

2023-2024 Transmission Plan



Foreword to Draft Addendum 1 to the 2023-2024 Transmission Plan

The ISO is recommending approval of Addendum 1 to the 2023-2024 Transmission Plan at the July 17, 2024 ISO Board of Governors meeting.

1. Introduction

As set out in the 2023-2024 Transmission Plan approved by the ISO Board of Governors at its May 2024 meeting, ISO management indicated that assessments of the Oakland Area Reinforcement, Short Circuit Mitigation for Imperial Valley 230 kV Circuit Breakers and Short Circuit Mitigation for Miguel 230 kV Circuit Breakers would continue beyond the approval of the rest of the Transmission Plan. This addendum sets out the status of the additional assessment, and the recommendation for approval of both short circuit mitigation projects for the circuit breakers at Imperial Valley and Miguel.

2. Oakland Area Reinforcement Project

As a result of recent increases in the load forecast in the Oakland area, a number of overloads were observed on most of the 115 kV lines serving this area. The previously approved OCEI project sufficient to mitigate the overloads; this has led to the need for additional transmission upgrades in the area. However, the ISO recommended that the previously approved OCEI project move forward as designed, which could help reduce reliance on the local thermal units while the additional transmission upgrades are being developed and implemented.

The Oakland area, being a densely populated urban area, has considerable construction challenges for new facilities, such as:

- Limited options for new transmission line routing to get to the metropolitan area;
- Limited open spaces to build new substations;
- Limited space in all of the 115 kV Oakland pocket substations; and
- Reduced scalability of the existing underground cables, among others.

Since May, the ISO has continued the feasibility and cost estimation for most of the alternatives, and the preliminary load flow evaluations are nearing completion.

However, the following assessments remain to be completed:

- Determining the achievable capacity potential for new 115 kV lines and underground cables;
- Finalizing the cost estimates and feasibility of a new double circuit 115 kV line from Sobrante to connect the Oakland area substations; and
- Completing the comparison of alternatives and a comprehensive power flow assessment of the alternative to be recommended.

With the analysis remaining to be completed, the ISO will continue the assessment of the Oakland area reinforcement in the 2024-2025 transmission planning process.

3. Short Circuit Mitigation for Imperial Valley 230 kV Circuit Breakers Project

This project was proposed by SDG&E as a reliability transmission solution to address the short circuit concerns since all of the 63 kA circuit breakers at Imperial Valley 230 kV substation will exceed their ratings during short circuit conditions with the previously approved transmission projects and the CPUC's base resource portfolio described in the 2023-2024 TPP study plan.

The recommended project involves the following:

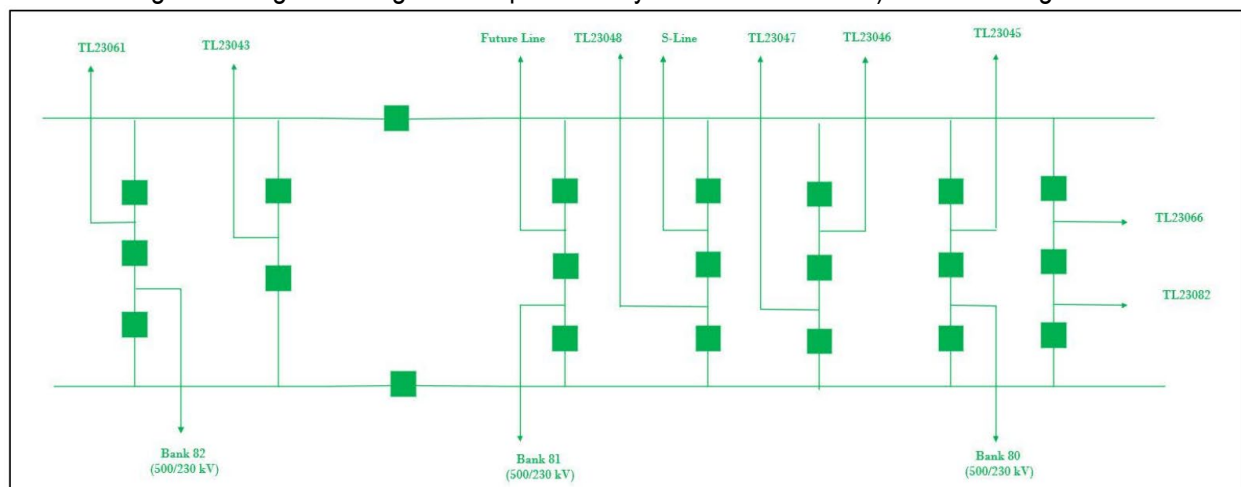
- Install two sets of 10-Ohm Current Limiting Reactors (CLRs) in series with the 230 kV buses, one on each bus;
- One CLR will be operated normally open; and
- Rearrange 230 kV transmission lines and move TL23043 Imperial Valley – Westside Canal, TL23066 Imperial Valley – Drew, and IID owned S-Line Imperial Valley – Wixom SS to the west buses.

