

APPENDIX I: Description and Functional Specifications for Transmission Facilities Eligible for Competitive Solicitation

Editorial Note: Technical details will be updated in the Revised Draft.

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Overview

The ISO has recommended the following policy-driven projects for approval that are eligible for competitive solicitation:

- 1- Imperial Valley – North of SONGS 500 kV Line and Substation;
- 2- North of SONGS – Serrano 500 kV Line;
- 3- North Gila – Imperial Valley 500 kV Transmission Line; and
- 4- Trout Canyon – Lugo 500 kV Line.

The Imperial Valley – North of SONGS 500 kV Line and Substation, North of SONGS – Serrano 500 kV Line, and North Gila – Imperial Valley 500 kV Transmission Line are part of the Southern Area Reinforcement projects to address the East of Miguel, Bay Boulevard-Silvergate, Encina-San Luis Rey, Sycamore area, San Luis Rey-San Onofre, and Silvergate-Old Town constraints.

The Trout Canyon – Lugo 500 kV Line project is recommended to mitigate the identified Lugo – Victorville 500 kV constraints and to retire the existing Lugo – Victorville N-1 RAS. The project would also improve GLW and VEA area generation deliverability and allow future transmission expansion to get access to the geothermal resources in Nevada.

More information on these projects are provided in Chapter 3 and Appendix F.

The following sections contain detailed descriptions and functional specifications for these four projects.

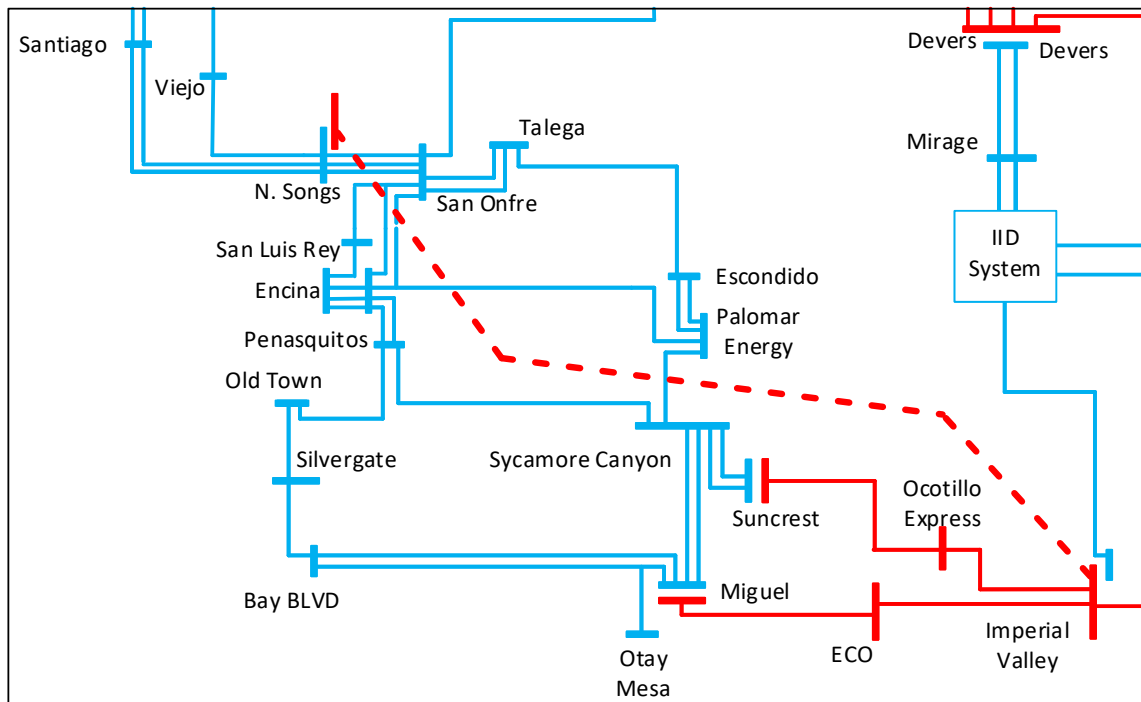
I.1 Description and Functional Specifications of Proposed Policy-Driven Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation Project

