ELECTRIC SYSTEM MASTER PLAN UPDATE - 2026

Prepared For:

Truckee Donner Public Utility District
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1.0 EXECUTIVE SUMMARY

1.1 Definition & Purpose

The Electric System Master Plan Update – 2026 provides a comprehensive evaluation of Truckee Donner Public Utility District's (TDPUD or the District) electric distribution system. Developed in accordance with District Code 7.45, the Plan serves as both a technical assessment and a strategic roadmap to guide the District's continued delivery of safe, reliable, affordable, and environmentally responsible power. It draws on recent system modeling and simulations, key findings from the District's 2024 Integrated Resource Plan (IRP), and lessons learned from the 2019 Master Plan. The Plan also incorporates community growth projections, regulatory requirements, and a contingency study to improve operational protection, system resilience, and service quality.

This planning cycle comes at a pivotal moment. The District faces rising electric demand from population growth, transportation and building electrification, and state decarbonization policies, alongside increased risks from climate change and wildfire. At the same time, advances in data analytics and system modeling provide the District with stronger tools than ever to evaluate its infrastructure and plan for the future.

All work presented herein, including this document and the associated analyses, has been prepared under the direct supervision of a licensed professional electrical engineer.

1.2 Key Outcomes of the Analysis

To evaluate both current and future community needs, the District conducted a comprehensive system-wide contingency analysis using advanced utility modeling tools. The analysis incorporated forecasted electrical loads derived from available meter and SCADA data and known planned development to simulate scenarios reflecting emergency and maintenance conditions. From this process, system constraints were identified, and corresponding capital projects were developed to mitigate each constraint. Each project was prioritized by project type, and completion dates are to be identified in the future capital plan that will be aligned with the constraints emerged in the forecast. These projects will be integrated into the Electric Department's ten-year Capital Improvement Plan and future budgets.

1.3 Recommended Projects

The analysis resulted in 60 critical constraints, 62 minor issues, and 30 projects, requiring an estimated $19,681,178 in investment over the next five years. These projects include targeted infrastructure reinforcements, system modernization initiatives, and resilience measures, all aligned with the District's strategic goals. Details on individual projects and costs are presented in Section 5.

1.4 Looking Ahead

The Master Plan is a living document, designed to be revisited and refined in response to changing technologies, regulations, customer needs, and environmental conditions. By maintaining a disciplined planning process, the District positions itself to adapt to uncertainty while ensuring reliable, affordable, and sustainable service for the Truckee community.

2.0 PLAN OVERVIEW

2.1 Scope of the Plan

The 2026–2030 Electric System Master Plan evaluates the District's electric distribution system over a five-year planning horizon, with updates performed on a recurring five-year cycle. The scope includes all distribution substations, feeders, and associated infrastructure, with emphasis on assessing system capacity, reliability, and resilience under both normal and contingency conditions.

While the primary focus is on the distribution network, the analysis also considers how transmission facilities and regional interconnections influence local operations and capacity. The Plan addresses near-term infrastructure needs, forecasts long-term growth impacts, and integrates planned capital projects into a coordinated investment strategy. By defining system performance expectations, identifying emerging constraints, and sequencing mitigation projects, the Master Plan establishes a structured framework to ensure reliable, affordable, and sustainable service for the Truckee community.

2.2 Planning Framework

The Master Plan is built on a structured planning framework that combines system modeling, industry standards, and scenario analysis. Core technical studies include load flow, fault analysis, voltage drop, and protection coordination, each designed to test system performance under multiple loss-of-feeder or loss-of-substation (n-1) conditions. This framework provides a consistent basis for identifying constraints, validating operational practices, and developing targeted mitigation projects. By applying these studies, the District is able to measure current system performance, forecast future needs, and prioritize investments that will deliver long-term reliability and resilience.

2.3 Strategic Goals

The Master Plan is driven by the District's strategic goals, as defined in the 2023 Strategic Plan adopted by the TDPUD Board of Directors. This plan emphasizes service reliability, safety, and net carbon reduction, principles that serve as the foundation for long-term system planning.

In addition, the Master Plan is informed by the Town of Truckee's 2023 General Plan, which prioritizes resilience, stewardship, efficiency, and intentional growth. These community-driven priorities provide critical context for forecasting future electric load and aligning infrastructure investments with anticipated patterns of growth and development.

Together, these guiding documents establish the values and planning assumptions that the Master Plan translates into actionable system improvements. The Plan defines four strategic goals that serve as the framework for evaluating system performance, identifying constraints, and prioritizing investments:

1) Ensure System Reliability and Resilience

Proactively identify and resolve constraints in the distribution system to maintain high reliability standards, while building resilience against outages, equipment failures, and external stressors. This includes strengthening operational practices and planning efforts to ensure customers experience consistent, dependable service.

2) Plan for Sustainable Growth and Financial Stewardship

Anticipate and accommodate rising electric demand from population growth, electric vehicle adoption, building electrification, and climate policy goals, while balancing these drivers with conservation and distributed energy resources. Provide cost estimates, project phasing, and capacity planning to guide annual work plans, rate studies, and multi-year capital investments, ensuring that system growth is both sustainable and fiscally responsible.

3) Comply with Federal, State, and Local Regulations

Align District operations with evolving regulatory requirements for California Publicly Owned Utilities (POUs), including renewable portfolio standards, wildfire mitigation rules, and energy efficiency targets. Ensure that planning and investment decisions reflect current laws and policies, while positioning the District to adapt to future mandates.

4) Modernize Grid Infrastructure and Optimize Operations

Strengthen and upgrade the distribution system through targeted investments in advanced technologies, replacement of aging infrastructure, and modernization of protection and sectionalizing equipment. Expand the use of real-time field monitoring devices, SCADA, and outage management systems to improve grid visibility, enhance operational flexibility, and increase resilience to wildfire, extreme weather, and cyber or physical security threats.

Planning Process

To prepare for the next planning and budget cycle, the District initiated a system-wide analysis designed to ensure the community is ready for the future. The 2026 Master Plan applies a data-driven approach by reviewing historical loading across all feeders and substations, coordinating with local agencies to account for planned developments, and forecasting future demand tied to electrification, population growth, and major capital initiatives. This process draws on a diverse set of resources and evaluates them against the real-world conditions of the District's electrical system to identify potential constraints and shape targeted mitigation projects. The following information provided the foundation for this analysis:

- 2020 – 2025 AMI meter data from all feeders
- 2023 Town of Truckee Annual Report
- Town of Truckee 2040 General Plan
- District's 2024 Integrated Resource Plan
- Federal, state and local government regulations

3.0 SYSTEM OVERVIEW

3.1 General Service Territory

TDPUD is a Special District in the State of California, engaged in the distribution, sale, and delivery of electric power. The District provides retail electric service to a region consisting of a large transient population driven by second homeowners and destination tourism, which can increase population by two to three plus times. TDPUD's local primary transmission system is connected to NV Energy transmission system and is located high on the eastern slope of the Sierra Nevada mountains. TDPUD's electric service territory comprises approximately 44 square miles in eastern Nevada County and approximately 1.5 square miles in adjacent Placer County. The electric system includes approximately 225 miles total with 135 miles of 12.47 kilovolt (kV) and 14.4 kV overhead and underground distribution lines, about 0.5 miles of 60 kV overhead transmission lines, and 89.5 miles of secondary service line.

3.2 Sources, Substations & Feeders

a. Asset Inventory

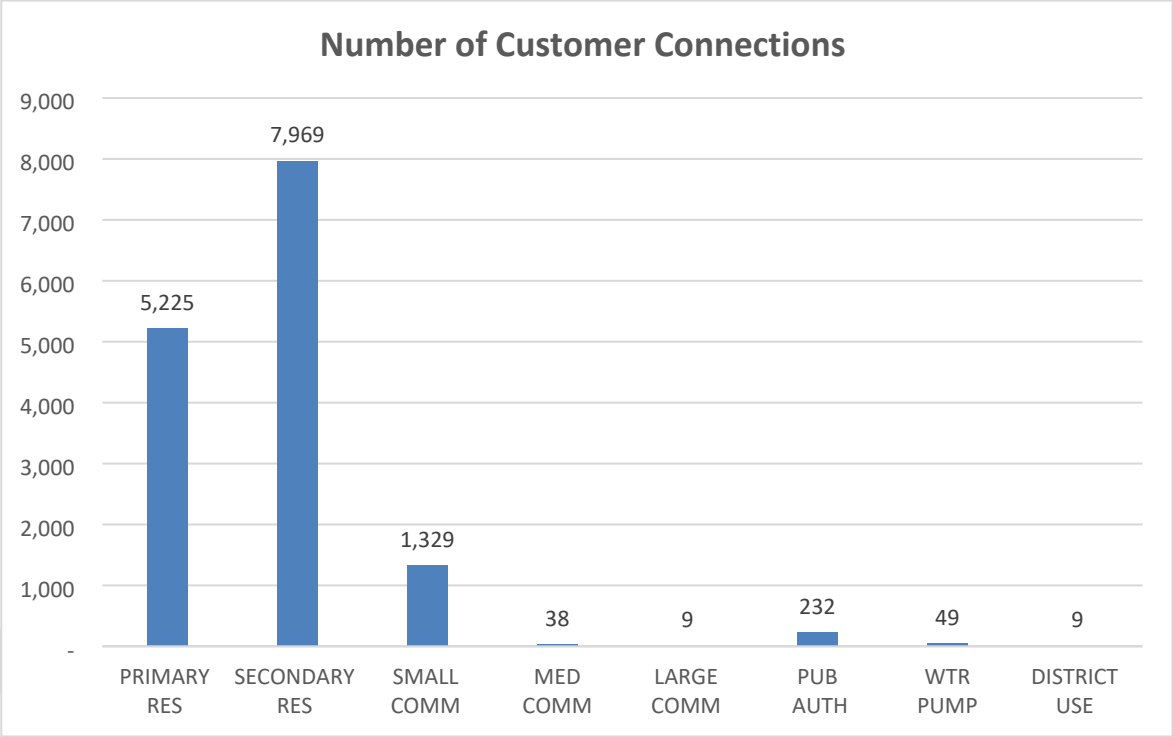
The District provides distribution-level service from four (4) 12.47kV substations: Donner Lake Substation, Martis Valley Substation, Tahoe Donner Substation and Truckee Substation, each with their own set of distribution feeders. Additionally, the Glenshire Service Area is served from an NV Energy 14.4 kV distribution line. District ownership and operational control is established at a primary line metering point from NV Energy. Table 3-2-1 details the District assets:

Table 3-2-1: Summary of District Assets

Substation	Feeder	Qty of Poles	OH Conductors (miles)	UG Conductors (miles)	Qty of Transformer Pole Mounted	Qty of Transformer Pad Mounted
Donner Lake (DL)	DL-1	432	4.9	1.5	64	13
	DL-2	623	6.1	4.2	88	33
	DL-3	1037	23.6	2.9	230	36
Glenshire (GL)	GL-1	301	7.1	2.2	66	30
Martis Valley (MV)	MV-1	302	5.6	3.8	63	44
	MV-2	285	4.9	9.6	52	92
	MV-3	254	4.4	7.2	72	69
	MV-4	159	5.2	3.2	20	19
Tahoe Donner (TD)	TD-1	437	7.3	0.1	85	-
	TD-2	835	15.1	1.3	171	24
	TD-3	948	17.8	3.7	196	33
Truckee (TR)	TR-1	203	5.2	12.0	32	71
	TR-2	24	0.1	2.5	6	22
	TR-3	19	0.4	4.8	2	30
	TR-4	463	6.4	6.4	82	64
	TR-5	820	16.1	25.9	158	203
	TR-6	8	2.2	10.6	1	71
TOTAL:		7150	132.3	101.9	1388	854

b. Customer Breakdown

As of December 2025, the District served 14,881 customer connections. Customers are categorized into six primary metering classes: residential, small commercial (<50 kW), medium commercial (>50 kW and <200 kW), large commercial (>200 kW), public authority, water pump, and District use. These categories reflect the District's diverse customer base across the residential, commercial, and industrial sectors. Within the residential segment, 60% of residential customers are secondary homeowners. A meaningful distinction exists between primary residents and secondary homeowners, the latter of which represents a notable share of service within the District. This customer composition is a critical input to system planning, providing insight into consumption patterns, seasonal demand variability, and long-term service obligations. To illustrate the geographic distribution of these customers, the following chart shows the number of connections by load category.



c. Historical Load Profile

While customer classification metrics are useful for planning purposes, a more accurate assessment of potential load growth and system needs is achieved through analysis at the feeder level. Historical meter data provides clear visibility into load trends, capturing recent years summer and winter peak demand patterns for each feeder and substation. This analysis not only illustrates growth trajectories but also highlights the available capacity across the system. For example, Donner Lake Substation feeders are predominantly residential, consisting of both primary and secondary homes, whereas the Truckee Substation feeders support a large portion of the District's commercial and industrial activity. Table 3-2-2 summarizes the four-year summer and winter historical peak loads of each of the 16 feeders. These values formed the basis of the load forecasting metrics used in this analysis.

