APPENDIX E: Project Need and Description

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Name	**Contra Costa 230 kV Line Terminals Reconfiguration**
Brief Description	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.
Type	Reliability
Objectives	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
Project Need Date	NERC Category P2 starting 2023
Expected In-service Date	May 2025 or earlier
Interim Solution	Operation solution
Project Cost	$5M - $10M
Alternatives Considered but Rejected	• Converting to BAAH • Add sectionalizing breaker not recommended as the fourth section would be beyond PG&E's standard.

Name	**Vasona-Metcalf 230 kV Line Limiting Elements Removal Project**
Brief Description	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
Type	Reliability
Objectives	Upgrade terminal equipment rating to achieve full conductor capacity
Project Need Date	NERC Category P2 and P7 starting 2023.
Expected In-service Date	May 2025 or earlier
Interim Solution	Operation solution
Project Cost	$0.6M - $1.2M
Alternatives Considered but Rejected	• 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.

Name	Coppermine 70 kV Reinforcement Project
Brief Description	Reconductor Borden-Cassidy and Cassidy-Coppermine and add voltage support at Coppemine
Type	Reliability
Objectives	Prevent normal overlads and low voltages at coppermine
Project Need Date	P0 overloads based on historical data
Expected In-service Date	May 2027
Interim Solution	Tivy Valley CB 42 to be normal open in summer to prevent overloads and low voltages
Project Cost	$15.8M - $31.6M
Alternatives Considered but Rejected	• Introduction of 115 kV source as its not cost-effective • 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.

Name	**Cortina 230/115/60 kV Bank #1 Replacement**
Brief Description	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
Type	Reliability
Objectives	Thermal overload issues for Cortina 230/115/60 kV Bank #1 for NERC Category P1 and P3 contingencies
Project Need Date	NERC Category P1 starting 2023
Expected In-service Date	May 2027
Interim Solution	Open Cortina CB 82
Project Cost	$21M - $42M
Alternatives Considered but Rejected	• 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. • 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) • 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)

Name	Manteca-Ripon-Riverbank-Melones Area 115 kV Line Reconductoring
Brief Description	Reconductor 2.4 miles between Manteca and Ripon Jct and 1.8 miles between Riverbank SW STA and Valley Home Tap.
Type	Reliability
Objectives	Reconductor Manteca - Ripon Jct - Valley Home Tap
Project Need Date	NERC Category P1 starting 2023
Expected In-service Date	May 2028
Interim Solution	Operating measure to connect Ripon load as a tap to the 115 kV line
Project Cost	$6.8M - $13.6M
Alternatives Considered but Rejected	• 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.

Name	**Weber - Mormon Jct 60 kV Line Section Reconductoring**
Brief Description	To reconductor 6.2 circuit miles of the Weber - Mormon Jct 60 kV Line.
Type	Reliability
Objectives	Recondutor Weber-Mormon 60kV Line
Project Need Date	NERC Category P0 starting 2023.
Expected In-service Date	May 2027
Interim Solution	Operating measure to transfer load to the neighboring substations
Project Cost	$9.3M - $18.6M
Alternatives Considered but Rejected	• 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. • Install 2x15 MW BESS: Just the interconnection cost, excluding the battery cost, is $13M - $26M which is more than the proposed project.

Name	San Jose Area HVDC Lines
Brief Description	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.
Type	Reliability
Objectives	To address multiple category contingencies driven near, mid and long-term reliability issues in San Jose 115 kV system.
Project Need Date	2023
Expected In-service Date	2027
Interim Solution	Operation soluiton and series compensation device for flow control.
Project Cost	Newark-NRS: $325M - $510M Metcalf-San Jose B: $425M - $615M
Alternatives Considered but Rejected	• 115 kV lines reconductoring: This alternative is not recommended as the forecasted overall San Jose area load is beyond capacity of 115 kV lines. • 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. • 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.

Name	Series Compensation on Los Esteros-Nortech 115 kV Line
Brief Description	To install about 2 ohm series reactor on the Los Esteros-Nortech 115 kV line.
Type	Reliability
Objectives	To address ctitical (P1 contengency driven) issue on the Los Esteros-Nortech 115 kV line in the interim.
Project Need Date	2023
Expected In-service Date	2023
Interim Solution	NA
Project Cost	$10M - $15M
Alternatives Considered but Rejected	• 115 kV lines reconductoring: This alternative is not recommended due to higher cost.