The estimated cost for this project is \$97 million with a targeted in-service date of June 2035. Figure 1 presents the single-line diagram of Imperial Valley 230 kV substation in its current configuration and with the proposed configuration. The ISO project will reduce the SCD at the Imperial Valley substation, as shown in Table 1, based on the short circuit analysis provided by SDG&E. Additionally, since these projects will result in the reconfiguration of the Imperial Valley substation, the ISO confirmed that they would not create new reliability concerns in the long-term scenarios.

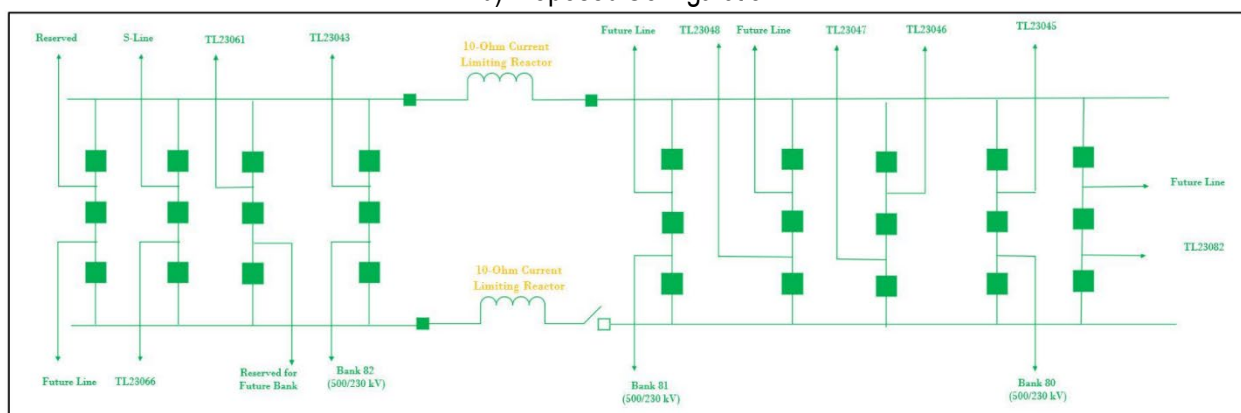
Table 1: SCD at Imperial Valley substation considering their current configuration and with the proposed projects

Substation	Current Configuration	Substation	With Project
Imperial Valley 230 kV	103.5 %	Imperial Valley East 230 kV	74.0 %
		Imperial Valley West 230 kV	80.0 %

Figure 1: Single-line diagram of Imperial Valley 230 kV substation: a) Current Configuration



b) Proposed Configuration



Alternative Assessment

The ISO in conjunction with SDG&E evaluated several alternatives to mitigate the SCD concerns at Imperial Valley 230 kV substation, which are the following:

1. Replace 63 kA with 80 kA circuit breakers: This alternative is not be feasible from the constructability perspective as all of the 230 kV substation would need to be upgraded to a 80 kA specification and there is no space to locate the 80 kA CBs, which require a larger footprint than the 63 kA CBs.
2. Split Imperial Valley 230 kV buses: This alternative has a cost of \$95 million and involves the following:
 - Build 500 kV bay 5, and 230 kV bay 19 at Imperial Valley substation;
 - Install a fourth 500/230 kV bank at Imperial Valley substation;
 - Split Imperial Valley 230 kV bus; and

- Rearrange 230 kV transmission lines and move TL23043 Imperial Valley – Westside Canal, TL23066 Imperial Valley – Drew, and IID owned S-Line Imperial Valley – Wixom SS to the west buses.