Table 3-2-2: 2021 - 2024 Feeder History Peak

Summer Peaks (kW)					Winter Peaks (kW)				
Feeder	**2021**	**2022**	**2023**	**2024**	**Feeder**	**2021**	**2022**	**2023**	**2024**
DL1	518	463	452	511	DL1	712	717	725	733
DL2	622	591	624	586	DL2	912	914	918	921
DL3	1468	1454	1405	1568	DL3	2209	2251	2263	2286
GL1	586	558	517	617	GL1	562	564	575	585
MV1	604	652	611	722	MV1	744	761	764	766
MV2	1972	2182	2417	2692	MV2	1113	1119	1121	1130
MV3	1328	1641	1426	1640	MV3	802	823	840	855
MV4	1539	1714	1578	1662	MV4	133	133	131	133
TD1	443	381	461	427	TD1	737	745	747	748
TD2	1246	1212	1171	1357	TD2	1705	1714	1720	1723
TD3	1505	1239	1226	1313	TD3	1688	1705	1721	1731
TR1	1488	1721	1427	1310	TR1	466	478	493	499
TR2	379	626	372	599	TR2	189	189	189	190
TR3	1433	1689	1437	1832	TR3	162	162	165	166
TR4	2063	2549	2220	2611	TR4	905	906	908	908
TR5	1915	2138	1885	2473	TR5	1705	1787	1856	1908
TR6	1128	1329	1203	1399	TR6	380	386	415	413

3.3 System Reliability

The District prioritizes delivering safe, reliable, and affordable power to its customers and maintains a proactive maintenance program with built-in redundancies to keep the system healthy, secure, and fully operational. When outages do occur, these practices enable service to be restored quickly and effectively.

Reliability performance is measured according to IEEE Standard 1366 — Guide for Electric Power Distribution Reliability Indices, which establishes standardized definitions, formulas, and reporting practices for utilities across North America. The standard provides a consistent framework for benchmarking reliability, including treatment of major event days and definitions for key indices such as SAIDI, SAIFI, and CAIDI.

SAIDI (System Average Interruption Duration Index): The average total number of minutes that a customer experiences power outages over the course of a year.

SAIFI (System Average Interruption Frequency Index): The average number of sustained outages that a customer experiences in a year.

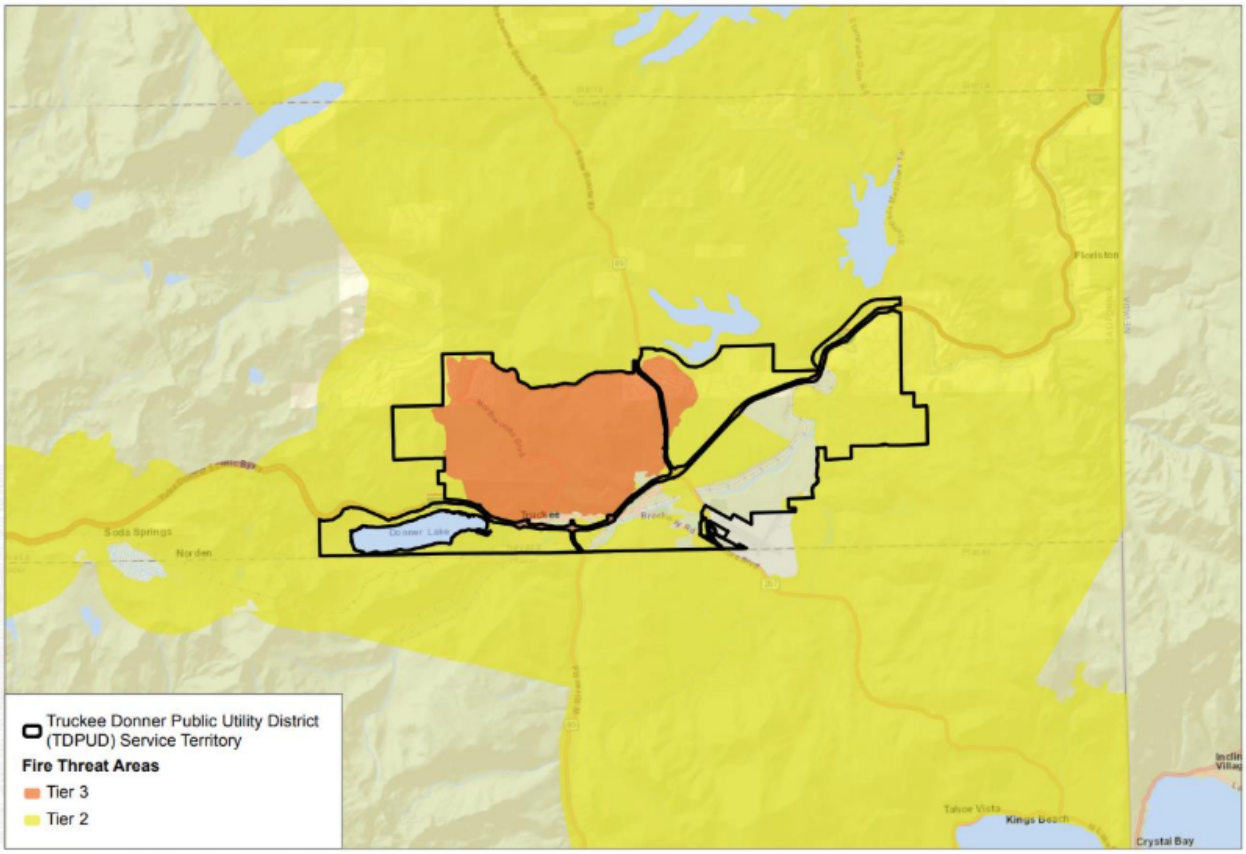
CAIDI (Customer Average Interruption Duration Index): The average length of time it takes to restore service for a single sustained outage.

The District benchmarks its performance against peer utilities with comparable service territory size, geography, and customer base. In 2025, the District began systematically tracking reliability metrics. As these datasets mature, the District will use them to establish key performance indicators (KPIs) and internal reliability goals. Establishing internal KPIs and reliability goals will ensure the District will continue to meet or exceed industry standards. By applying lessons learned, implementing improved outage-mitigation strategies, and completing targeted system-hardening projects, the District is building a more resilient and adaptive grid. Major ongoing and planned projects are described in Section 7.

3.4 Wildfire Risk

To increase resilience against wildfire risk, in accordance with and guided by California Public Utilities Code (PUC) Section 8386, the District develops and maintains a Wildfire Mitigation Plan (WMP). Figure 3-4-1 shows all 44 square miles of service territory is within Tier 2 and 3 HFTD. Reference Section 6 for WMP details.

Figure 3-4-1: TTPUD Service Territory in Tier 2 and Tier3 Fire Threat Districts



4.0 SYSTEM MODELING APPROACH

4.1 Modeling Approach

The District engaged with National Information Solutions Cooperative (NISC) to support development of a detailed distribution system model. NISC is a member-owned cooperative that provides software and technology solutions to electric utilities, with tools widely used for system planning, analysis, and operations.

Using coordinated field assessments and advanced metering infrastructure (AMI) data, NISC produced the most accurate representation of the District's current assets and distribution system configuration to date. In collaboration with Operations and Maintenance staff, operationally credible switching configurations were incorporated into the model, reflecting both emergency and planned maintenance conditions, as well as future planned projects and annualized load growth (described further in Section 4.2). The modeling process followed the step-by-step approach outlined below:

1) **Establish the Base Case:** The model represents today's SCADA peak of each feeder from 10/1/2024 to 9/30/2025, equipment, and circuit configurations as the reference condition.
2) **Embed Switching Configurations:** Approved tie points and transfer paths are incorporated into the model to represent how loads can be shifted during outage contingencies and planned maintenance.
3) **Run Contingency Scenarios:** The base case is simulated under normal or contingency scenarios. The following contingencies are applied in base case and forecasting years:
   - **Loss of Feeder:** Outage at the individual substation feeder breaker, simulated for all 16 feeders.
   - **Loss of Substation:** Loss of power for the entire substation, simulated for all four (4) substations and loss of 607 transmission line.

   Overloading of substation equipment can result in downstream feeder deficiencies. To isolate these impacts, substations and feeders are analyzed separately in the model.
4) **Identify Existing Deficiencies:** The base case results highlight any equipment rating or operational deficiencies already present on the system.
5) **Run 5-Year Loading Forecast Scenarios:** The model is then projected forward one-, three-, and five-years, applying both planned projects and annualized load growth, to identify new constraints that may arise and assess how existing issues may worsen under base case and contingency scenarios.
6) **Finalize Deficiencies:** The results are consolidated into a list of constraints across feeders and substations, identifying what the issues are and when they are expected to occur.
7) **Interpreting Results:** Based on the deficiency and the potential problems it may cause, the risk level is determined to decide whether a mitigation project is recommended or monitoring is sufficient.

8) **Develop Solutions.** Mitigations range from capital projects (e.g., reconductoring, voltage-regulating equipment, line extensions) to operational improvements (e.g., switch installations/replacements, conductor rephasing, added segmentation). Recommended projects are detailed in Section 5.4.

This structured approach provides clear visibility into where constraints may occur and when they will impact the system, enabling the District to prioritize projects effectively while balancing long-term capital planning with near-term operational readiness and maintenance activities, especially during seasonal peaks when load transfers are most critical.

4.2 Load Growth Projections

Forecasting load growth is a critical component of this analysis. The District's approach divided load growth into two categories based on how they were applied in the system model:

Annualized Load Growth: Representing background growth across the system.

Planned Projects and Regional Development: Representing specific known additions.

These forecasts were then validated against the 2024 Integrated Resource Plan (IRP) to ensure consistency and alignment with previously adopted planning assumptions.

a. Annualized Load Growth

Annualized load growth accounts for incremental increases across the existing system over time. This captures the effects of residential infill, business expansion, electric vehicle (EV) adoption, and appliance electrification.

Growth rates are developed using three primary data sources:

Historical meter data: Four years of feeder-level AMI data provide consistent and predictable load trends, which are more reliable than customer-type analysis. Because feeder load composition is strongly tied to customer type by geography (e.g., residential vs. commercial areas), the feeder-level approach captures this variation while remaining stable for forecasting.

Yearly peak data: While some feeders reach annual peak demand during summer, the majority of feeders peak in winter. To ensure the most conservative results, the analysis is performed using SCADA peaks on each feeder either Summer or Winter peak.

2024 Integrated Resource Plan: The District's previously completed 2024 IRP provides a benchmark for validating this Master Plan's forecasting assumptions. The IRP projected low, medium, and high growth scenarios ranging from 1.66% to 2.79% annually across the system. Consistent with the IRP, the District adopts a growth rate of 1.66% for feeders with calculated annual growth below 1.66%, 2.22% for feeders with growth between 1.66% and 2.79%, and 2.79% for all remaining feeders.

