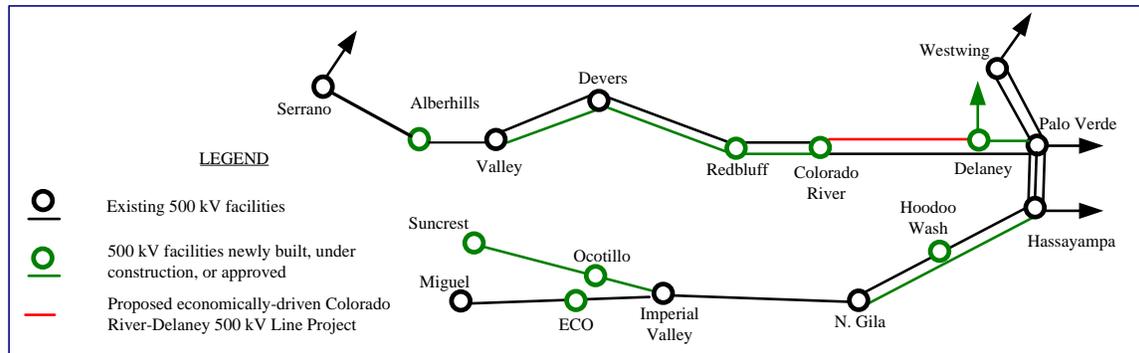


APPENDIX G: Draft Description and Functional Specifications for Transmission Elements Eligible for Competitive Solicitation

G1 Colorado River – Delaney 500 kV Line Description and Functional Specifications

G1.1 Description

In the draft 2012-2013 Transmission Plan, the ISO has identified an economically driven need for a 500 kV transmission line between SCE owned Colorado River 500 kV substation and APS owned Delaney 500 kV substation, as depicted below:



The ISO estimates that the cost of the proposed 500 kV line will approximately cost \$325 million.

G1.2 Functional Specifications

Overhead Line Construction

Line Terminus 1: Colorado River Substation 500 kV Bus

Line Terminus 2: Delaney Substation 500 kV Bus

Nominal Phase to Phase Voltage: 500 kV

Minimum Line Continuous Ampacity - Summer: 3,950 Amps

Minimum Line Continuous Ampacity – Winter: 3,950 Amps

Minimum Line 4 Hour Emergency Ampacity – Summer: 5,330 Amps

Minimum Line 4 Hour Emergency Ampacity – Winter: 5,330 Amps

Minimum Line 30 Minute Emergency Ampacity – Summer: 6,040 Amps

Minimum Line 30 Minute Emergency Ampacity – Winter: 6,040 Amps

Approximate Line Impedance: $(0.0012 \text{ to } 0.0015) + j(0.027 \text{ to } 0.033)$ pu (100 MVA base)

Maximum Line Resistance: 0.0015 pu (100 MVA base)

Approximate Line Length: 115-140 miles

Approximate Switched Shunt Line Reactor Capacity: 75 MVAR switched shunt reactor connected to the line at Colorado River terminal, 75 MVAR switched shunt reactor connected to the line at Delaney terminal.

Approximate Series Compensation Level: 70%

Location of Series Compensation: Approximately in the middle of the Colorado River-Delaney 500 kV line.

Minimum Series Capacitor Continuous Ampacity - Summer: 2,700 Amps

Minimum Series Capacitor Continuous Ampacity – Winter: 2,700 Amps

Minimum Series Capacitor 4 Hour Emergency Ampacity – Summer: 2,700 Amps

Minimum Series Capacitor 4 Hour Emergency Ampacity – Winter: 2,700 Amps

Minimum Series Capacitor 30 Minute Emergency Ampacity – Summer: 3,645 Amps

Minimum Series Capacitor 30 Minute Emergency Ampacity – Winter: 3,645 Amps

Latest In Service Date: 2018

Support Structures: Single circuit structures

Shield Wire Required: Optical ground wire (minimum 6 pairs of fibers)

Failure Containment Loading Mitigation (anti-cascade structures, etc.): Per applicable codes.