Name	**Table Mountain 500/230 kV TB #2 Project.**
Brief Description	The scope of this project is to install another 500/230 kV transformer bank at the Table Mountain substation.
Type	Reliability
Objectives	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.
Project Need Date	2027 or earlier
Expected In-service Date	2027 or earlier
Interim Solution	Operating solution
Project Cost	$38.4M – $76.8M
Alternatives Considered but Rejected	• Do nothing (status quo) • Install reactive support device

Name	**Atlantic 60 kV Voltage Regulator Project.**
Brief Description	The scope of this project is to install a voltage regulator at the existing Atlantic 60 kV substation .
Type	Reliability
Objectives	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.
Project Need Date	2026 or earlier
Expected In-service Date	2026 or earlier
Interim Solution	Operating solution
Project Cost	$5M – $10M
Alternatives Considered but Rejected	• Do nothing (status quo) • Replace the transformer with another one with LTC

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

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

Name	Victor 230 kV Switchrack Reconfiguration
Brief Description	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.
Type	Reliability-Driven
Objectives	Mitigate voltage instability risk during planned/unplanned Victor 230kV bus outage and associated constraints; provide operational flexibility and enhance reliability
Project Need Date	2023
Expected In-service Date	12/31/2023
Interim Solution	None
Project Cost	$5.0M
Alternatives Considered but Rejected	• Status Quo. This alternative is not recommended due to the post contingency voltage instability risk

Name	**Devers 230 kV Reconfiguration Project**
Brief Description	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.
Type	Reliability-Driven
Objectives	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. 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.
Project Need Date	2023
Expected In-service Date	December 31st 2023
Interim Solution	None
Project Cost	$6.0M
Alternatives Considered but Rejected	Do nothing

Name	Antelope 66 kV Short Circuit Duty Mitigation Project
Brief Description	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.
Type	Reliability-Driven
Objectives	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.
Project Need Date	1/1/2026
Expected In-service Date	1/1/2026
Interim Solution	none
Project Cost	$55 M
Alternatives Considered but Rejected	Do nothing

Name	Collinsville 500/230 kV Substation Project
Brief Description	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 substaiton, 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.
Type	Policy-Driven
Objectives	To address a number of identified transmission constraints within the base portfolio of policy studies
Project Need Date	2028 or earlier
Expected In-service Date	2028 or earlier
Interim Solution	Operating solution
Project Cost	$475M - $675M
Alternatives Considered but Rejected	• Do nothing (status quo) • 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.

Name	**Manning 500/230 kV Substation Project.**
Brief Description	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 substaiton, 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.
Type	Policy-Driven
Objectives	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.
Project Need Date	2028 or earlier
Expected In-service Date	2028 or earlier
Interim Solution	Operating solution
Project Cost	$325M – $485M
Alternatives Considered but Rejected	• Do nothing (status quo) • 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.

Name	GLW/VEA area upgrades
Brief Description	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
Type	Policy-Driven
Objectives	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.
Project Need Date	2025
Expected In-service Date	2025
Interim Solution	Congestion management and proposed RAS in GIDAP process
Project Cost	$278 M
Alternatives Considered but Rejected	• 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

Name	**Laguna Bell-Mesa No. 1 230 kV Line Rating Increase Project**
Brief Description	Reconductor Laguna Bell-Mesa No. 1 230 kV line
Type	Policy-Driven
Objectives	To mitigate the Mesa–Laguna Bell 230 kV deliverability constraint.
Project Need Date	Q4 2023
Expected In-service Date	Q4 2023
Interim Solution	Congestion management
Project Cost	$17.3 M
Alternatives Considered but Rejected	• Laguna Bell – Mesa Series Compensation Project ($18.1 M)

Name	**Installing 10 ohms series reactors on the PG&E's Moss Landing – Las Aguilas 230 kV line**
Brief Description	Installing a 10 ohms series reactor on the Mosslanding – Las Aguilas 230 kV line
Type	Economic-Driven
Objectives	To mitigate congestion on the Mosslanding – Las Aguilas 230 kV line
Project Need Date	
Expected In-service Date	TBD
Interim Solution	None
Project Cost	$30-40 M
Alternatives Considered but Rejected	Reconductoring