I.1.1 Description

In the 2022-2023 Transmission Plan, the ISO has identified a policy-driven need for the Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation project as part of the Southern Area Reinforcement Projects. Figure I.1-1 provides a schematic diagram of the transmission system in the area. The project scope includes the followings

- New 500/230 kV substation north of SONGS complete with three (3) 500/230 kV transformers
- Loop the San Onofre – Santiago 230 kV 1 and 2 lines and the San Onofre – Viejo 230 kV line into the new substation
- New Imperial Valley – North of SONGS 500 kV line, estimated at 145 miles, with 50% series compensation

Figure I.1-1: Schematic Diagram of the Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation project



The ISO estimates that the proposed project will approximately cost \$2,228 million including both the competitive solicitation and directly assigned components. Figure I.1-2 provides a high level area of the location of the North of SONGS 500/230 kV substation.

Figure I.1-2: Approximate location of the North of SONGS 500/230 kV substation

Editorial Note: Technical details will be updated in the Revised Draft.

Figure I.1-3 provides a schematic diagram of the new North of SONGS substation with the initial and the ultimate plan.

Figure I.1-3: Schematic Diagram of the North of SONGS Substation

Editorial Note: Technical details will be updated in the Revised Draft.

Figure I.1-4 provides a high level diagram of line terminations and interconnection to the new North of SONGS and Imperial Valley 500/230 kV substations.

Figure I.1-4: Interconnection to North of SONGS and Imperial Valley 500 kV Substations

Editorial Note: Technical details will be updated in the Revised Draft.

The facilities in the Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation project that are eligible for competitive solicitation are

- The new 500/230 kV North of SONGS substation with the 500 kV and 230 kV bus-work and termination equipment at North of SONGS Substation
- The 500/230 kV transformers at North of SONGS Substation
- The new 145-mile 500 kV line from Imperial Valley to North of SONGS Substation
- The interconnection of the existing San Onofre – Santiago 230 kV 1 and 2 lines and the San Onofre – Viejo 230 kV line into the North of SONGS Substation

For the interconnection of the existing San Onofre – Santiago 230 kV 1 and 2 lines and the San Onofre – Viejo 230 kV line, the incumbent PTO will be responsible for bringing the new transmission lines extensions up to a point within 100 feet of the new substation fence. The new line extensions will terminate on a dead end structure(s), to be owned by the incumbent PTO.

For the interconnection of the new Imperial Valley – North of SONGS 500 kV Line, the incumbent PTO will be responsible for installing the new transmission line segment from the Imperial Valley 500 kV bus up to a point within 100 feet of the Imperial Valley substation property line. These new line segments will terminate on a dead end structure(s), to be owned by incumbent PTO . The approved project sponsor will be responsible for (and will own and maintain) the facilities from this last dead end structure(s) back to the North of SONGS Substation.

The approved project sponsor, who will own the North of SONGS substation, will be responsible for owning, operating and maintaining the protection equipment located within the substation that is designated for the protection of the incoming transmission lines. The approved project sponsor will coordinate with incumbent PTO regarding the specifications and the details of the associated line protection (*e.g.* current differential, directional comparison, etc.) and will work with incumbent PTO to develop relay logic and detailed relay settings.

As the project includes building new transmission facility with voltage level over 200 kV, the approved project sponsor will be responsible for completing the WECC Progress Report and other processes required for this project.

I.1.2 Functional Specification for Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation Project

Editorial Note: The following illustrates the technical requirements that will be included in the functional specification. The technical requirements will be updated in the Revised Draft.

North of SONGS Substation:

Nominal Phase to Phase Voltage: 500/230 kV

500 kV and 230 kV Initial Bus Configuration: Breaker and a half (BAAH)

500 kV and 230 kV Ultimate Bus Configuration: BAAH

Initial Number of 500 kV Lines:

Ultimate Number of 500 kV Lines:

Initial Number of 500 kV CBs:

Ultimate Number of 500 kV CBs:

Initial Number of 230 kV Lines:

Ultimate Number of 230 kV Lines:

Initial Number of 230 kV CBs:

Ultimate Number of 230 kV CBs:

Initial Minimum Bus Ampacity: _____ Ultimate Bus Ampacity: _____

Minimum CB Ampacity: _____ Minimum CB Interrupting Capability: _____

Transfer Bus Required (SBSB only): N/A

Station Minimum BIL: 900 kV at the 230 kV side and 1800 kV at the 500 kV side

Initial Reactive Power Requirements:

Ultimate Reactive Power Requirements:

Telemetry Requirements: Install necessary equipment, including RTUs to monitor the typical bulk power elements such as MW, MVAR, and phase currents (Amps) at each line and also voltages (kV) at lines and buses and all circuit breaker (CB) status/control, protection relays statuses and alarms. The installed equipment must be capable of transmitting information to the appropriate Control Center.