Table 4-2-1: Feeder Annual Growth Table

Feeder Annual Growth Table			
Feeder ID	**Peak Season**	**Projected Annual Growth (Using Historical Meter Data)**	**Used Annual Growth (IRP Value)**
DL-1	Winter	0.95%	1.66%
DL-2	Winter	0.33%	1.66%
DL-3	Winter	1.10%	1.66%
GL-1	Winter	0.36%	1.66%
MV-1	Winter	0.97%	1.66%
MV-2	Winter	0.47%	1.66%
MV-3	Winter	2.06%	2.22%
MV-4	Summer	1.81%	2.22%
TD-1	Winter	0.50%	1.66%
TD-2	Winter	0.36%	1.66%
TD-3	Winter	0.84%	1.66%
TR-1	Summer	-5.48%	1.66%
TR-2	Winter	0.14%	1.66%
TR-3	Summer	5.58%	2.79%
TR-4	Winter	0.12%	1.66%
TR-5	Winter	3.55%	2.79%
TR-6	Winter	3.01%	2.79%

b. Planned Projects & Regional Development

The second category of growth reflects documented developments within the service area, identified through coordination with the Town of Truckee and other local agencies. These projects include:

- Major residential subdivisions.
- Expansions of commercial and industrial facilities.
- New public infrastructure, including parking facilities with planned EV charging.
- Other community-driven developments requiring substantial electrical service.

Each project is incorporated into the system model as an individual load addition and is assigned to the appropriate feeder based on project location. Anticipated loads are drawn directly from project documentation when available or are estimated using industry-standard engineering methods (e.g., load per square foot by facility type). These projects are applied to the relevant planning horizon (1, 3, or 5 years) based on their expected completion dates. A complete project list and corresponding forecasted loads are detailed in Appendix B.

TDPUD has an established process, in coordination with the Town of Truckee, for addressing new load requests from Developers/New Business customers. To appropriately address impacts created by new load requests, TDPUD will institute a System Impact Study (SIS) process that will be triggered by predetermined load request thresholds. The TDPUD SIS process will need to initiate an NVE system impact study for any load increase of 1-2MW depending on the NVE connection point.

4.3 Contingency Switching

The switching configurations included in each planning scenario are developed internally by the District's Engineering and Operations groups to capture all usable system tie points during emergency events and planned maintenance. These configurations represent real-world practices already used by the District and are incorporated into the system model to validate that neighboring feeder and substation infrastructure possess adequate capacity to accept transferred load.

To strengthen this analysis, multiple contingency switching options are developed for certain feeders, allowing staff to evaluate the best configuration under different operating conditions. In total, 51 switching configurations were developed and analyzed, including one loss-of-substation configuration per substation and a single loss-of-transmission source scenario. Appendix A, "TDPUD One Line Diagram", details the connection points between adjacent feeders.

a. Loss of Feeder

For each of the District's 16 feeders, the model simulates the loss of the substation feeder breaker. In these scenarios, the entire feeder load is transferred to adjacent feeders through established tie points. Each configuration is validated to confirm that the receiving feeders could safely accommodate the additional load.

- Example: *Loss of Donner Lake Feeder 1 (DL-1) results in XX kW of load transferred to DL-2. Alternative configurations also consider splitting load between DL-2 and Truckee feeders, depending on operational conditions.*

A complete breakdown of loss-of-feeder switching configurations is provided through Table 4-3-a-1 to 4-3-a-4.

Table 4-3-a-1: Switching Configurations - Loss of Donner Lake Feeder

Scenarios	Loss of Feeder	Transfer To	Switching Operations	Substation Capacity (Total / Available)	Transferred Load in Base Case(kW)
DL1 to MV3	DL-1	MV-3	R10 (N/O), DL-1 (N/C)	18.75 MVA / 8.45 MVA	1119
DL1 to DL2	DL-1	DL-2	A-23 (N/O), DL-1 (N/C)	16 MVA / 8.9 MVA	1119
DL2 to DL1	DL-2	DL-1	A-23 (N/O), DL-1 (N/C)	16 MVA / 8.9 MVA	1598
DL3 to TD1	DL-3	TD-1	A59 (N/O), DL-3 (N/C)	21 MVA / 13.6 MVA	4416
DL3 to TD3	DL-3	TD-3	A-62 (N/O), DL-3 (N/C)	21 MVA / 13.6 MVA	4416
DL3 to TD2	DL-3	TD-2	A-44 (N/O), DL-3 (N/C)	21 MVA / 13.6 MVA	4416

Table 4-3-a-2: Switching Configurations - Loss of Tahoe Donner Feeder

Scenarios	Loss of Feeder	Transfer To	Switching Operations	Substation Capacity (Total / Available)	Transferred Load in Base Case(kW)
TD1 to TD2	TD-1	TD-2	A-11(N/O), TD-1(N/C)	21 MVA / 13.6 MVA	1366
TD1 to DL3	TD-1	DL-3	A-59 (N/O), TD-1(N/C)	16 MVA / 8.9 MVA	1366
TD2 to TD1	TD-2	TD-1	A-11(N/O), TD-2 (N/C)	21 MVA / 13.6 MVA	2978
TD2 to DL3	TD-2	DL-3	A-44 (N/O), TD-2 (N/C)	16 MVA / 8.9 MVA	2978
TD2 to TD3_1	TD-2	TD-3	A-28 (N/O), TD-2 (N/C)	21 MVA / 13.6 MVA	2978
TD2 to TD3_2	TD-2	TD-3	A-52 (N/O), TD-2 (N/C)	21 MVA / 13.6 MVA	2978
TD3 to TD2	TD-3	TD-2	A-52 (N/O), TD-3 (N/C)	21 MVA / 13.6 MVA	3068
TD3 to TR5	TD-3	TR-5	A-50 (N/O), TD-3 (N/C)	21 MVA / 7.3 MVA	3068
TD3 to TR4_1	TD-3	TR-4	PMS-26 Pos. #4 (N/O), TD-3 (N/C)	21 MVA / 7.3 MVA	3068
TD3 to TR4_2	TD-3	TR-4	A-16 (N/O), TD-3 (N/C)	21 MVA / 7.3 MVA	3068
TD3 to DL3	TD-3	DL-3	A-62 (N/O), TD-3 (N/C)	16 MVA / 8.9 MVA	3068

Table 4-3-a-3: Switching Configurations - Loss of Truckee Feeder

Scenarios	Loss of Feeder	Transfer To	Switching Operations	Substation Capacity (Total / Available)	Transferred Load in Base Case(kW)
TR1 to TR2	TR-1	TR-2	PMS-72 Pos. #2 (N/O), TR-1 (N/C)	21 MVA / 7.3 MVA	1932
TR1 to MV4	TR-1	MV-4	A-19 (N/O), TR-1 (N/C)	18.75 MVA / 8.45 MVA	1932
TR1 to TR6	TR-1	TR-6	PMS-27 Pos. #1 (N/O), TR-1 (N/C)	21 MVA / 7.3 MVA	1932
TR2 to TR1	TR-2	TR-1	PMS-72 Pos. #2 (N/O), TR-2 (N/C)	21 MVA / 7.3 MVA	884
TR2 to MV3	TR-2	MV-3	A-18 (N/O), TR-2 (N/C)	18.75 MVA / 8.45 MVA	884
TR2 to TR3	TR-2	TR-3	PMS-6 Pos. #1 (N/O), TR-2 (N/C)	21 MVA / 7.3 MVA	884
TR3 to TR2	TR-3	TR-2	PMS-6 Pos. #1 (N/O), TR-3 (N/C)	21 MVA / 7.3 MVA	1935
TR3 to TR4	TR-3	TR-4	PMS-33 Pos. #1 (N/O), TR-3 (N/C)	21 MVA / 7.3 MVA	1935
TR3 to MV3	TR-3	MV-3	PMS-3 Pos. #2 (N/O), TR-3 (N/C)	18.75 MVA / 8.45 MVA	1935
TR4 to TR3	TR-4	TR-3	PMS-33 Pos. #1 (N/O), TR-4 (N/C)	21 MVA / 7.3 MVA	3555
TR4 to TD3_1	TR-4	TD-3	A-16 (N/O), TR-4 (N/C)	21 MVA / 13.6 MVA	3555
TR4 to TD3_2	TR-4	TD-3	PMS-26 Pos. #4 (N/O), TR-4 (N/C)	21 MVA / 13.6 MVA	3555
TR4 to MV3	TR-4	MV-3	S503 (N/O), TR-4 (N/C)	18.75 MVA / 8.45 MVA	3555
TR5 to TR6_1	TR-5	TR-6	PMS-29 Pos. #2 (N/O), TR-5 (N/C)	21 MVA / 7.3 MVA	3789
TR5 to TD3	TR-5	TD-3	A-50 (N/O), TR-5 (N/C)	21 MVA / 13.6 MVA	3789
TR5 to TR6_2	TR-5	TR-6	S202 (N/O), TR-5 (N/C)	21 MVA / 7.3 MVA	3789
TR5 to TR6_3	TR-5	TR-6	PMS-39 Pos. #1 (N/O), TR-5 (N/C)	21 MVA / 7.3 MVA	3789
TR5 to TR6_4	TR-5	TR-6	PMS-45 Pos. #2 (N/O), TR-5 (N/C)	21 MVA / 7.3 MVA	3789
TR6 to TR1	TR-6	TR-1	PMS-29 Pos. #2 (N/O), TR-6 (N/C)	21 MVA / 7.3 MVA	1564
TR6 to TR5_1	TR-6	TR-5	PMS-27 Pos. #1 (N/O), TR-6 (N/C)	21 MVA / 7.3 MVA	1564
TR6 to TR5_2	TR-6	TR-5	S202 (N/O), TR-6 (N/C)	21 MVA / 7.3 MVA	1564
TR6 to TR5_3	TR-6	TR-5	PMS-39 Pos. #1 (N/O), TR-6 (N/C)	21 MVA / 7.3 MVA	1564
TR6 to TR5_4	TR-6	TR-5	PMS-45 Pos. #2 (N/O), TR-6 (N/C)	21 MVA / 7.3 MVA	1564

Table 4-3-a-4: Switching Configurations - Loss of Martis Valley Feeder

Scenarios	Loss of Feeder	Transfer To	Switching Operations	Substation Capacity (Total / Available)	Transferred Load in Base Case(kW)
MV1 to MV2	MV-1	MV-2	A-7 (N/O), MV-1 (N/C)	18.75 MVA / 8.45 MVA	1374
MV1 to MV3	MV-1	MV-3	PMS-7 Pos. #2 (N/O), MV-1 (N/C)	18.75 MVA / 8.45 MVA	1374
MV2 to MV1	MV-2	MV-1	A-7 (N/O), MV-2 (N/C)	18.75 MVA / 8.45 MVA	3560
MV3 to MV1	MV-3	MV-1	PMS-7 Pos. #2 (N/O), MV-3 (N/C)	18.75 MVA / 8.45 MVA	3372
MV3 to DL1	MV-3	DL-1	R10 (N/O), MV-3 (N/C)	16 MVA / 8.9 MVA	3372
MV3 to TR4	MV-3	TR-4	S503 (N/O), MV-3 (N/C)	21 MVA / 7.3 MVA	3372
MV3 to TR2	MV-3	TR-2	PMS-22 Pos. #2 (N/O), MV-3 (N/C)	21 MVA / 7.3 MVA	3372
MV3 to TR3	MV-3	TR-3	PMS-3 Pos. #2 (N/O), MV-3 (N/C)	21 MVA / 7.3 MVA	3372
MV3 to MV4	MV-3	MV-4	A-8 (N/O), MV-3 (N/C)	18.75 MVA / 8.45 MVA	3372
MV4 to TR1	MV-4	TR-1	A-19 (N/O), MV-4 (N/C)	21 MVA / 7.3 MVA	2081

b. Loss of Substation

The model also simulates the complete outage of each substation, resulting in the loss of all feeder breakers at that location. In these scenarios, feeder loads are distributed to multiple adjacent substations based on the operational tie points defined in that substation's contingency scenario.

Example: Loss of the Truckee Substation requires transferring load from all Truckee feeders across multiple Martis Valley and Tahoe Donner feeders, with distribution dependent on available seasonal capacity.

A summary of loss-of-substation switching configurations is provided in Table 4-3-2, including the amount of load transferred from each feeder.