Shield Wire Ground Fault Withstand Ampacity: Coordinate with interconnecting entities.

Aeolian Vibration Control (Conductor and Shield Wire): Vibration dampers must be installed on all conductors and overhead shield wires, with the exception of slack spans.

Transmission Line Minimum BIL: 1,800 kV with solidly grounded systems.

Minimum ROW Width: Per applicable codes.

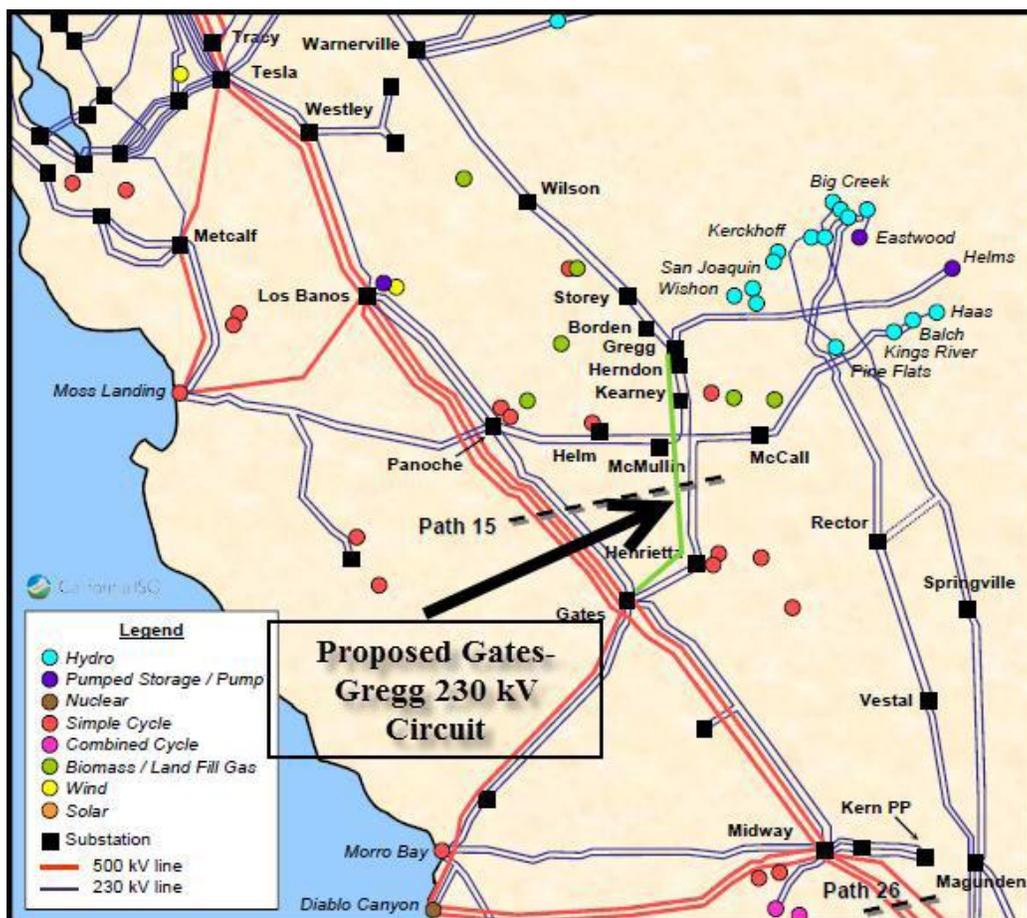
Route Requirement: The route should meet the applicable WECC criteria so that Part 1.1 of Requirement R1 of WECC System Performance Criterion (TPL-001-WECC-CRT-2) related to the common mode contingency does not apply to the Colorado River-Palo Verde and Colorado River-Delaney 500 kV lines.

Governing Design and Construction Standards: (GO 95, NESC Code, applicable municipal codes).