Requested In Service Date:

Low Profile Required: Subject to local permitting requirements

Gas Insulation Required: No, but if proposed shall be enclosed

Initial Number of Transformers: 3, including spare

Ultimate Number of Transformers: 3, including spare

Transformer Nominal Low Winding Phase to Phase Voltage: 230 kV

Tertiary Winding Required: ___Yes___ Nominal Voltage Rating: ___13.8 kV___

Primary Voltage Winding (wye, grounded wye, delta, etc): Grounded Wye

Secondary Voltage Winding: Grounded Wye; Tertiary Voltage Winding: Corner Grounded Delta

Maximum Transformer % IZ: _____ Minimum Transformer %IZ: _____

Minimum Transformer Normal Rating: _____ Minimum Transformer 4-hour Emergency Rating: _____ LTC Required: _____

No Load Taps Required: 5 NLTs with two 2.5% taps above & below nominal voltage of 235 kV

CIP 14 requirement: The substation perimeter shall be fenced by a wall

Location of Series Compensation: The cost of the series compensation is within the scope of this project and will be the responsibility of the approved project sponsor.

Minimum Series Capacitor Continuous Ampacity - Summer:

Minimum Series Capacitor Continuous Ampacity – Winter:

Minimum Series Capacitor 30 Minute Emergency Ampacity – Summer:

Minimum Series Capacitor 30 Minute Emergency Ampacity – Winter:

500 kV Transmission Line Functional Specifications

Overhead Line Construction

Line Terminus 1: Imperial Valley Substation 500 kV Bus

Line Terminus 2: North of SONGS Substation 500 kV Bus

Nominal Phase to Phase Voltage: 525 kV

Minimum Line Continuous Ampacity - Summer:

Minimum Line Continuous Ampacity – Winter:

Minimum Line 4 Hour Emergency Ampacity – Summer:

Minimum Line 4 Hour Emergency Ampacity – Winter:

Approximate Line Impedance.

Approximate Line Length: 145 miles

Requested In Service Date:

Support Structures: Single circuit structure

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: 900 kV with solidly grounded systems

Minimum ROW Width: Per applicable codes

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

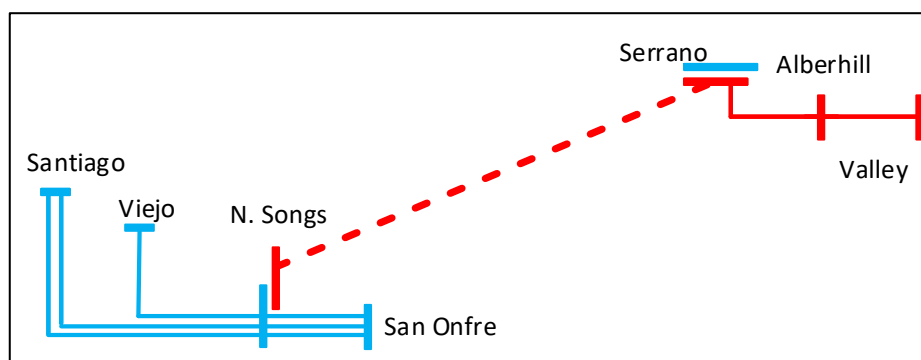
Design Temperature: 50°C

I.2 Description and Functional Specifications of Proposed Policy-Driven North of SONGS – Serrano 500 kV Line Project

I.2.1 Description

In the 2022-2023 Transmission Plan, the ISO has identified a policy-driven need for the North of SONGS – Serrano 500 kV Line project as part of the Southern Area Reinforcement Projects. Figure I.2-1. provides a schematic diagram of the transmission system in the area. The project scope includes the new North of SONGS – Serrano 500 kV line, estimated at 30 miles.