During the evaluation process, the ISO identified reliability concerns for P6 outages of the 500/230 kV banks that would require developing complex operational procedures; either to trip all the generation connected to the west 230 kV bus section and partially the generation connected to the east 230 kV bus section, or a real time tool that calculates the SCD, so the bus tie CBs can be closed while one 500/230 kV bank is out-of-service.

3. CLRs and a different rearrangement of 230 kV transmission lines: This alternative has a cost of \$112 million and involves the following:
 - Install two sets of 10-Ohm CLRs in series with the 230 kV buses, one on each bus;
 - One CLR will be operated normally open; and
 - Rearrange 230 kV transmission lines and move TL23043 Imperial Valley – Westside Canal, TL23045 and TL23046 Imperial Valley – Central La Rosita II lines 1 and 2, and IID owned S-Line Imperial Valley – Wixom SS to the west buses.

The difference between this alternative 3 and the proposed project is that instead of relocating TL23066 Imperial Valley – Drew, TL23045 and TL23046 Imperial Valley – Central La Rosita II lines 1 and 2 are rearranged to the west buses. This alternative provides a better power flow distribution between the three 500/230 kV transformers during high solar generation output scenarios, but has the disadvantage that the current bay positions for TL23045 and TL23046 might not be usable without relocating almost every 230 kV transmission line outside of Imperial Valley substation, representing a significant cost increase for future projects.

4. Short Circuit Mitigation for Miguel 230 kV Circuit Breakers Project

This project was proposed by SDG&E as a reliability transmission solution to address the SCD concerns since all of the 63 kA circuit breakers at Miguel 230 kV substation will exceed their ratings during short circuit conditions with the previously approved transmission projects and the CPUC’s base resource portfolio described in the 2023-2024 TPP study plan.

The recommended project involves the following:

- Open Miguel 230 kV CB 6X;
- Operate TL23042C Miguel – Miguel 6X Tap normally open;
- Modify TL 23041 / TL 23042 RAS to consider Miguel CB 6X status and upgrade RAS panel; and
- Install a 3-Ohm series reactor on TL23026 Silvergate – Bay Boulevard 230 kV line which will be located at Bay Boulevard substation.

The estimated cost for this project is \$51 million with a targeted in-service date of June 2035. Figure 2 presents the single-line diagram of the Miguel 230 kV substation in its proposed future configuration by opening CB 6X.

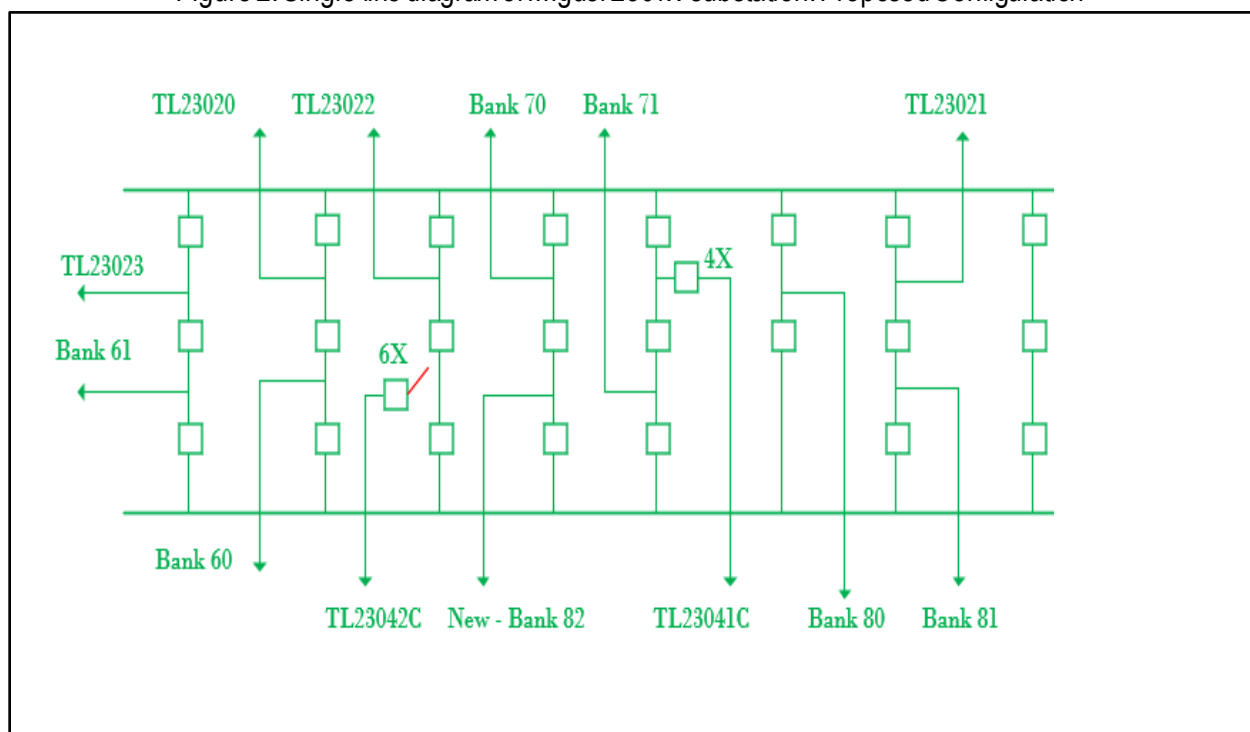
During the evaluation process of the original project submitted by SDG&E in the Request Window, the ISO identified an increased loading in the Bay Boulevard – Silvergate – Old Town 230 kV transmission lines when Miguel CB 6X is operated normally open which could pose potential reliability and policy concerns. Thus, the final proposal includes the addition of the 3-Ohm series reactor on TL23026 Silvergate – Bay Boulevard 230 kV line, which mitigates this issue.