Table 4-3-2: Switching Configurations - Loss of Substation

Scenarios	Loss of Feeder	Transfer To	Toggled Switches	Transferred Load in Base Case(kW)
Donner Lake Substation Loss	DL-1	MV-3	R10 (N/O), DL-1 (N/C)	1119
	DL-2	DL-1	A-23 (N/O), DL-2 (N/C)	1598
	DL-3	TD-2 & TD-1	A13 (N/C), A-44 (N/O), A59 (N/O), DL-3 (N/C)	4416
Tahoe Donner Substation Loss	TD-1	TD-2	A-11(N/O), TD-1(N/C)	1366
	TD-2	TR-5, TR-4	A-28 (N/O), A-51(N/C), A-52 (N/O), TD-2 (N/C)	2978
	TD-3	TR-5, TR-4	A-50 (N/O), S-368 (N/C), PMS-26 Pos. #4 (N/O), TD-3 (N/C)	3068
Truckee Substation Loss	TR-1	MV-4	A-19 (N/O), TR-1 (N/C)	1932
	TR-2	MV-3	MV-3, TR-2 (N/C)	884
	TR-3	MV-3	PMS-3 Pos. #2 (N/O), TR-3 (N/C)	1935
	TR-4	TD-3	PMS-26 Pos. #4 (N/O), TR-4 (N/C)	3555
	TR-5	TD-3	A-28 (N/O), A-49(N/C), A-50 (N/O), TR-5 (N/C)	3789
	TR-6	TR-1	PMS-27 Pos. #1 (N/O), TR-6 (N/C)	1564
Martis Valley Substation Loss	MV-1	TR-2	PMS-7 Pos. #2 (N/O), MV-1 (N/C)	1374
	MV-2	MV-1	A-7 (N/O), MV-2 (N/C)	3560
	MV-3	TR-2	PMS-22 Pos. #2 (N/O), MV-3 (N/C)	3372
	MV-4	TR-1	A-19 (N/O), MV-4 (N/C)	2081

c. Loss of 607 Transmission Line

In addition to distribution-level contingencies, the model considers the loss of the 607 Transmission Line, which delivers 60 kV service from NV Energy into the District. An outage of this line results in a complete loss of supply to both the Donner Lake and Tahoe Donner substations. Under this scenario, all feeder loads normally served by these substations must be reallocated to remaining substations (Martis Valley and Truckee) through available tie points, subject to thermal and voltage limits.

This transmission-level contingency represents a high-impact, low-frequency event and is critical for confirming the District's ability to maintain reliable service during major grid disturbances. The associated switching configurations and transferred loads are summarized in Table 4-3-3.

Table 4-3-3: Switching Configurations - Loss of 607 Transmission Line

Scenarios	Loss of Feeder	Transfer To	Toggled Switches	Transferred Load in Base Case(kW)
607 Transmission Line Loss	DL-1	MV-3	R10 (N/O), DL-1 (N/C)	1119
	DL-2	DL-1	A-23 (N/O), DL-2 (N/C)	1598
	DL-3	TD-2 & TD-1	A13 (N/C), A-44 (N/O), A59 (N/O), DL-3 (N/C)	4416
	TD-1	TD-2	A-11(N/O), TD-1(N/C)	1366
	TD-2	TR-5, TR-4	A-28 (N/O), A-51(N/C), A-52 (N/O), TD-2 (N/C)	2978

	TD-3	TR-5, TR-4	A-16 (N/O), A-49 (N/C), A-50 (N/O), TD-3 (N/C)	3068

4.4 Analysis

This section introduces the analytical studies used to evaluate the performance of the District's distribution system. These studies form the basis for identifying system constraints, validating operational practices, and planning targeted improvements. By applying industry standards and current technologies, the District can assess service quality, reliability, and efficiency under a variety of operating conditions, ensuring that facilities are planned and operated to meet both present and future community needs.

a. Voltage Tolerance

Voltage tolerance boundaries are established in ANSI C84.1, which defines acceptable service and utilization voltage ranges used throughout the electric utility industry. Per ANSI C84.1, the normally expected voltage is designed to maintain 114.0 volts at service point, 118.0 volts at all distribution transformer primaries, considering 4.0-volt drop across service transformers and service conductors. Under contingency conditions, the minimum voltage at service point is 110.0 volts, however these conditions should be limited in extent, frequency and duration.

The report evaluates the primary and secondary voltage levels. For the cluster of secondary voltage below 114.0 volts or primary voltage below 118.0 volts, improvements will be recommended

b. Conductor Overload

Conductor overloading increases conductor temperature due to Joule heating (I^2R losses), which can lead to excessive conductor sag, reduced ground clearance, and accelerated thermal aging of associated equipment. In addition, higher current levels increase feeder voltage drop, potentially resulting in voltage violations at downstream nodes. Persistent overload conditions may trigger protective device operations, leading to feeder outages and reduced system reliability.

The analysis evaluates the primary conductors. For the conductors that are loaded over their allowable ampere rating, improvements will be recommended.

c. Transformer Overload

Transformer overloading occurs when downstream connected load exceeds the transformer's rated capacity, leading to increased operating temperature due to higher losses associated with Joule heating. Elevated temperatures accelerate insulation aging within the transformer windings, which can significantly reduce the equipment's service life and increase the risk of insulation failure or internal faults. In addition, higher loading levels increase voltage drop across the transformer impedance, potentially causing low-voltage conditions for downstream customers. IEEE C57 provide guidelines for transformer loading capacity. Operating definitions are consistent with IEEE C57 requirements and as follows:

- Normal Loading: defines a condition wherein a power transformer is loaded at or below nameplate rating and its hottest-spot temperature is within defined temperature range.

- Long-Time Emergency (LTE) Loading: defines a condition wherein a power transformer is so loaded that its hottest-spot temperature is in the temperature range of 120°C–140°C.
- Short-Time Emergency (STE) Loading: defines a loading condition wherein a transformer is so loaded that its hottest-spot temperature is as high as 180 °C for a short time.

The report evaluates the performance of substation and service transformers.

Service Transformer: The transformers can tolerate short time overloads because their temperature rise lags behind increases in load current due to their thermal time constant. And the loads of transformers are inherently diverse and intermittent, rather than continuous. Brief overloads, such as those occurring during peak demand periods or contingency conditions, are generally acceptable provided the resulting temperatures remain within the insulation limits specified by applicable standards. Therefore, for service transformers operating above 150% of their nameplate rating, improvements will be recommended.

Substation Transformer: Overloading a substation transformer increases temperatures, accelerates insulation aging, reduces efficiency, and can cause voltage drops or mechanical damage. It also raises the risk of protective trips, outages, and cascading failures, potentially leading to costly repairs or premature replacement. However, a cooling system helps mitigate these effects by removing excess heat, keeping winding and core temperatures within safe limits. The table 4-4-1 summary the nameplate loading capacity of substation transformers with natural air cooling or forced air cooling. In analysis, for a substation transformer operating above 100% of its rated capacity with forced air-cooling system, improvements will be recommended.

Table 4-4-1 Summary of Substation Transformer Capacity under Normal Loading

Substation	Loading Capacity with Natural Air Cooling	Loading Capacity with Forced Air Cooling
Donner Lake (DL)	12000KVA	16000KVA
Martis Valley (MV)	15000KVA	18750KVA
Tahoe Donner (TD)	16800KVA	21000KVA
Truckee (TR)	16800KVA	21000KVA

d. Protective Equipment Overload

Protective devices play a critical role in maintaining the safety and reliability of electrical distribution systems by preventing equipment damage due to excessive current. When a distribution feeder, transformer, or conductor experiences currents beyond its rated capacity, these protective devices, such as fuses or reclosers, operate to interrupt the flow of electricity, limiting thermal and mechanical stress on system components. By isolating the faulted or overloaded section, they protect conductors, transformers, and other equipment from overheating, insulation failure, or permanent damage. Overloading of protective devices may accelerate wear of device components and affect their operating characteristics. Prolonged overload can lead to unintended or frequent (or nuisance) tripping, causing service interruptions and affecting system reliability. Therefore, monitoring and mitigating overload conditions are essential to ensure proper protective device operation and maintain stable and reliable distribution system performance.

The report evaluates the loading performance of cutout switches, disconnect switches and reclosers. For devices operating above 100% of their rated capacity, improvements will be recommended.

e. Phase Balance

Phase imbalance can lead to poor voltage regulation, increased line losses, and potential overloading of facilities, even when the total three-phase load remains within acceptable limits. Phase imbalance can also lead to nuisance ground tripping affecting system reliability. If the load on a feeder is unevenly distributed among phases, appropriate measures shall be implemented to achieve a reasonable level of balance. A balanced condition is defined as equal current in each phase, resulting in minimal voltage regulation under system design loading conditions.

The report analyses the phase imbalance of each feeder. For feeders where imbalance exceeds 10%, improvements will be recommended.

f. Protection Coordination and Fault Analysis

At the time of this master plan, the distribution system model requires additional data validation. This does not affect the analysis or conclusions presented in this master plan; however, it does limit the ability to complete a detailed protection coordination study and fault analysis. The following criteria provide general guidance for designing a distribution protection system:

i. The primary objective of a distribution system protection scheme is to safeguard system equipment and ensure public safety during fault conditions.

ii. The distribution protection scheme is designed to quickly provide restoration of service to as many consumers as possible. In terms of design; cost, practicality, and service reliability must be considered collectively, with the optimal balance of these factors determined by the Engineer's professional judgment.

iii. Protective devices should correctly and specifically isolate faults so that operations personnel can easily locate the faulted section, make repairs, and restore service to consumers.

iv. Locations for proposed protective coordination devices, where supplied by the Engineer, should be field verified by operations personnel. The actual location for installation must meet protection requirements, as well as provide reasonable access for operations crews.

v. The final objective of protective coordination is to minimize short circuit stress on system equipment, in particular, power transformers.

The distribution system model will undergo additional data validation in the months following completion of this master plan. Once the model has been updated and is in an acceptable state for analysis, Engineering will complete the protection coordination study and associated fault analysis. The criteria outlined above will guide the development of the final protection scheme when the validated model becomes available.

4.5 Addressing Deficiencies

As each planning scenario is studied across all switching configurations, identified deficiencies are captured, documented, and analyzed. Results for each configuration are provided in Appendix C, with a summary of findings presented in Section 5.

a. Interpreting Results

All deficiencies are reviewed across feeders, substations, and switching configurations to ensure consistency and transparency**.** Overlapping constraints are flagged, allowing the District to develop specific project solutions that address multiple issues at once. This process ensures that mitigation measures are not developed in isolation but rather consider the system as a whole.

b. Developing Projects

Based on the interpreted results, the District develops a list of potential solutions and evaluates them according to system impact, effectiveness, and project cost-effectiveness.

The resulting list of recommended projects is prioritized and consolidated into the District's ten year capital improvement plan, with projects categorized, listed and budget allocations provided in Section 5.5; while unit cost allocations are summarized in Section 6.

5.0 STUDY RESULTS & PROPOSED CAPACITY PROJECTS

This section discusses the results of the study by substation service area and associated distribution feeders. Tables identifying the type of violation and in which study year horizon the violation occurs are provided. A description of violations present by feeder configuration, violation type and year the violation occurs is provided within each substation service area and specific circuit feeder.

The identified violations were analyzed and consolidated into projects in Section 5.5, accounting for overlapping violations across feeder configurations. The projects are classified into Tier 1 and Tier 2 projects with budgetary costs provided for Tier 1 projects. The general descriptions below summarize the approach that was taken to resolve the specific type of violation identified. The sections in the body of the report list the specific solution selected to resolve the violation(s).

Substation Overload Methodology

Proposed solutions for identified substation overload conditions follow a structured methodology to ensure that all feasible operational and infrastructure solutions are evaluated.

The first step reviews all existing feeder ties connected to the affected substation. Available capacity on these feeders is assessed and switching scenarios identified where the load can be shifted to viable circuits that can safely and reliably feed the transferred customer load.