G2 Gates-Gregg 230 kV Line Description and Functional Specifications

G2.1 Description

In the draft 2012-2013 Transmission Plan, the ISO has identified a reliability project with policy benefits for a 230 kV transmission line between PG&E owned Gates and Gregg 230 kV substations, as depicted below:



The ISO estimates that the cost of the 230 kV line will be between \$115 and \$145 million. This proposed transmission configuration will provide a reliable means to pump water at Helms during dry year conditions in order to generate the next day without jeopardizing load reliability during peak periods, it will also provide a great increase in Helms pumping window in order to facilitate with the daily load and renewable balancing cycle, while minimizing environmental impacts in the PG&E service territory.

G2.2 Functional Specifications

Overhead Line Construction

Line Terminus 1: PG&E Gates 230 kV Bus

Line Terminus 2: PG&E Gregg 230 kV Bus

Nominal Phase to Phase Voltage: 230 kV

Minimum Continuous Ampacity - Summer: 1,893 Amps (~754 MVA)

Minimum Continuous Ampacity – Winter: 2,069 Amps (~824 MVA)

Minimum 4 Hour Emergency Ampacity – Summer: 1,893 Amps (~754 MVA)

Minimum 4 Hour Emergency Ampacity – Winter: 2,069 Amps (~824 MVA)

Approximate Line Impedance (Ohms): $(0.01) + j(0.08)$ pu 100 MVA base

Approximate Series Compensation Level: N/A

Approximate Line Length: 59 miles

Latest In Service Date: May, 2022

Support Structures: Double circuit structures – strung one side (one circuit).

Shield Wire Required: Optical ground wire (minimum 6 pairs of fibers).

Failure Containment Loading Mitigation (anti-cascade structures, etc.): Per applicable codes.

Shield Wire Ground Fault Withstand Ampacity: Coordinate with interconnecting PTOs.

Aeolian Vibration Control (Conductor and Shield Wire): Vibration dampers must be installed on all overhead conductors and shield wires, with the exception of slack spans.

Transmission Line Minimum BIL: 1,050 kV (900 kV for solidly grounded systems)

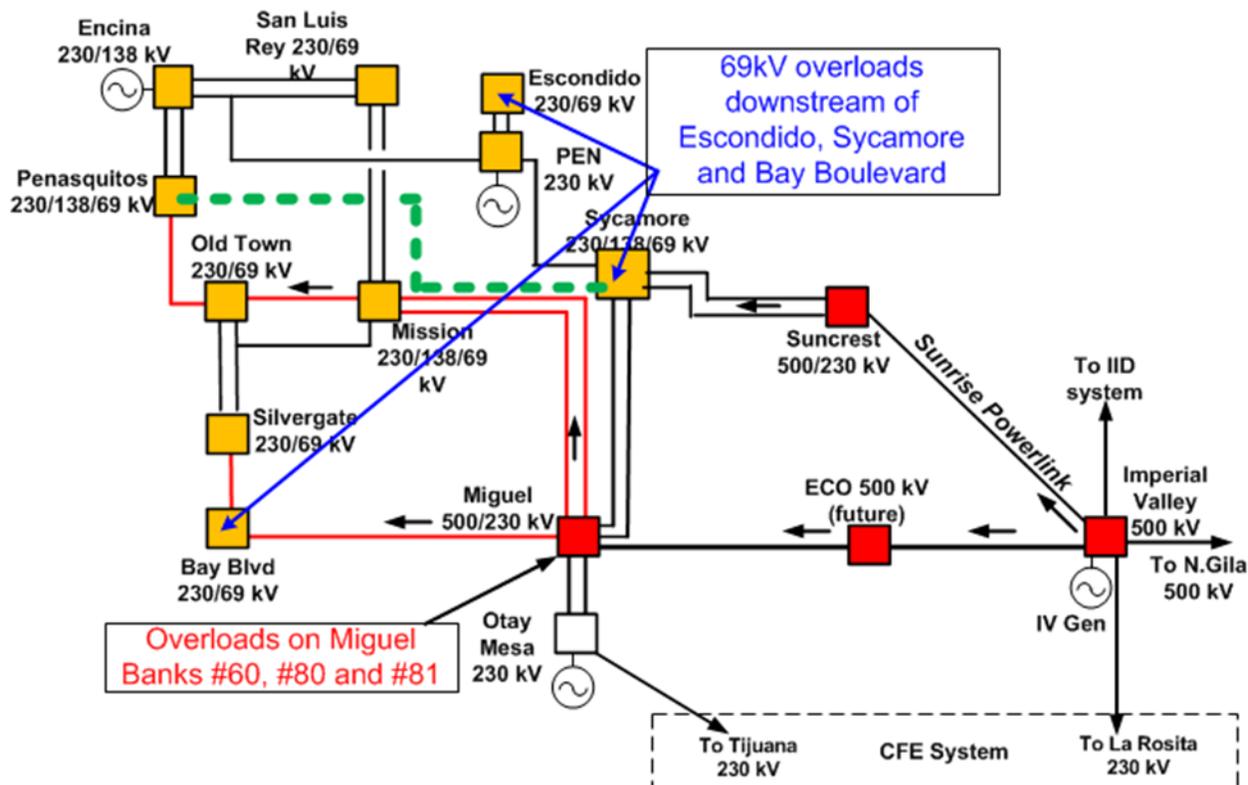
Minimum ROW Width: Per applicable codes; ROW should be close to Raison City Junction.

