

## **APPENDIX E: Project Need and Description**

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<b>Name</b>	<b>Contra Costa 230 kV Line Terminals Reconfiguration</b>
<b>Brief Description</b>	Swap Lone Tree – Contra Costa PP 230 kV line and Birds Landing – Contra Costa PP 230 kV line terminal positions at Contra Costa PP 230 kV Substation and relocate Windmaster from Section F to Section E.
<b>Type</b>	Reliability
<b>Objectives</b>	Protects against the NERC TPL-001-4 Category P2 bus tie breaker fault at Contra Costa PP 230 kV bus. Las Positas – Newark 230 kV line was overloaded following a P2-4 contingency starting in 20
<b>Project Need Date</b>	NERC Category P2 starting 2023
<b>Expected In-service Date</b>	May 2025 or earlier
<b>Interim Solution</b>	Operation solution
<b>Project Cost</b>	\$5M - \$10M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• Converting to BAAH</li> <li>• Add sectionalizing breaker not recommended as the fourth section would be beyond PG&amp;E's standard.</li> </ul>

<b>Name</b>	<b>Vasona-Metcalf 230 kV Line Limiting Elements Removal Project</b>
<b>Brief Description</b>	The scope of this project is to remove the limiting elements for Vasona-Metcalf 230 kV line at Vasona and Metcalf Substations to achieve the line conductor rating
<b>Type</b>	Reliability
<b>Objectives</b>	Upgrade terminal equipment rating to achieve full conductor capacity
<b>Project Need Date</b>	NERC Category P2 and P7 starting 2023.
<b>Expected In-service Date</b>	May 2025 or earlier
<b>Interim Solution</b>	Operation solution
<b>Project Cost</b>	\$0.6M - \$1.2M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>Energy storage, which is not recommended because a roughly 152 MW*4 hour energy storage will be required to mitigate all the identified overloads and it will not be cost-effective.</li> </ul>

<b>Name</b>	<b>Coppermine 70 kV Reinforcement Project</b>
<b>Brief Description</b>	Reconductor Borden-Cassidy and Cassidy-Coppermine and add voltage support at Coppermine
<b>Type</b>	Reliability
<b>Objectives</b>	Prevent normal overloads and low voltages at coppermine
<b>Project Need Date</b>	P0 overloads based on historical data
<b>Expected In-service Date</b>	May 2027
<b>Interim Solution</b>	Tivy Valley CB 42 to be normal open in summer to prevent overloads and low voltages
<b>Project Cost</b>	\$15.8M - \$31.6M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• Introduction of 115 kV source as its not cost-effective</li> <li>• Energy Storage is not recommended as it will also trigger a complete 70 kV bus upgrade which is expensive. Other alternative interconnection optionsa are not feasible.</li> </ul>

<b>Name</b>	<b>Cortina 230/115/60 kV Bank #1 Replacement</b>
<b>Brief Description</b>	The scope of this project is to replace the Cortina 230/115/60 kV Bank #1 with one 230/115 kV and one 115/60 kV transformer banks
<b>Type</b>	Reliability
<b>Objectives</b>	Thermal overload issues for Cortina 230/115/60 kV Bank #1 for NERC Category P1 and P3 contingencies
<b>Project Need Date</b>	NERC Category P1 starting 2023
<b>Expected In-service Date</b>	May 2027
<b>Interim Solution</b>	Open Cortina CB 82
<b>Project Cost</b>	\$21M - \$42M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>To rely on operation Procedure to open Cortina 115/60 kV Bank #5. This will result in load tripping following N-1 which is not acceptable for the long term.</li> <li>Converting Existing Cortina 230/115/60 kV Bank #1 to 115/60 kV and adding one new 230/115 kV. The cos is higher than the proposed project (\$25M - \$50M)</li> <li>Keeping existing Cortina 230/115/60 kV bank #1 and add one new 230/115 kV bank. The cost is higher than the proposed project (\$22M - \$44M)</li> </ul>

<b>Name</b>	<b>Manteca-Ripon-Riverbank-Melones Area 115 kV Line Reconductoring</b>
<b>Brief Description</b>	Reconductor 2.4 miles between Manteca and Ripon Jct and 1.8 miles between Riverbank SW STA and Valley Home Tap.
<b>Type</b>	Reliability
<b>Objectives</b>	Reconductor Manteca - Ripon Jct - Valley Home Tap
<b>Project Need Date</b>	NERC Category P1 starting 2023
<b>Expected In-service Date</b>	May 2028
<b>Interim Solution</b>	Operating measure to connect Ripon load as a tap to the 115 kV line
<b>Project Cost</b>	\$6.8M - \$13.6M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>Line Re-rate: This is not applicable in the area as the re-rate is only up to 7pm while the peak load in the area occurs after 7pm.</li> </ul>