The recommended project will reduce the SCD at the Miguel substation, as shown in Table 2, based on the short circuit analysis provided by SDG&E. Additionally, since these projects will result in the reconfiguration of the Miguel substation, the ISO confirmed that they would not create new reliability concerns in the long-term scenarios.

Table 2: SCD at Miguel 230 kV substations considering their current configuration and with the proposed projects

Substation	Current Configuration	Substation	With Project
Miguel 230 kV	102.1 %	Miguel 230 kV	88.6 %

Figure 2: Single-line diagram of Miguel 230 kV substation: Proposed Configuration



Alternative Assessment

The ISO in conjunction with SDG&E evaluated several alternatives to mitigate the SCD concerns at Miguel 230 kV substation, which are the following:

1. Open Miguel 230 kV CB 4X: This alternative has a cost of \$84 million and involves the following:
 - Open Miguel 230 kV CB 4X;
 - Operate TL23041C Miguel – Miguel 4X Tap normally open;
 - Modify TL 23041 / TL 23042 RAS to consider Miguel CB 4X status and upgrade RAS panel; and
 - Reconductor TL6916 Sycamore Canyon – Scripps to achieve a 200 MVA normal/emergency rating.

The alternative of opening Miguel CB 4X would produce an increased loading in the Sycamore Canyon area transmission lines, needing to reconductor TL6916 Sycamore Canyon – Scripps to avoid potential reliability and policy concerns. The proposed project and this alternative have similar performances. Therefore, the cost is the main driver for the selection of the proposed project over this alternative.

2. CLRs in series with Miguel 230 kV buses: This alternative has a cost of \$192 million and involves the following:
 - Install two sets of 10-Ohm CLRs in series with the 230 kV buses, one on each bus; and
 - One CLR will be operated normally open.

This alternative is feasible but its cost is significantly higher than the proposed project.

5. Conclusion

The ISO is recommending the following additional reliability-driven projects for approval as an Addendum to the 2023-2024 Transmission Plan:

- Short Circuit Mitigation for Imperial Valley 230 kV Circuit Breakers Project; and
- Short Circuit Mitigation for Miguel 230 kV Circuit Breakers Project

The projects are needed to address the identified short circuit concerns described above and will allow the interconnection of future generation resources beyond the CPUC baseline portfolio and transmission upgrades beyond the previously approved transmission projects.

With the analysis remaining to be undertaken to determine the recommended mitigation for the Oakland area, the ISO will continue the assessment of the Oakland area reinforcement in the 2024-2025 transmission planning process.