Figure I.2-1: Schematic Diagram of the North of SONGS – Serrano 500 kV Line Project



The ISO estimates that the proposed project will approximately cost \$503 million including both the competitive solicitation and directly assigned components. Figure I.2-2 provides a high level diagram of line terminations and interconnection to the new North of SONGS and Serrano 500/230 kV substation.

Figure I.2-2: Interconnection to North of SONGS and Serrano 500 kV Substations

Editorial Note: Technical details will be updated in the Revised Draft.

The facilities in the North of SONGS – Serrano 500 kV Line project that are eligible for competitive solicitation is the new 30-mile 500 kV line from North of SONGS to Serrano Substation.

For the interconnection of the new North of SONGS – Serrano 500 kV Line, the incumbent PTO will be responsible for installing the new transmission line segments from the Serrano 500 kV bus up to a point within 100 feet of the Serrano substation property line. These new line segments will terminate on a dead end structure(s), to be owned by the incumbent PTO. The approved project sponsor will be responsible for (and will own and maintain) the facilities from this last dead end structure(s) back to the North of SONGS Substation.

For the interconnection of the new North of SONGS – Serrano 500 kV Line, the project sponsor for the Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation Project will be responsible for installing the new transmission line segments from the new North of SONGS 500 kV bus up to a point within 100 feet of the North of SONGS substation property line. These new line segments will terminate on a dead end structure(s), to be owned by the project sponsor for the Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation Project. The approved project sponsor will be responsible for (and will own and maintain) the facilities from this last dead end structure(s) back to the Serrano Substation.

The approved project sponsor will coordinate with the incumbent PTO and the project sponsor for the Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation Project regarding the specifications and the details of the associated line protection (e.g. current differential, directional comparison, etc.) and will work with SCE and the project sponsor for the Imperial Valley – North of SONGS 500 kV Line and 500/230 kV Substation Project to develop relay logic and detailed relay settings.

As the project includes building new transmission facility with voltage level over 200 kV, the approved project sponsor will be responsible for completing the WECC Progress Report and other processes required for this project.

I.2.2 Functional Specification for North of SONGS – Serrano 500 kV Line Project

Editorial Note: The following illustrates the technical requirements that will be included in the functional specification. The technical requirements will be updated in the Revised Draft.

500 kV Transmission Line Functional Specifications

Overhead Line Construction

Line Terminus 1: North Gila Substation 500 kV Bus

Line Terminus 2: Imperial Valley Substation 500 kV Bus

Nominal Phase to Phase Voltage: 525 kV

Minimum Line Continuous Ampacity - Summer:

Minimum Line Continuous Ampacity – Winter:

Minimum Line 4 Hour Emergency Ampacity – Summer:

Minimum Line 4 Hour Emergency Ampacity – Winter:

Approximate Line Impedance:

Approximate Line Length: 30 miles

Requested Service Date:

Support Structures: Single circuit structure

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: 1800 kV with solidly grounded systems

Minimum ROW Width: Per applicable codes

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

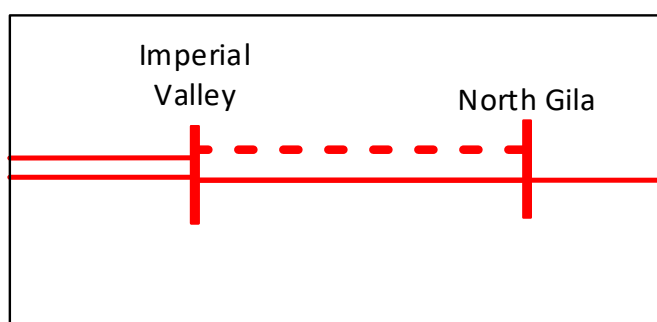
Design Temperature: 50°C

I.3 Description and Functional Specifications of Proposed Policy-Driven North Gila – Imperial Valley #2 500 kV Line Project

I.3.1 Description

In the 2022-2023 Transmission Plan, the ISO has identified a policy-driven need for the North Gila – Imperial Valley #2 500 kV Line Project as part of the Southern Area Reinforcement Projects. Figure I.3-1 provides a schematic diagram of the transmission system in the area. The project scope includes a new 500 kV circuit between North Gila and Imperial Valley substations, estimated at 97 miles.