<b>Name</b>	<b>Weber - Mormon Jct 60 kV Line Section Reconductoring</b>
<b>Brief Description</b>	To reconductor 6.2 circuit miles of the Weber - Mormon Jct 60 kV Line.
<b>Type</b>	Reliability
<b>Objectives</b>	Reconductor Weber-Mormon 60kV Line
<b>Project Need Date</b>	NERC Category P0 starting 2023.
<b>Expected In-service Date</b>	May 2027
<b>Interim Solution</b>	Operating measure to transfer load to the neighboring substations
<b>Project Cost</b>	\$9.3M - \$18.6M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>Line Re-rate: This is not applicable in the area as the re-rate is only up to 7pm while the peak load in the area occurs after 7pm.</li> <li>Install 2x15 MW BESS: Just the interconnection cost, excluding the battery cost, is \$13M - \$26M which is more than the proposed project.</li> </ul>



<b>Name</b>	<b>San Jose Area HVDC Lines</b>
<b>Brief Description</b>	To build two HVDC lines, 1) from Newark 230 kV to NRS 230 kV and 2) Metcalf 500 kV to San Jose B 115 kV.
<b>Type</b>	Reliability
<b>Objectives</b>	To address multiple category contingencies driven near, mid and long-term reliability issues in San Jose 115 kV system.
<b>Project Need Date</b>	2023
<b>Expected In-service Date</b>	2027
<b>Interim Solution</b>	Operation solution and series compensation device for flow control.
<b>Project Cost</b>	Newark-NRS: \$325M - \$510M Metcalf-San Jose B: \$425M - \$615M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• 115 kV lines reconductoring: This alternative is not recommended as the forecasted overall San Jose area load is beyond capacity of 115 kV lines.</li> <li>• New 230 kV AC lines from Newark and Metcalf: This alternative is not recommended because of unbalance in natural flows from the Newark and Metcalf sources.</li> <li>• Energy Storage: This alternative is not recommended as previous studies have shown that San Jose system has far less charging capacity compared to the size of energy storage needed to address all reliability issues identified in the area.</li> </ul>

<b>Name</b>	<b>Series Compensation on Los Esteros-Nortech 115 kV Line</b>
<b>Brief Description</b>	To install about 2 ohm series reactor on the Los Esteros-Nortech 115 kV line.
<b>Type</b>	Reliability
<b>Objectives</b>	To address critical (P1 contingency driven) issue on the Los Esteros-Nortech 115 kV line in the interim.
<b>Project Need Date</b>	2023
<b>Expected In-service Date</b>	2023
<b>Interim Solution</b>	NA
<b>Project Cost</b>	\$10M - \$15M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• 115 kV lines reconductoring: This alternative is not recommended due to higher cost.</li> </ul>

<b>Name</b>	<b>Table Mountain 500/230 kV TB #2 Project.</b>
<b>Brief Description</b>	The scope of this project is to install another 500/230 kV transformer bank at the Table Mountain substation.
<b>Type</b>	Reliability
<b>Objectives</b>	There are high voltage issues in the Table Mountain/Palermo 230 kV area under the maintenance outage or contingency of the existing 500/230 kV transformer at Table Mountain substation. This project will address the issue.
<b>Project Need Date</b>	2027 or earlier
<b>Expected In-service Date</b>	2027 or earlier
<b>Interim Solution</b>	Operating solution
<b>Project Cost</b>	\$38.4M – \$76.8M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• Do nothing (status quo)</li> <li>• Install reactive support device</li> </ul>

<b>Name</b>	<b>Atlantic 60 kV Voltage Regulator Project.</b>
<b>Brief Description</b>	The scope of this project is to install a voltage regulator at the existing Atlantic 60 kV substation .
<b>Type</b>	Reliability
<b>Objectives</b>	There are high voltage issues on the 60 kV system which is radially supplied by the Atlantic 230/60 kV transformer. The transformer does not have LTC and there are no means for operators to control the voltage. This project will address the issue.
<b>Project Need Date</b>	2026 or earlier
<b>Expected In-service Date</b>	2026 or earlier
<b>Interim Solution</b>	Operating solution
<b>Project Cost</b>	\$5M – \$10M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• Do nothing (status quo)</li> <li>• Replace the transformer with another one with LTC</li> </ul>