If existing feeder tie configurations do not provide sufficient capacity to relieve the overload, the next step identified other viable adjacent feeder ties that have available capacity. New switching scenarios are listed and new tie-in projects will need to be developed to establish the infrastructure needed to offload excess load and restore the substation to within acceptable operating limits.

If existing or newly developed feeder-tie and switching configurations cannot fully mitigate the overload, TDPUD will evaluate the need to upgrade or replace the affected substation transformer(s). Potential transformer capacity enhancements will be analyzed to determine the most effective solution for maintaining long-term reliability.

The final step, if operational adjustments and transformer upgrades are insufficient to address the overload, the need to expand the existing substation or construct a new substation will be assessed. This option will be considered only after all other alternatives have been exhausted.

Mainline Overload Methodology

Mainline sections that exceed loading limits are designated for rebuild or reconductoring in the areas where overload violations are identified. Candidate mainline segments will be evaluated against planned system-hardening efforts or other scheduled projects to identify opportunities for coordination and cost efficiency. Alternatives to reconductoring may be further studied to confirm that forecasted load growth is progressing as expected before a violation is projected to occur in the planning year.

Protective Device and Service Transformer Overload Methodology

Results are evaluated to identify the planning year in which violations occur. Asset replacement with higher rated equipment that aligns with system capacity requirements are then identified. Prior to the planning-year violation, a root cause assessment may be performed to determine whether alternative solutions, such as load transfers or the addition of transformer capacity, are viable options before proceeding with equipment replacement. TDPUD will utilize NISC Operational Analytics to assess service transformers with an identified overload greater than 150% of its nameplate capacity prior to the violation year.

Phase Imbalance Methodology

Phase imbalance violations are assessed to identify the planning year in which the violations occur. Violations that occur in Year 3 and Year 5 planning horizons will be re-evaluated at a later date to determine if other implemented projects (reconductoring, asset replacement, load transfers, etc..) have resolved the violation. Remaining violations or violations in the Base Case and year 1 planning horizons will be investigated to determine if load transfers are feasible to resolve the violations.

Primary and Secondary Low Voltage Methodology

Low-voltage violations are categorized separately for mainline segments and for clusters of secondary low-voltage conditions. Proposed solutions will first evaluate whether secondary clusters are being affected by adjacent mainline low-voltage issues. In such cases, mainline voltage violations will be addressed first, after which the secondary clusters will be re-evaluated to determine which violations remain. Secondary low-voltage clusters that are not influenced by nearby mainline issues will be listed independently, along with the corresponding proposed resolutions.

5.1 Donner Lake Substation Service Area

The Donner Lake Service Area is served by the DL-1, DL-2, and DL-3 circuits with a combined peak load of 7.1 MW. Load growth on the DL-1, DL-2, and DL-3 circuits is projected at 1.66%. Existing three-phase ties are present between MV-3 and DL-1, TD-1 and DL-3, TD-2 and DL-3, and TD-3 and DL-3.

DONNER LAKE SUBSTATION

a. Substation Capacity Study Results

Donner Lake Substation has capacity of 16 MVA. Under normal operating conditions, the substation is forecasted to reach 50% of capacity within the five-year planning horizon. The forecasted load on Donner Lake Substation is 8.1 MVA in Year 5.

Substation loading under MV-3, TD-1, TD-2, and TD-3 switching scenarios do not exceed substation capacity.

Table 5-1-1 Summary of Donner Lake Substation Transformer Capacity

Substation Capacity * (kVA)	Scenario	Forecasted Load			
		Base Case	1-Year	3-Year	5-Year
16000	Normal Operation	45%	46%	49%	50%
	Picking Up MV-3	66%	83%	92%	95%

	Picking Up TD-1	53%	45%	58%	58%
	Picking Up TD-2	63%	66%	70%	72%
	Picking Up TD-3	64%	65%	69%	71%

* Substation Capacity with Forced Air Cooling

b. Substation Capacity Proposed Solutions

Donner Lake Substation has no transformer overload to mitigate.

Donner Lake Substation is projected to reach 50% loading under normal operating conditions and up to 95% loading when assuming MV-3 pickup within the Year 5 planning horizon. TDPUD will assess existing operational practices, District policies, and associated risks to determine the conditions under which a substation upgrade or transformer replacement would be warranted.

DL-1 CIRCUIT

a. DL-I Circuit Study Results

DL-1 is serving approximately 1.1 MW of load. Phase imbalance violations are noted in the base case as well as in the 1-year, 3-year, and 5-year study horizons.

DL-1 has one (1) tie to DL-2 and MV-3. The recommended switching option is from DL-1 to DL-2, as it results in fewer violations than DL-1 to MV-3.

Table 5-1-2 summarizes the years in which significant violations occur under DL-1 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-1-2: Feeder: DL-1

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
DL1 Normal	No Issue	No Issue	No Issue	No Issue	BC/1/3/5Y	No Issue
DL1 to DL2	No Issue	No Issue	No Issue	No Issue	No Issue	No Issue
DL1 to MV3	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	BC/1	BC/1/3/5Y

b. DL-1 Normal Operations

DL-1 under normal operating conditions, scenario violations occur exclusively in the phase-imbalance category. Phase-imbalance violations are observed in the base case as well as in the Year 1, Year 3, and Year 5 planning horizons.

BASE CASE / YEAR 1 / YEAR 3 / YEAR 5

DL1 Phase Imbalance Summary: There exists a 50% phase imbalance in all study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

c. DL-1 to DL-2 Contingency Scenario

The DL-1 to DL-2 switching scenario has no violations identified under any category. This configuration is the recommended primary switching option for the DL-1 circuit.

d. DL-1 to MV-3 Contingency Scenario

The DL-1 to MV-3 switching scenario is not recommended due to the higher number and type of violations that are present, unless Donner Lake substation fails. In the case DL-1 to MV-3 will need to be utilized, following are the proposed solutions to mitigate violations:

BASE CASE

DL1/MV3 Mainline Conductor Overload Summary: MV-3 has a negligible amount of overloaded mainline conductor, less than 10', in the Base Case. TDPUD will reconductor under 10' of conductor to resolve overload conductor violations. Reconductoring can be mitigated if DL-1 to MV-3 switching scenario is not used or alternative load transfer configuration is identified.

DL1/MV3 Protective Device Equipment Summary: The MV-3 circuit has four (4) cutout switches and ten (10) disconnect switches that are modeled to be overloaded. TDPUD will initiate an asset replacement program to install appropriately sized protective devices. Asset replacement can be mitigated if DL1/MV3 switching scenario is not used.

DL1/MV3 Primary Low Voltage Summary: The Base Case analysis identified 6.47 miles of low voltage on the DL-1 circuit and 6.17 miles on the MV-3 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. Low voltage can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Phase Imbalance Summary: A 16% phase imbalance occurs on MV-3 in the Base Case planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. Phase imbalance can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Secondary Low Voltage Summary: Secondary low voltage has been identified on 637 services on the DL-1 circuit and 500 services on the MV-3 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if DL-1 to MV-3 switching scenario is not used.

YEAR 1

DL1/MV3 Mainline Conductor Overload Summary: MV-3 has 2.23 miles of overloaded mainline conductor in the Year 1 planning horizon. TDPUD will reconductor approximately 2.23 miles of conductor to resolve overload conductor violations. Reconductoring can be mitigated if DL-1 to MV-3 switching scenario is not used or alternative load transfer configuration is identified.

DL1/MV3 Protective Device Equipment Summary: The MV-3 circuit has an additional one (1) cutout switch and five (5) disconnect switches that are modeled to be overloaded in Year 1. TDPUD will initiate an asset replacement program to install appropriately sized protective devices. Asset replacement can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Primary Low Voltage Summary: The Year 1 analysis identified an additional 1.03 miles of low voltage on the MV-3 circuit and none on the DL-1 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. Low voltage can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Phase imbalance Summary: Phase imbalance of 11% occurs on MV-3 in the Year 1 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. Phase imbalance can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Service Transformer Summary: The Year 1 analysis identified 1 service transformer with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. Asset replacement can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Secondary Low Voltage Summary: Additional secondary low voltage has been identified on 75 services on the DL-1 circuit and 69 services on the MV-3 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if DL-1 to MV-3 switching scenario is not used.

YEAR 3

DL1/MV3 Mainline Conductor Overload Summary: MV-3 has 0.03 miles of overloaded mainline conductor in the Year 1 planning horizon. TDPUD will reconductor approximately 0.03 miles of conductor to resolve overload conductor violations. Reconductoring can be mitigated if DL-1 to MV-3 switching scenario is not used or alternative load transfer configuration is identified.

DL1/MV3 Protective Device Equipment Summary: Protective devices modeled to be overloaded in Year 3 have been addressed in the base case and Year 1 planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment if not previously addressed. Asset replacement can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Primary Low Voltage Summary: The Year 3 analysis identified an additional 0.03 miles of low voltage on the MV-3 circuit and none on the DL-1 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. Low voltage can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Service Transformer Summary: The service transformer modeled to be overloaded in Year 3 analysis has been addressed in the Year 1 planning horizon. TDPUD

will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. Asset replacement can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Secondary Low Voltage Summary: Additional secondary low voltage has been identified on 28 services on the MV-3 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if DL-1 to MV-3 switching scenario is not used.

YEAR 5

DL1/MV3 Mainline Conductor Overload Summary**:** MV-3 conductor overload for Year 5 have been addressed in the base case, Year 1 and Year 3 planning horizons. Reconductoring can be mitigated if DL-1 to MV-3 switching scenario is not used or alternative load transfer configuration is identified.

DL1/MV3 Protective Device Equipment Summary: Protective devices modeled to be overloaded in Year 5 have been addressed in the base case and Year 1 planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment if not previously addressed. Asset replacement can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Primary Low Voltage Summary: The Year 5 analysis identified an additional 0.95 miles of low voltage on the MV-3 circuit and none on the DL-1 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. Low voltage can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Service Transformer Summary: The Year 5 analysis identified one (1) additional transformer overloaded on MV-3 circuit. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. Asset replacement can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL1/MV3 Secondary Low Voltage Summary: Additional secondary low voltage has been identified on 36 services on the MV-3 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if DL-1 to MV-3 switching scenario is not used.

DL-2 CIRCUIT

a. DL2 Circuit Study Results

DL-2 is serving approximately 1.6 MW of load. Phase imbalance violations are present in the base case as well as in the 1-year, 3-year, and 5-year study horizons.

DL-2 has one (1) tie to DL-1, Under DL-2 contingency scenario, the phase imbalance violation is mitigated.

Table 5-1-3 summarizes the years in which significant violations occur under DL-2 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-1-3: Feeder: DL-2

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
DL2 Normal	No Issue	No Issue	No Issue	No Issue	BC/1/3/5Y	No Issue
DL2 to DL1	No Issue	5Y	No Issue	No Issue	No Issue	No Issue

b. DL-2 Normal Operations

DL-2 under normal operations condition, scenario violations occur exclusively in the phase imbalance category for the base case, Year 1, Year 3 and Year 5 planning horizons.

BASE CASE / YEAR 1 / YEAR 3 / YEAR 5

DL2 Phase imbalance Summary**:** The model indicates a phase imbalance of 36% on the DL-2 circuit for the entire planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

c. DL-2 to DL-1 Contingency Scenario

The DL-2 to DL-1 switching scenario analysis results in violations occurring exclusively under primary low voltage in the Year 5 planning horizon.

YEAR 5

DL2/DL1 Primary Low Voltage Summary: The low voltage is limited to approximately 1,500 feet on the DL-2 feeder in the DL-2 to DL-1 contingency scenario. TDPUD will analyze completed projects on DL-2 prior to the Year 5 planning horizon and re-evaluate low voltage to determine course of action.

DL-3 CIRCUIT

a. DL-3 Circuit Study Results

DL-3 is serving approximately 4.4 MW of load. Under normal operation, DL-3 has phase imbalance, low voltage issues, mainline and device overload violations. Violations are identified in the base case as well as in the 1-year, 3-year, and 5-year study horizons.

DL-3 has three (3) potential feeder ties, one with each of the following feeders: TD-1, TD-2 and TD-3. Of the three possible DL-3 contingency scenarios, the preferred switching option is from DL-3 to TD-3, which results in fewer violations than the alternative options.