Figure I.3-1: Location of North Gila – Imperial Valley #2 500 kV Line Project



The ISO estimates that the proposed project, including both the competitive and directly assigned components, will approximately cost \$340 million. Figure I.3-2 provides a schematic diagram of the interconnection to North Gila and Imperial Valley 500 kV substations.

Figure I.3-2: Interconnection to North Gila 500 kV and Imperial Valley 500 kV

Editorial Note: Technical details will be updated in the Revised Draft.

The facilities in the North Gila – Imperial Valley #2 500 kV Line Project that are eligible for competitive solicitation are the North Gila – Imperial Valley #2 500 kV line and the interconnection of the existing 500 kV substations.

For the interconnection of the North Gila – Imperial Valley #2 500 kV Line to the Imperial Valley substation, the incumbent PTO will be responsible for installing the new transmission line segments from the Imperial Valley 500 kV bus up to a point within 100 feet of the Imperial Valley substation property line. This new line segments will terminate on a dead end structure(s), to be owned by the incumbent PTO. The approved project sponsor will be responsible for (and will own and maintain) the facilities from this last dead end structure(s) back to the North Gila Substation.

For the interconnection of the North Gila – Imperial Valley #2 500 kV Line to the North Gila substation, the incumbent PTO will be responsible for installing the new transmission line segments from the North Gila 500 kV bus up to a point within 100 feet of the North Gila substation property line. This new line segments will terminate on a dead end structure(s), to be owned by the incumbent PTO. The approved project sponsor will be responsible for (and will own and maintain) the facilities from this last dead end structure(s) back to the Imperial Valley substation.

The approved project sponsor will coordinate with the incumbent PTO for the specifications and the details of the associated line protection (e.g. current differential, directional comparison, etc.) and will work with the incumbent PTO to develop relay logic and detailed relay settings.

As the project includes building new transmission facility with voltage level over 200 kV, the approved project sponsor will be responsible for completing the WECC Progress Report and other processes required for this project.

I.3.2 Functional Specification for North Gila – Imperial Valley #2 500 kV Line Project

Editorial Note: The following illustrates the technical requirements that will be included in the functional specification. The technical requirements will be updated in the Revised Draft.

500 kV Transmission Line Functional Specifications

Overhead Line Construction

Line Terminus 1: North Gila Substation 500 kV Bus

Line Terminus 2: Imperial Valley Substation 500 kV Bus

Nominal Phase to Phase Voltage: 525 kV

Minimum Line Continuous Ampacity - Summer:

Minimum Line Continuous Ampacity – Winter:

Minimum Line 4 Hour Emergency Ampacity – Summer:

Minimum Line 4 Hour Emergency Ampacity – Winter:

Approximate Line Impedance:

Approximate Line Length: 97 miles

Latest In Service Date:

Support Structures: Single circuit structure

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: 1800 kV with solidly grounded systems