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<b>Name</b>	<b>Cooley Landing Substation Circuit Breaker #62 Upgrade</b>
<b>Brief Description</b>	Upgrade Cooley Landing Circuit Breaker #62
<b>Type</b>	Reliability
<b>Objectives</b>	Upgrade Cooley Landing Circuit Breaker #62 due to overstress issues
<b>Project Need Date</b>	2023
<b>Expected In-service Date</b>	2026
<b>Interim Solution</b>	Operating Solution
<b>Project Cost</b>	\$750k - \$1.13M
<b>Alternatives Considered but Rejected</b>	None

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<b>Name</b>	<b>Metcalf Substation Circuit Breaker #292 Upgrade</b>
<b>Brief Description</b>	Upgrade Metcalf Circuit Breaker #292
<b>Type</b>	Reliability
<b>Objectives</b>	Upgrade Metcalf Circuit Breaker #292 due to overstress issues
<b>Project Need Date</b>	2023
<b>Expected In-service Date</b>	2025
<b>Interim Solution</b>	Operating Solution
<b>Project Cost</b>	\$900k - \$1.13M
<b>Alternatives Considered but Rejected</b>	None

<b>Name</b>	<b>Victor 230 kV Switchrack Reconfiguration</b>
<b>Brief Description</b>	Convert two bus positions from the existing double bus double breaker configuration to breaker-and-a-half configuration by adding a tie breaker and relocate two lines.
<b>Type</b>	Reliability-Driven
<b>Objectives</b>	Mitigate voltage instability risk during planned/unplanned Victor 230kV bus outage and associated constraints; provide operational flexibility and enhance reliability
<b>Project Need Date</b>	2023
<b>Expected In-service Date</b>	12/31/2023
<b>Interim Solution</b>	None
<b>Project Cost</b>	\$5.0M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• Status Quo. This alternative is not recommended due to the post contingency voltage instability risk</li> </ul>

<b>Name</b>	<b>Devers 230 kV Reconfiguration Project</b>
<b>Brief Description</b>	Minor system reconfiguration needed, to avoid a system voltage collapse following loss of the remaining Devers 230 kV bus, during a planned outage of the other Devers 230 kV bus.
<b>Type</b>	Reliability-Driven
<b>Objectives</b>	<p>With one of the two 230 kV buses at the Devers substation de-energized for maintenance purposes; a fault on the second bus would result in a system voltage collapse. During this event, with the current bus configuration, the Devers - Mirage No. 2 and Devers - Vista No. 2 lines would be disconnected, from the Devers substation. This would result in voltage collapse for that area; and isolation of the IID and MWD systems from the SCE system.</p> <p>The proposed bus configuration, during the same event described above, the Devers - Mirage No. 2 line would stay connected to the system through the Devers 1AA Bank; while the Devers - Vista No. 2 line would serve the 4A Bank, and a system voltage collapse would be avoided.</p>
<b>Project Need Date</b>	2023
<b>Expected In-service Date</b>	December 31 <sup>st</sup> 2023
<b>Interim Solution</b>	None
<b>Project Cost</b>	\$6.0M
<b>Alternatives Considered but Rejected</b>	Do nothing



<b>Name</b>	<b>Antelope 66 kV Short Circuit Duty Mitigation Project</b>
<b>Brief Description</b>	This project proposes to upgrade the existing Antelope 66 kV switchrack to a 50 kA short circuit duty rating by replacing (41) 66 kV circuit breakers, (101) 66 kV ground disconnect switches, (45) 66 kV potential transformers, performing a ground grid study, and removing (15) steel lattice structures and installing (15) new dead-end structures.
<b>Type</b>	Reliability-Driven
<b>Objectives</b>	The existing circuit breakers are currently operating at 96 percent of their 40 kA short circuit duty rating and our preliminary analyses show that adding the CPUC portfolio generation at the Antelope Substation 230 kV bus alone will trigger the need for circuit breaker replacement.
<b>Project Need Date</b>	1/1/2026
<b>Expected In-service Date</b>	1/1/2026
<b>Interim Solution</b>	none
<b>Project Cost</b>	\$55 M
<b>Alternatives Considered but Rejected</b>	Do nothing