Table 5-1-4 summarizes the years in which significant violations occur under DL-3 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-1-4: Feeder: DL-3

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
DL3 Normal	3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y
DL3 to TD3	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y
DL3 to TD1	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y
DL3 to TD2	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y

b. DL-3 Normal Operation

The DL-3 under normal operations condition contains mainline conductor overload violations that must be addressed prior to Year 3 and Year 5 planning horizons. Overloaded protection device equipment, overloaded service transformers, low voltage, and phase imbalance violations are present in all planning horizons.

BASE CASE

DL3 Protective Device Equipment Summary: The DL-3 circuit has four (4) cutout switches and seven (7) disconnect switches overloaded in the base case study horizon. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation.

DL3 Primary Low Voltage Summary: The base case analysis identified 22.8 miles of mainline conductor with low voltage on the DL-3 circuit. The DL-3 mainline low voltage will be re-evaluated after high priority projects are completed to confirm low voltage conditions and generate a mitigation action plan.

DL3 Phase imbalance Summary: Phase imbalance is identified on the DL-3 circuit in the base case analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

DL3 Service Transformer Summary: The base case analysis identified two (2) service transformers with an overload greater than 150% of the rated value. TDPD will utilize NISC Operation Analysis tool to validate overload condition and determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

DL3 Secondary Low Voltage Summary: Secondary low voltage violations have been identified on 1137 services on the DL-3 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results.

YEAR 1

DL3 Protective Device Equipment Summary: The DL-3 circuit has an additional one (1) cutout switch overloaded in the Year 1 study horizon. TDPUD will initiate an asset

replacement program to install appropriately sized protection device equipment prior to the identified planning year violation.

DL3 Primary Low Voltage Summary: The Year 1 analysis did not identify additional miles of mainline conductor with low voltage on the DL-3 circuit. All low voltage identified in the Year 1 results have been addressed in the base case scenario.

DL3 Phase imbalance Summary: Phase imbalance is identified on the DL-3 circuit in the Year 1 analysis. TDPUD will investigate the load on each phase to identify if imbalance persists, then quantify the imbalance and determine if load transfers can be completed between phases.

DL3 Service Transformer Summary: The Year 1 analysis did not identify additional service transformers with an overload greater than 150% of the rated value. All overload conditions present in Year 1 have been addressed by the base case scenario. TDPD will utilize NISC Operation Analysis tool to validate overload condition and determine if an equipment upgrade would be required.

DL3 Secondary Low Voltage Summary: Additional secondary low voltage violations have been identified on 144 services on the DL-3 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results.

YEAR 3

DL3 Cable Overload Summary: DL-3 has 0.7 miles of overloaded mainline conductor in the Year 3 planning horizon under normal operations. TDPUD will reconductor 0.7 miles of overloaded conductor to resolve the violations.

DL3 Protective Device Equipment Summary: The DL-3 circuit has no additional protective devices overloaded in the Year 3 study horizon. All devices indicating overload conditions within the Year 3 planning horizon have been addressed in the base case and Year 1 analysis.

DL3 Primary Low Voltage Summary: The Year 3 analysis identified an additional 0.3 miles of mainline conductor with low voltage on the DL-3 circuit. The DL-3 mainline low voltage will be re-evaluated after high priority projects are completed to confirm low voltage conditions and generate a mitigation action plan.

DL3 Phase imbalance Summary: Phase imbalance is identified on the DL-3 circuit in the Year 3 analysis. TDPUD will investigate the load on each phase to identify if imbalance persists, then quantify the imbalance and determine if load transfers can be completed between phases.

DL3 Service Transformer Summary: The Year 3 analysis identified three (3) additional service transformers with an overload greater than 150% of the rated value. TDPD will utilize NISC Operation Analysis tool to validate overload condition and determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

DL3 Secondary Low Voltage Summary: Additional secondary low voltage violations have been identified on 28 services on the DL-3 circuit. Low voltage will be re-evaluated

to determine if violations persist after other projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results.

YEAR 5

DL3 Cable Overload Summary: DL-3 does not have additional miles of overloaded mainline conductor in the Year 5 planning horizon under normal operations. The mainline overload conditions present in Year 5 have been addressed in the Year 3 planning horizon,

DL3 Protective Device Equipment Summary: The DL-3 circuit has an additional one (1) cutout switch overloaded in the Year 5 study horizon. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation.

DL3 Primary Low Voltage Summary: The Year 5 analysis did not identify additional miles of mainline conductor with low voltage on the DL-3 circuit. All low voltage identified in the Year 5 results have been addressed in the base case , Year 1 and Year 3 scenarios.

DL3 Phase imbalance Summary: Phase imbalance is identified on the DL-3 circuit in the Year 5 analysis. TDPUD will investigate the load on each phase to identify if imbalance persists, then quantify the imbalance and determine if load transfers can be completed between phases.

DL3 Service Transformer Summary: The Year 5 analysis did not identify additional service transformers with an overload greater than 150% of the rated value. All overload conditions present in Year 5 have been addressed by the base case , Year 1 and Year 3 scenarios. TDPD will utilize NISC Operation Analysis tool to validate overload condition and determine if an equipment upgrade would be required.

DL3 Secondary Low Voltage Summary: Additional secondary low voltage violations have been identified on 36 services on the DL-3 circuit. Low voltage will be re-evaluated to determine if violations persist after other projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results.

c) DL-3 to TD-3 Contingency Scenario

The DL-3 to TD-3 switching scenario results in mainline conductor overload, mainline protective device overload, mainline primary low voltage, phase imbalance, service transformer overload and secondary low voltage violations in all planning year horizons.

BASE CASE

DL3/TD3 Mainline Conductor Overload Summary: DL-3 has less than 10 feet and TD-3 has 1.1 miles of overloaded mainline conductor in the base case planning horizon. TDPUD will reconductor approximately 1.1 miles of conductor to resolve the violations. Reconductoring can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Mainline Protective Device Equipment Summary: The DL-3 circuit has four (4) cutout switches and two (2) disconnect switches modeled to be overloaded in the base

case scenario. The TD-3 circuit has five (5) cutout switches, three (3) disconnect switches, and one (1) recloser modeled to be overloaded in the base case scenario. TDPUD will initiate an asset replacement program to install appropriately sized protection devices. Asset replacement can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Primary Low Voltage Summary: The base case analysis identified 23.4 miles of DL-3 and 9.5 miles of TD-3 conductor with low voltage violations. Low voltage will be re-evaluated to determine if violations persist after higher priority projects in this section are completed. Mainline low voltage projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Phase Imbalance Summary: Phase imbalance occurs on the DL-3 circuit in the Base Case scenario. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases. Phase imbalance projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Service Transformer Summary: The base case analysis identified two (2) service transformers on the DL-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to violation year. Service Transformer Replacement projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Secondary Low Voltage Summary: Secondary low voltage has been identified on 1,740 service points on the DL-3 circuit and 168 service points on the TD-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

YEAR 1

DL3/TD3 Mainline Conductor Overload Summary: DL-3 has 0.3 miles and TD-3 has no additional miles of overloaded mainline conductor in the Year 1 planning horizon. The mainline overloaded conductor on the TD-3 circuit for the Year 1 analysis would be addressed in the base case scenario. TDPUD will reconductor approximately 0.3 miles of conductor on DL-3 to resolve the violations. Reconductoring can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Mainline Protective Device Equipment Summary: The DL-3 circuit has an additional one (1) cutout switch modeled to be overloaded in the Year 1 scenario. The TD-3 has no additional protective devices modeled to be overloaded in the Year 1 scenario. TDPUD will initiate an asset replacement program to install appropriately sized protection devices. Asset replacement can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Primary Low Voltage Summary: The Year 1 analysis identified no additional miles of DL-3 and an additional 0.2 miles of TD-3 conductor with low voltage violations.

Low voltage will be re-evaluated to determine if violations persist after higher priority projects in this section are completed. Mainline low voltage projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Phase Imbalance Summary: Phase imbalance occurs on the DL-3 circuit in the Year 1 scenario. TDPUD will investigate the load on each phase to verify if imbalance persists beyond what was addressed in the base case . TDPUD will determine if load transfers can be completed between phases to resolve the imbalance. Phase imbalance projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Service Transformer Summary: The Year 1 analysis does not identify additional service transformers with an overload greater than 150% of the rated value. The service transformers identified to be overloaded in the Year 1 analysis have been addressed in the base case scenario. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. Service Transformer Replacement projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Secondary Low Voltage Summary: Additional secondary low voltage has been identified on 8 service points on the DL-3 circuit and 21 service points on the TD-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

YEAR 3

DL3/TD3 Mainline Conductor Overload Summary: DL-3 has an additional 0.5 miles and TD-3 has no additional miles of overloaded mainline conductor in the Year 3 planning horizon. The mainline overloaded conductor on the TD-3 circuit and a portion of the mainline overloaded conductor on the DL-3 circuit for the Year 3 analysis would be addressed in the base case and Year 1 scenarios. TDPUD will reconductor approximately 0.5 miles of conductor on DL-3 to resolve the violations. Reconductoring can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Mainline Protective Device Equipment Summary: The DL-3 circuit has an additional two (2) cutout switches modeled to be overloaded in the Year 3 scenario. The TD-3 has no additional protective devices modeled to be overloaded in the Year 3 scenario. TDPUD will initiate an asset replacement program to install appropriately sized protection devices. Asset replacement can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Primary Low Voltage Summary: The Year 3 analysis identified an additional 0.5 miles of DL-3 and an additional 0.8 miles of TD-3 conductor with low voltage violations. Low voltage will be re-evaluated to determine if violations persist after higher priority projects in this section are completed. Mainline low voltage projects can be

mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Phase Imbalance Summary: Phase imbalance occurs on the DL-3 circuit in the Year 3 scenario. TDPUD will investigate the load on each phase to verify if imbalance persists beyond what was addressed in the base case and Year 1 scenarios. TDPUD will determine if load transfers can be completed between phases to resolve the imbalance. Phase imbalance projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Service Transformer Summary: The Year 3 analysis identified an additional three (3) service transformers on the DL-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. Service Transformer Replacement projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Secondary Low Voltage Summary: Additional secondary low voltage has been identified on 36 service points on the DL-3 circuit and 93 service points on the TD-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

YEAR 5

DL3/TD3 Mainline Conductor Overload Summary: No additional miles of overloaded conductor are identified in the DL-3 and TD-3 circuits in the Year 5 planning horizon. The mainline overloaded conductor violation on the DL-3 and TD-3 circuits for the Year 5 analysis would be addressed in the base case, Year 1 and Year 3 scenarios. Reconductoring can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Mainline Protective Device Equipment Summary: The DL-3 circuit has no additional protective devices modeled to be overloaded in the Year 5 scenario. The TD-3 has no additional protective devices modeled to be overloaded in the Year 3 scenario. Asset replacement can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Primary Low Voltage Summary: The Year 5 analysis identified an additional 0.1 miles of DL-3 and an additional 0.1 miles of TD-3 conductor with low voltage violations. Low voltage will be re-evaluated to determine if violations persist after higher priority projects in this section are completed. Mainline low voltage projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Phase Imbalance Summary: Phase imbalance occurs on the DL-3 circuit in the Year 5 scenario. TDPUD will investigate the load on each phase to verify if imbalance persists beyond what was addressed in the base case, Year 1 and Year 3 scenarios. TDPUD will determine if load transfers can be completed between phases to resolve the imbalance.

Phase imbalance projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Service Transformer Summary: The Year 5 analysis does not identify additional service transformers with an overload greater than 150% of the rated value. The service transformers identified to be overloaded in the Year 1 analysis have been addressed in the base case scenario. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. Service Transformer Replacement projects can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

DL3/TD3 Secondary Low Voltage Summary: Additional secondary low voltage has been identified on 11 service points on the DL-3 circuit and 73 service points on the TD-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if DL-3 to TD-3 switching scenario is not used or alternative load transfer configuration is identified.

c. Other Contingency Scenarios

The DL-3 to TD-1 and DL-3 to TD-2 contingency scenarios are not recommended to be utilized during peak loading conditions due to the quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility, system impacts, and mitigation projects required to utilize contingency scenario.