Minimum ROW Width: Per applicable codes

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

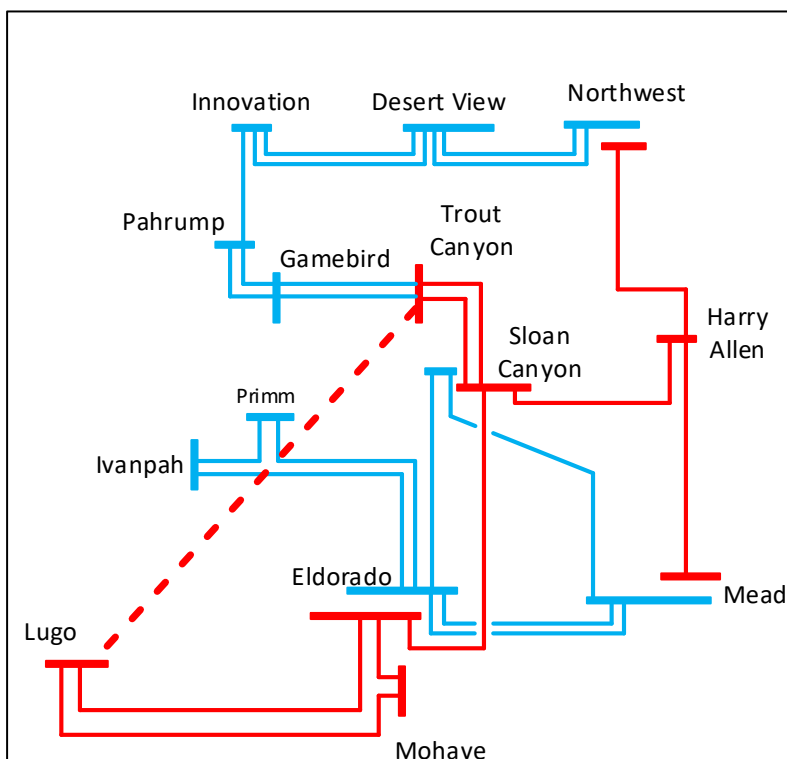
Design Temperature: 50°C

I.4 Description and Functional Specifications of Proposed Policy-Driven Trout Canyon – Lugo 500 kV Line Project

I.4.1 Description

In the 2022-2023 Transmission Plan, the ISO has identified a policy-driven need for the Trout Canyon – Lugo 500 kV Line Project to mitigate the identified Lugo – Victorville 500 kV constraints and retire the existing Lugo – Victorville N-1 RAS. The project would also improve GLW and VEA area generation deliverability and allow future transmission expansion to get access to the geothermal resources in Nevada. Figure I.4-1 provides a schematic diagram of the transmission system in the area. The project scope includes a new 180-mile 500 kV circuit between Trout Canyon and Lugo 500 kV substations.

Figure I.4-1: Location of Trout Canyon - Lugo 500 kV Line Project



The ISO estimates that the proposed project, including both the competitive and directly assigned components, will approximately cost \$1,500 – 2,000 million. Figure I.4-2 provides a schematic diagram of the interconnection to Trout Canyon and Lugo 500 kV substations.

Figure I.4-2: Interconnection to Trout Canyon 500 kV, Lugo 500 kV

Editorial Note: Technical details will be updated in the Revised Draft.

The facilities in the Trout Canyon – Lugo 500 kV Line Project that are eligible for competitive solicitation are the new 180-mile Trout Canyon – Lugo 500 kV line and the interconnection to the existing 500 kV substations.

For the interconnection of the Trout Canyon – Lugo 500 kV Line to the Trout Canyon substation, the incumbent PTO will be responsible for installing the new transmission line segments from the Trout Canyon 500 kV bus up to a point within 100 feet of the Trout Canyon substation property line. This new line segments will terminate on a dead end structure(s), to be owned by the incumbent PTO. The approved project sponsor will be responsible for (and will own and maintain) the facilities from this last dead end structure(s) back to the Lugo substation.

For the interconnection of the Trout Canyon – Lugo 500 kV Line to the Lugo substation, the incumbent PTO will be responsible for installing the new transmission line segments from the Lugo 500 kV bus up to a point within 100 feet of the Lugo substation property line. This new line segments will terminate on a dead end structure(s), to be owned by the incumbent PTO. The approved project sponsor will be responsible for (and will own and maintain) the facilities from this last dead end structure(s) back to the Trout Canyon substation.

The approved project sponsor will coordinate with the incumbent PTO for the specifications and the details of the associated line protection (e.g. current differential, directional comparison, etc.) and will work with the incumbent PTO to develop relay logic and detailed relay settings.

As the project includes building new transmission facility with voltage level over 200 kV, the approved project sponsor will be responsible for completing the WECC Progress Report and other processes required for this project.

I.4.2 Functional Specification for Trout Canyon – Lugo 500 kV Line Project

Editorial Note: The following illustrates the technical requirements that will be included in the functional specification. The technical requirements will be updated in the Revised Draft.

500 kV Transmission Line Functional Specifications

Overhead Line Construction

Line Terminus 1: North Gila Substation 500 kV Bus

Line Terminus 2: Imperial Valley Substation 500 kV Bus

Nominal Phase to Phase Voltage: 525 kV

Minimum Line Continuous Ampacity - Summer:

Minimum Line Continuous Ampacity – Winter:

Minimum Line 4 Hour Emergency Ampacity – Summer:

Minimum Line 4 Hour Emergency Ampacity – Winter:

Approximate Line Impedance:

Approximate Line Length: 180 miles

Latest In Service Date:

Support Structures: Single circuit structure

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: 1800 kV with solidly grounded systems

Minimum ROW Width: Per applicable codes

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

Design Temperature: 50°C