South Bay to prevent the 115 kV system overloads due to the aggressive ramp-up in load trends reflected in the current load forecast • To reinforce the most important 115 kV paths in the South Bay after the interconnection of the other bigger scope proposed projects for the area, such as the 500 kV line to Metcalf, the 500/230 kV transformer bank at this substation, the 1,000 HVDC line Metcalf – San Jose B, and the Newark – NRS, and NRS – San Jose B 230 kV lines.
Project Need Date	2029
Expected In-service Date	2032
Interim Solution	Operating solutions such as PST adjustment, HVDC ramp-down, and Los Esteros-Nortech-NRS 115 kV reactor switching
Project Cost	$217 M - $434 M
Alternatives Considered but Rejected	• Additional sources into the pocket or expansion of existing substation to prevent overloads. These type of alternatives are not recommended, since this need is already addressed by the bigger scope proposed projects for the area. • Given the high complexity of constructing new transmission assets or upgrading the existing grid in a densely populated urban environment, the lines identified for reconductoring do not have feasible alternatives for comparison.

Name	**Ames Distribution – Palo Alto 115 kV transmission line**
Brief Description	Construction of a new Ames Distribution – Palo Alto 115 kV line using existing vacant tower positions and idle lines, with a minimum capacity requirement of 1500 Amps, and the expansion of the Ames Distribution and Palo Alto Switching Station buses to allow for one additional 115 kV connection at each location.
Type	Reliability
Objectives	• Prevent the P6 and P7 overloads on the Ravenswood – Palo Alto 115 kV lines • Diversifying the sources serving the CPAU load to improve the supply security in the Palo Alto load in case of extreme events like the airplane strikes.
Project Need Date	2034
Expected In-service Date	2034
Interim Solution	NA
Project Cost	$42 M - $84 M
Alternatives Considered but Rejected	• New radial line from Ames Distribution to a new Adobe Creek substation which will take some of the load of tha Palo Alto station, avoiding the overloads. • New line from Ames Distribution to the Adobe Creek station and continuing to Palo Alto. • These alternatives are not recommended because they require a new switching station, which makes them economically unfeasible.

Name	Metcalf-Piercy & Swift and Newark-Dixon Landing 115 kV Upgrade (re-scope)
Brief Description	Reconductor the following 115 kV lines using advanced conductors to achieve a summer emergency rating of 3,000 Amps or higher: Piercy-Metcalf, Swift-Metcalf, Newark-Dixon Landing, and McKee-Piercy.
Type	Reliability
Objectives	• To ensure enough transmission capacity and reliability in one of the most importants 115 kV links between Newark and Metcalf to prevent system overloads due to the aggressive ramp-up in load trends reflected in the current load forecast
Project Need Date	2028
Expected In-service Date	2028
Interim Solution	NA
Project Cost	$124 M - $248 M
Alternatives Considered but Rejected	• No alternatives were considered since this is a project rescope. The analysis of alternatives was conducted when the project was initially proposed.

Name	Sloan Canyon Tertiary Reactors
Brief Description	The scope of this project is to install three 66 MVAR shunt reactors on the 24.9 kV tertiary of the Sloan Canyon 500/230 kV transformer.
Type	Reliability
Objectives	To address high voltage under contingency conditions. During the P6 contingency the Harry Allen-Sloan Canyon 500 kV and Sloan Canyon-Eldorado 500 kV lines the 500 kV bus voltage at Sloan Canyon was 560 kV in the 2029 summer peak base case which exceeds the 550 kV high voltage limit.
Project Need Date	2027
Expected In-service Date	2027
Interim Solution	NA
Project Cost	$5 M - 10 M
Alternatives Considered but Rejected	GLW identified the potential for high voltages with all lines in-service, so deenergizing the lines is not a feasible option due to potential daily operation of the breakers, increased maintenance costs and breaker failure rates.

Name	**Eagle Rock- Fulton- Silverado 115 kV Line Reconductor**
Brief Description	Reconductor Eagle Rock-020/087A with minimum rating of 1236 Amps or higher and update any limiting components at the substation (if any). Reconductor 020/87A-037/191A with minimum rating of 1687 Amps or higher and update any limiting components at the substation (if any).
Type	Policy
Objectives	To mitigate overloads identified in the on-peak baseline deliverability study
Project Need Date	2034
Expected In-service Date	2034
Interim Solution	N/A
Project Cost	$92.9M
Alternatives Considered but Rejected	RAS was considered but ruled out due to RAS criteria violation.

Name	**Reconductor of GWF – Kingsburg 115 kV line**
Brief Description	Reconductor the entire GWF-Kingsburg 115 kV Line with minimum summer emergency rating of 1500 Amps or higher and update the limiting components at the substations if there is any.
Type	Policy
Objectives	To mitigate overloads identified in the on-peak baseline deliverability study
Project Need Date	2034
Expected In-service Date	2034
Interim Solution	N/A
Project Cost	$81.6M
Alternatives Considered but Rejected	RAS was considered but ruled out due to RAS criteria violation.

Name	New Helm 230/70 kV Bank #2
Brief Description	The scope includes a new 230/70 kV Bank at Helm Substation with a 200 MVA rating. It will also include any bus upgrades and limiting equipment upgrades to achieve this transformer rating.
Type	Policy
Objectives	To mitigate overloads identified in the on-peak baseline deliverability study
Project Need Date	2034
Expected In-service Date	2034
Interim Solution	N/A
Project Cost	$115M
Alternatives Considered but Rejected	Construct Helm-Crescent Sw Station 70 kV #1 and #2 line (5 miles x2, DCTL) with mininum summer emergency rating of 1500 Amps or higher (795 ACSS or larger) each and upgrade buses as needed