5.2 Tahoe Donner Substation Service Area

The Tahoe Donner Service Area is served by the TD-1, TD-2, and TD-3 circuits with a combined peak load of 7.4 MW. TD-1, TD-2, and TD-3 circuits have projected growth rate of 1.66%. There are existing 3-phase ties between DL-3 and TD-1, DL-3 and TD-2, TR4 and TD-3, and TR-5 and TD-3, DL-3 and TD-3.

TAHOE DONNER SUBSTATION CAPACITY

a) Tahoe Donner Substation Capacity Study Results

Tahoe Donner Substation has a capacity of 21MVA. Under normal operating conditions, the substation is forecasted to reach 39% of capacity within the five-year planning horizon. The forecasted load on Tahoe Donner Substation is 8.3MVA in Year 5.

When picking up TR-4, TR-5, or during a Truckee Substation outage, Tahoe Donner Substation will not exceed substation capacity. Table 5-2-1 summarizes forecasted substation loading under normal and switching conditions.

Table 5-2-1 Summary of Tahoe Donner Substation Transformer Capacity

Substation Capacity * (kVA)	Scenario	Forecasted Load			
		Base Case	1-Year	3-Year	5-Year
21000	Normal Operation	35%	37%	38%	39%
	Picking Up DL3	56%	58%	62%	64%
	Picking Up TR4	52%	61%	63%	65%
	Picking Up TR5	53%	55%	58%	61%
	Picking Up TR4 & TR5(1)	70%	79%	82%	86%

(1) Loss of Truckee Substation

* Substation Capacity with Forced Air Cooling

b) Proposed Solutions

Taho Donner Substation has no transformer overload to mitigate.

TD-1 CIRCUIT

a) TD-1 Circuit Study Results

TD-1 is serving approximately 1.4 MW of load. Protection device overload and phase imbalance violations are noted in the base case as well as in the 1-year, 3-year, and 5-year study horizons.

There are two feeder ties to the following feeders: DL-3 and TD-2. Under TD-1 contingency scenarios, the primary switching option is from TD-1 to TD-2, as it results in fewer violations than TD-1 to DL-3.

Table 5-2-2 summarizes the years in which significant violations occur under TD-1 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-2-2: Feeder: TD-1

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TD1 Normal	No issues	No issues	BC/1/3/5Y	No issues	BC/1/3/5Y	No issues
TD1 to TD2	No issues	No issues	BC/1/3/5Y	No issues	BC/1/3/5Y	No issues
TD1 to DL3	3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y

b) TD-1 Normal Operation

The TD-1 circuit under normal operation, experiences protection device equipment overload and phase imbalance violations that must be addressed in all planning horizons.

BASE CASE

TD1 Protective Device Equipment Summary: The TD-1 circuit has two (2) cutout switches overloaded in the Base Case planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation.

TD1 Phase imbalance Summary: A 43% phase imbalance is identified on TD-1 for the base case planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

YEAR 1

TD1 Protective Device Equipment Summary: The TD-1 circuit does not have additional overloaded protective device equipment in the Year 1 planning horizon. The two (2) cutout switches shown in the model results have been addressed in the Base Case planning horizon.

TD1 Phase imbalance Summary: A 43% phase imbalance is identified on TD-1 for the Year 1 planning horizon. There is no increase from the base case to the Year 1 planning horizons. TDPUD will determine if phase imbalance persists after base case mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

YEAR 3

TD1 Protective Device Equipment Summary: The TD-1 circuit does not have additional overloaded protective device equipment in the Year 3 planning horizon. The two (2) cutout switches shown in the model results have been addressed in the base case planning horizon.

TD1 Phase imbalance Summary: A 43% phase imbalance is identified on TD-1 for the Year 3 planning horizon. There is no increase from the base case to the Year 3 planning horizons. TDPUD will determine if phase imbalance persists after base case mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

Year 5

TD1 Protective Device Equipment Summary: The TD-1 circuit does not have additional overloaded protective device equipment in the Year 5 planning horizon. The two (2) cutout switches shown in the model results have been addressed in the base case planning horizon.

TD1 Phase imbalance Summary: A 43% phase imbalance is identified on TD-1 for the Year 5 planning horizon. There is no increase from the base case to the Year 5 planning horizons. TDPUD will determine if phase imbalance persists after base case mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

c) TD-1 to TD-2 Contingency Scenario

The TD-1 to TD-2 contingency scenario results in protection device equipment overload and phase imbalance violations that must be addressed in all planning horizons.

BASE CASE

TD1/TD2 Protective Device Equipment Summary: The TD-1 circuit has two (2) cutout switches overloaded in the Base Case planning horizon. The two TD-1 devices have also been identified as overloaded in the TD-1 normal operation scenario of the base case planning horizon and have been addressed in that section. The TD-2 circuit has four (4) cutout switches and two (2) disconnect switches overloaded in the base case planning

horizon. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation.

TD1/TD2 Phase Imbalance Summary: A 20% phase imbalance is identified on TD-1 for the Base Case planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

YEAR 1

TD1/TD2 Protective Device Equipment Summary: There are no additional protective device overloads identified in the Year 1 planning horizon. The violations identified in the model analysis have been addressed in the base case planning horizon. TDPUD will re-evaluate as needed to identify any additional protective device overloads.

TD1/TD2 Phase Imbalance Summary: A 19% phase imbalance is identified on TD-1 for the Year 1 planning horizon. This is a reduction of 1% from the base case planning horizon. TDPUD will determine if phase imbalance persists after base case mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

YEAR 3

TD1/TD2 Protective Device Equipment Summary: There are no additional protective device overloads identified in the Year 3 planning horizon. The violations identified in the model analysis have been addressed in the base case planning horizon. TDPUD will re-evaluate as needed to identify any additional protective device overloads.

TD1/TD2 Phase Imbalance Summary: A 19% phase imbalance is identified on TD-1 for the Year 3 planning horizon. This is a reduction of 1% from the base case planning horizon. TDPUD will determine if phase imbalance persists after base case mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

YEAR 5

TD1/TD2 Protective Device Equipment Summary: There are no additional protective device overloads identified in the Year 5 planning horizon. The violations identified in the model analysis have been addressed in the base case planning horizon. TDPUD will re-evaluate as needed to identify any additional protective device overloads.

TD1/TD2 Phase Imbalance Summary: A 19% phase imbalance is identified on TD-1 for the Year 3 planning horizon. This is a reduction of 1% from the base case planning horizon. TDPUD will determine if phase imbalance persists after base case mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

d) TD-1 to DL-3 Contingency Scenario

The **TD-1 to DL-3** contingency scenario is not recommended to be utilized due to additional violations. This contingency scenario results in mainline conductor overload, protective device equipment overload, mainline low voltage, phase imbalance, service transformer overloads, and secondary low voltage violations that must be addressed in all

planning horizons. In the case TD-1 to DL-3 will need to be utilized, following are the proposed solutions to mitigate violations:

BASE CASE

TD1/DL3 Protection Device Equipment Replacement Project: The TD-1 circuit has two (2) cutout switches overloaded in the base case planning horizon. The DL-3 circuit has four (4) cutout switches, seven (7) disconnect switches and one (1) recloser that are overloaded in the base case planning horizon. It is noted that the four (4) cutout switches and two (2) disconnect switches on DL-3 are also identified as overloaded in the DL-3 to TD-3 switching scenario. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation. Asset replacement can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Primary Low Voltage Summary: The base case analysis identified 4.9 miles of TD-1 and 23.1 miles of DL-3 conductor with low voltage violations. TDPUD will re-evaluate low voltage to determine if violations persist after higher priority projects in this section are completed. Low voltage violations can be mitigated if TD-1 to DL-3 switching scenario is not used or alternative load transfer configuration is identified.

TD1/DL3 Phase imbalance Summary: A 29% phase imbalance is identified on DL-3 for the base case planning horizon. TDPUD will determine if phase imbalance persists after higher priority projects in this section are implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases. Phase imbalance can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Service Transformer Summary: The base case analysis identified two (2) service transformers on the DL-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. Note that the two (2) service transformers on DL-3 are also identified as overloaded in the DL-3 to TD-3 switching scenario. Service Transformer Replacement projects can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Secondary Low Voltage Summary: Secondary low voltage has been identified with 453 service points on the TD-1 circuit and 1,714 service points on the DL-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis tool to determine validity of the analysis results. Secondary low voltage violations can be mitigated if TD-1 to DL-3 switching scenario is not used.

YEAR 1

TD1/DL3 Protection Device Equipment Summary: The TD-1 circuit does not have additional overloaded protective equipment devices in the Year 1 planning horizon. The DL-3 circuit has an additional one (1) cutout switch that is overloaded in the Year 1 planning horizon. Other identified overload protective devices identified in the Year 1 analysis is addressed in the Base Case planning horizon. The one (1) cutout switch on DL-3 is also identified as overloaded in the DL-3 to TD-3 switching scenario. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation. Asset replacement can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Primary Low Voltage Summary: The Year 1 analysis does not identify additional TD-1 or DL-3 conductors with low voltage violations.

TD1/DL3 Phase Imbalance Summary: There is no additional phase imbalance identified on DL-3 for the Year 1 planning horizon. TDPUD will determine if phase imbalance persists after base case mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases. Phase imbalance can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Service Transformer Summary: The Year 1 analysis does not identify additional service transformers on the DL-3 circuit with an overload greater than 150% of the rated value.

TD1/DL3 Secondary Low Voltage Summary: Secondary low voltage has been identified with 391 service points on the TD-1 circuit and 1,714 service points on the DL-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis tool to determine validity of the analysis results. secondary low voltage violations can be mitigated if TD-1 to DL-3 switching scenario is not used.

YEAR 3

TD1/DL3 Mainline Conductor Overload Summary: The DL-3 circuit has 0.7 miles of overloaded mainline conductor the Year 3 planning horizon. TDPUD will reconductor approximately 0.7 miles of primary conductor to resolve the overload conductor violations. Reconductoring can be mitigated if TD-1 to DL-3 switching scenario is not used or alternative load transfer configuration is identified.

TD1/DL3 Protection Device Equipment Summary: The TD-1 circuit does not have additional overloaded protective equipment devices in the Year 3 planning horizon. The DL-3 circuit does not have additional overloaded in the Year 3 planning horizon.

TD1/DL3 Primary Low Voltage Summary: The Year 3 analysis does not identify additional TD-1 or DL-3 conductors with low voltage violations.

TD1/DL3 Phase Imbalance Summary: There is no additional phase imbalance identified on DL-3 for the Year 3 planning horizon. TDPUD will determine if phase imbalance persists after base case and Year 1 mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases. Phase imbalance can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Service Transformer Summary: The Year 3 analysis identified three (3) additional service transformers on the DL-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. Note that the three (3) service transformers on DL-3 are also identified as overloaded in the DL-3 to TD-3 switching scenario. Service Transformer Replacement projects can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Secondary Low Voltage Summary: Secondary low voltage has been identified with 462 service points on the TD-1 circuit and 1,741 service points on the DL-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after

the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis tool to determine validity of the analysis results. Secondary low voltage violations can be mitigated if TD-1 to DL-3 switching scenario is not used.

YEAR 5

TD1/DL3 Cable Overload Summary: The DL-3 circuit has an additional 0.1 miles of overloaded mainline conductor in the Year 5 planning horizon. TDPUD will reconductor approximately 0.1 miles of primary conductor to resolve the overload conductor violations. Mainline overload conductor present in the Year 5 analysis beyond the 0.1 miles, was identified and addressed in Year 3 planning horizon. Reconductoring can be mitigated if TD-1 to DL-3 switching scenario is not used or alternative load transfer configuration is identified.