Governing Design and Construction Standards: (GO 95, GO 128, NESC Code, applicable municipal codes).

G3 Sycamore-Penasquitos 230 kV Line Description and Functional Specifications

G3.1 Description

In the draft 2012-2013 Transmission Plan, the ISO has identified a potential policy driven need for a 230 kV transmission line between SDG&E owned Sycamore and Penasquitos 230 kV substations, as depicted below:



The ISO estimates that the cost of the 230 kV line will be between \$111 and \$221 million. This proposed transmission configuration will provide a means by which renewable generation MW in the ISO interconnection queue can quickly and efficiently be delivered to the existing ISO grid, while minimizing environmental impacts in the IID service territory.

G3.2 Functional Specifications

Line Terminus 1: SDG&E Sycamore Canyon 230 kV Bus

Line Terminus 2: SDG&E Penasquitos 230 kV Bus

Nominal Phase to Phase Voltage: 230 kV

Approximate Line Impedance (Ohms): $(0.0005 \text{ to } 0.001) + j(0.005 \text{ to } 0.01)$ pu 100 MVA base.

Approximate Line Length: 11 miles

Latest In Service Date: May, 2017

Transmission Line Minimum BIL: 1,050 kV (900 kV for solidly grounded systems)

Minimum ROW Width: Per applicable codes.

Governing Design and Construction Standards: (GO 95, GO 128, NESC Code, applicable municipal codes).

Overhead Line Construction

Minimum Continuous Ampacity - Summer: 2,290 Amps (~912 MVA)

Minimum Continuous Ampacity – Winter: 2,290 Amps (~912 MVA)

Minimum 4 Hour Emergency Ampacity – Summer: 2,950 Amps (~1175 MVA)

Minimum 4 Hour Emergency Ampacity – Winter: 2,950 Amps (~1175 MVA)

Approximate Series Compensation Level: N/A

Support Structures: Single circuit structures or underground.

Shield Wire Required: Optical ground wire (minimum 6 pairs of fibers)

Failure Containment Loading Mitigation (anti-cascade structures, etc.): Per applicable codes.

Shield Wire Ground Fault Withstand Ampacity: Coordinate with interconnecting PTOs.

Aeolian Vibration Control (Conductor and Shield Wire): Vibration dampers must be installed on all overhead conductors and shield wires, with the exception of slack spans.

Underground Construction (if required)

Minimum Ampacity – Summer and Winter: Must meet the minimum continuous and emergency Ampacity of the overhead portion.

Spare Conduit: A spare conduit to be installed, if conduit/manhole construction is used.

Insulation type: If conduit/manhole construction is used, then solid dielectric is preferred.