<b>Name</b>	<b>Collinsville 500/230 kV Substation Project</b>
<b>Brief Description</b>	The scope of this project includes a new 500/230 kV substation (Collinsville), looping in the Vaca Dixon – Tesla 500 kV line into the new substation, two 500/230 kV transformers, and two 230 kV cables connecting Collinsville to Pittsburg substation. The project provides an additional supply from the 500 kV system into the northern Greater Bay Area to increase reliability of the area and advance additional renewable generation in the northern area.
<b>Type</b>	Policy-Driven
<b>Objectives</b>	To address a number of identified transmission constraints within the base portfolio of policy studies
<b>Project Need Date</b>	2028 or earlier
<b>Expected In-service Date</b>	2028 or earlier
<b>Interim Solution</b>	Operating solution
<b>Project Cost</b>	\$475M - \$675M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• Do nothing (status quo)</li> <li>• Initially reconductor several 230 kV lines in the area (Lone Tree-USWP-JRW-Cayetano 230 kV line, Cayetano-North Dublin 230 kV line, Las Positas-Newark 230 kV line) with more system reinforcements in future.</li> </ul>

<b>Name</b>	<b>Manning 500/230 kV Substation Project.</b>
<b>Brief Description</b>	The scope of this project includes a new 500/230 kV substation (Manning), looping in the Midway – Los Banos and Gates – Los Banos 500 kV lines into the new substation, two 500/230 kV transformers, looping in the Panoche – Tranquility 230 kV lines into the new substation and reconductor the Mannign – Tranquility 230 kV lines, and a new double circuit 230 kV line from Manning to Tranquility substation.
<b>Type</b>	Policy-Driven
<b>Objectives</b>	To address a number of identified transmission constraints within the base portfolio of policy studies. This project will allow for the advancement of renewable generation within the Westlands or San Joaquin area that has been identified with significant least conflict lands for potential solar development . In addition within the SB100 analysis, the California Energy Commission has identified this area having significant potential for solar development for the state to meet the long-term greenhouse gas goals.
<b>Project Need Date</b>	2028 or earlier
<b>Expected In-service Date</b>	2028 or earlier
<b>Interim Solution</b>	Operating solution
<b>Project Cost</b>	\$325M – \$485M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• Do nothing (status quo)</li> <li>• Initially reconductor a number of 230 kV lines (Bordern – Story 230 kV line) with many more system reinforcements in future to integrate the solar generation and to transfer power to the rest of the CAISO system.</li> </ul>

<b>Name</b>	<b>GLW/VEA area upgrades</b>
<b>Brief Description</b>	Rebuild Desert View – Northwest 230 kV, Pahrump – Gamebird 230 kV, Gamebird – Trout Canyon 230kV and Trout Canyon – Sloan Canyon 230 kV to double circuit lines; rebuild Innovation – Pahrump 230 kV line; add a second Innovation – Desert View 230 kV line; add a 500/230 kV transformer at Sloan Canyon and loop in the Harry Allen – Eldorado 500 kV line; a 138kV phase shifter at Innovation 138 kV and an upgrade to WAPA’s Amargosa 230/138 kV transformer
<b>Type</b>	Policy-Driven
<b>Objectives</b>	Accommodate 2,024 MW CPUC base portfolio generation in the GLW area; provide transmission capability for existing and future generation development without relying on neighboring transmission systems.
<b>Project Need Date</b>	2025
<b>Expected In-service Date</b>	2025
<b>Interim Solution</b>	Congestion management and proposed RAS in GIDAP process
<b>Project Cost</b>	\$278 M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>GLW Conversion Project: the project did not help with commercial issues of whether the ISO system had enough capacity without relying on the neighboring transmission system and thus was rejected</li> </ul>

<b>Name</b>	<b>Laguna Bell-Mesa No. 1 230 kV Line Rating Increase Project</b>
<b>Brief Description</b>	Reconductor Laguna Bell-Mesa No. 1 230 kV line
<b>Type</b>	Policy-Driven
<b>Objectives</b>	To mitigate the Mesa–Laguna Bell 230 kV deliverability constraint.
<b>Project Need Date</b>	Q4 2023
<b>Expected In-service Date</b>	Q4 2023
<b>Interim Solution</b>	Congestion management
<b>Project Cost</b>	\$17.3 M
<b>Alternatives Considered but Rejected</b>	<ul style="list-style-type: none"> <li>• Laguna Bell – Mesa Series Compensation Project (\$18.1 M)</li> </ul>

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<b>Name</b>	<b>Installing 10 ohms series reactors on the PG&amp;E's Moss Landing – Las Aguilas 230 kV line</b>
<b>Brief Description</b>	Installing a 10 ohms series reactor on the Mosslanding – Las Aguilas 230 kV line
<b>Type</b>	Economic-Driven
<b>Objectives</b>	To mitigate congestion on the Mosslanding – Las Aguilas 230 kV line
<b>Project Need Date</b>	
<b>Expected In-service Date</b>	TBD
<b>Interim Solution</b>	None
<b>Project Cost</b>	\$20 M
<b>Alternatives Considered but Rejected</b>	Reconductoring