TD1/DL3 Protection Device Equipment Summary: The TD-1 circuit does not have additional overloaded protective equipment devices in the Year 5 planning horizon. The DL-3 circuit has an additional two (2) cutout switches that are overloaded in the Year 5 planning horizon. Other identified overloaded protective devices identified in the Year 5 analysis is addressed in the base case and Year 1 planning horizons. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation. Asset replacement can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Primary Low Voltage Summary: The Year 5 analysis does not identify additional TD-1 or DL-3 conductors with low voltage violations.

TD1/DL3 Phase Imbalance Summary: There is no additional phase imbalance identified on DL-3 for the Year 5 planning horizon. TDPUD will determine if phase imbalance persists after base case, Year 1 and Year 3 mitigation is implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases. Phase imbalance can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD1/DL3 Service Transformer Summary: The Year 5 analysis does not identify additional service transformers on the DL-3 circuit with an overload greater than 150% of the rated value.

TD1/DL3 Secondary Low Voltage Summary: Secondary low voltage has been identified with 481 service points on the TD-1 circuit and 1,757 service points on the DL-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis tool to determine validity of the analysis results. Secondary low voltage violations can be mitigated if TD-1 to DL-3 switching scenario is not used.

TD-2 CIRCUIT

a) TD-2 Circuit Study Results

TD-2 serves approximately 3.0 MW of load. Protective device overload and phase imbalance violations are noted in the base case as well as in the 1-year, 3-year, and 5-year study horizons.

There are three feeder ties to the following feeders: DL-3, TD-1, and two (2) ties to TD-3. Under TD-2 contingency scenarios, the recommended switching option is from TD-2 to TD-1, as it results in fewer violations than the alternative options.

Table 5-2-3 summarizes the years in which significant violations occur under TD-2 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-2-3: Feeder: TD-2

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TD2 Normal	No issues	No issues	BC/1/3/5Y	No issues	BC/1/3/5Y	No issues
TD2 to TD1	No issues	No issues	BC/1/3/5Y	No issues	BC/1/3/5Y	No issues
TD2 to DL3	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y
TD2 to TD3_1	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	5Y	BC/1/3/5Y	BC/1/3/5Y
TD2 to TD3_2	No issues	BC/1/3/5Y	BC/1/3/5Y	No issues	BC/1/3/5Y	BC/1/3/5Y

b) TD-2 Normal Operation

Under normal operation, TD-2 experiences protective device equipment overload and phase imbalance violations that must be addressed in all planning horizons.

BASE CASE

TD2 Mainline Protective Device Equipment Summary: The TD-2 circuit has four (4) cutout switches overloaded in the base case planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation.

TD2 Phase imbalance Summary: A 16.9% phase imbalance is identified on TD-2 for the base case planning horizon. TDPUD will determine if phase imbalance persists after higher priority projects in this section are implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

YEAR 1

TD2 Mainline Protective Device Equipment Summary: The TD-2 circuit has no additional protective device overload identified in the Year 1 planning horizon. Mainline protective device overloads present in the Year 1 analysis have been identified and addressed in the base case scenario.

TD2 Phase imbalance Summary: A 16.9% to 16% phase imbalance reduction is identified on TD-2 from the base case to Year 1 planning horizons. TDPUD will determine if phase imbalance persists after higher priority projects and phase imbalance mitigation from base case are implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

YEAR 3

TD2 Mainline Protective Device Equipment Summary: The TD-2 circuit has no additional protective device overload identified in the Year 3analysis have been identified and addressed in the base case scenario.

TD2 Phase imbalance Summary: No change in phase imbalance is identified on TD-2 from the Year 1 to Year 3 planning horizons. TDPUD will determine if phase imbalance persists after higher priority projects and phase imbalance mitigation from the base case are implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

YEAR 5

TD2 Mainline Protective Device Equipment Summary: The TD-2 circuit has no additional protective device overload identified in the Year 1 planning horizon. Mainline protective device overloads present in the Year 1 analysis have been identified and addressed in the base case scenario.

TD2 Phase imbalance Summary: No change in phase imbalance is identified on TD-2 from the Year 3 to Year 5 planning horizons. TDPUD will determine if phase imbalance persists after higher priority projects and phase imbalance mitigation from the base case are implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

c) TD-2 to TD-1 Contingency Scenario

The **TD-2 to TD-1** contingency scenario results in mainline protective device equipment overload and phase imbalance violations that must be addressed in all planning horizons.

BASE CASE

TD2/TD1 Mainline Protective Device Equipment Summary: The TD-2 circuit has four (4) cutout switches overloaded in the base case planning horizon. The TD-1 circuit has two (2) cutout switches and two (2) disconnect switches overloaded in the base case planning horizon. The four (4) cutout switches on TD-2 and two (2) cutout switches on TD-1 are also identified as overloaded in the TD-2 Normal Operations and TD-1 Normal Operations. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation. Mainline protective device equipment replacement projects can be mitigated if TD-2 to TD-1 switching scenario is not used or alternative switching scenarios are identified.

TD2/TD1 Phase Imbalance Summary: A 19.9% phase imbalance is identified on TD-1 for the base case planning horizon. TDPUD will determine if phase imbalance persists after higher priority projects in this section are implemented. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases. Phase imbalance can be mitigated if TD-2 to TD-1 switching scenario is not used or alternative switching scenarios are identified.

YEAR 1

TD2/TD1 Mainline Protective Device Equipment Summary: There are no additional mainline protective device equipment overloaded on TD-2 or TD-1 in the Year 1 planning horizon. The mainline protective device overloads identified in the Year 1 analysis is identified and addressed in the base case planning horizon. Mainline protective device

equipment replacement projects can be mitigated if TD-2 to TD-1 switching scenario is not used or alternative switching scenarios are identified.

TD2/TD1 Phase Imbalance Summary: No change in phase imbalance is identified on TD-1 for the Year 1 planning horizon. TDPUD will determine if phase imbalance persists after higher priority projects in this section and base case mitigate are implemented. Phase imbalance can be mitigated if TD-2 to TD-1 switching scenario is not used or alternative switching scenarios are identified.

YEAR 3

TD2/TD1 Mainline Protective Device Equipment Summary: There are no additional mainline protective device equipment overloaded on TD-2 or TD-1 in the Year 3 planning horizon. The mainline protective device overloads identified in the Year 3 analysis is identified and addressed in the base case planning horizon. Mainline protective device equipment replacement projects can be mitigated if TD-2 to TD-1 switching scenario is not used or alternative switching scenarios are identified.

TD2/TD1 Phase Imbalance Summary: No change in phase imbalance is identified on TD-1 for the Year 3 planning horizon. TDPUD will determine if phase imbalance persists after higher priority projects in this section and base case mitigate are implemented. Phase imbalance can be mitigated if TD-2 to TD-1 switching scenario is not used or alternative switching scenarios are identified.

YEAR 5

TD2/TD1 Mainline Protective Device Equipment Summary: There are no additional mainline protective device equipment overloaded on TD-2 or TD-1 in the Year 5 planning horizon. The mainline protective device overloads identified in the Year 5 analysis is identified and addressed in the base case planning horizon. Mainline protective device equipment replacement projects can be mitigated if TD-2 to TD-1 switching scenario is not used or alternative switching scenarios are identified.

TD2/TD1 Phase Imbalance Summary: No change in phase imbalance is identified on TD-1 for the Year 5 planning horizon. TDPUD will determine if phase imbalance persists after higher priority projects in this section and base case mitigate are implemented. Phase imbalance can be mitigated if TD-2 to TD-1 switching scenario is not used or alternative switching scenarios are identified.

d) TD-2 to DL-3 Contingency Scenario

The **TD-2 to DL-3** contingency scenario is not recommended to be utilized due to additional violations. This contingency scenario has mainline conductor overload, mainline protective device equipment overload, mainline low voltage, phase imbalance, service transformer overloads, and secondary low voltage violations that must be addressed in all planning horizons. In the case TD-2 to DL-3 will need to be utilized, following are the proposed solutions to mitigate violations:

BASE CASE

TD2/DL3 Mainline Conductor Overload Replacement Project: The DL-3 circuit has approximately 1.5 miles of overloaded mainline conductor in the base case planning horizon. TDPUD is required to reconductor approximately 1.5 miles of primary conductor

to resolve overload conductor violations. Reconductoring can be mitigated if TD-2 to DL-3 switching scenario is not used or alternative load transfer configuration is identified.

TD2/DL3 Mainline Protective Device Equipment Summary: The TD-2 circuit has five (5) cutout switches overloaded in the base case planning horizon. The DL-3 circuit has four (4) cutout switches, eight (8) disconnect switches and one (1) recloser overloaded in the Base Case planning horizon. It is noted that the overloaded protective devices on the DL-3 circuit have also been identified on other configurations including DL-3 Normal Operation and TD-1 to DL-3. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation. Asset replacement can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Primary Low Voltage Summary: The base case analysis identified 16.4 miles of conductor on the TD-2 circuit and 25.6 miles of conductor on the DL-3 circuit with low voltage violations. Primary low voltage will be re-evaluated after higher priority in this section is completed to confirm low voltage conditions and generate a mitigation action plan. Low voltage violations can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Phase Imbalance Summary: A 23% phase imbalance is identified on the DL-3 circuit for the base case planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. Phase imbalance can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Service Transformer Summary: The base case analysis identifies two (2) service transformers with an overloaded greater than 150% of the rated value on the DL-3 circuit. TDPUD will utilize NISC Operation Analysis tool to validate overload conditions and determine if an equipment upgrade will be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation. Asset replacement can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,702 service points on the TD-2 circuit and 1,988 service points on the DL-3 circuit for the Base Case planning horizon. Secondary low voltage will be re-evaluated to determine if low voltage persists after higher priority projects in this section are implemented. Low voltage can be mitigated if TD-2 to DL-3 switching scenario is not used.

YEAR 1

TD2/DL3 Mainline Conductor Overload Summary: The DL-3 circuit does not have additional overloaded mainline conductor in the Year 1 planning horizon. Mainline overloaded conductor present in the Year 1 analysis is identified and addressed in the base case planning horizon. Reconductoring can be mitigated if TD-2 to DL-3 switching scenario is not used or alternative load transfer configuration is identified.

TD2/DL3 Mainline Protective Device Equipment Summary: The TD-2 circuit has one (1) recloser overloaded in the Year 1 planning horizon. The DL-3 circuit has an additional two (2) cutout switches overloaded in the Year 1 planning horizon. Additional overloaded mainline protective devices present in the Year 1 analysis is identified and addressed in

the base case planning horizon. It is noted that the overloaded protective devices on the DL-3 circuit have also been identified on other configurations including DL-3 Normal Operation and TD-1 to DL-3. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation. Asset replacement can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Primary Low Voltage Summary: The Year 1 analysis did not identify additional miles of conductor on the TD-2 or DL-3 circuits with low voltage violations. Primary low voltage will be re-evaluated after higher priority in this section is completed to confirm low voltage conditions and generate a mitigation action plan. Low voltage violations can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Phase Imbalance Summary: Phase imbalance does not increase on the DL-3 circuit from the base case to Year 1 planning horizons. TDPUD will evaluate phase imbalance as projects are implemented. Phase imbalance can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Service Transformer Summary: The Year 1 analysis identifies an additional one (1) service transformers with an overloaded greater than 150% of the rated value on the DL-3 circuit. TDPUD will utilize NISC Operation Analysis tool to validate overload conditions and determine if an equipment upgrade will be required. Additional overloaded service transformers present in the Year 1 analysis is identified and addressed in the base case planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation. Asset replacement can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,703 service points on the TD-2 circuit and 1,994 service points on the DL-3 circuit for the Year 1 planning horizon. Secondary low voltage will be re-evaluated to determine if low voltage persists after higher priority projects in this section are implemented. Low voltage can be mitigated if TD-2 to DL-3 switching scenario is not used.

YEAR 3

TD2/DL3 Mainline Conductor Overload Summary: The DL-3 circuit does not have additional overloaded mainline conductor in the Year 3 planning horizon. Mainline overloaded conductor present in the Year 1 analysis is identified and addressed in the base case planning Horizon. Reconductoring can be mitigated if TD-2 to DL-3 switching scenario is not used or alternative load transfer configuration is identified.

TD2/DL3 Mainline Protective Device Equipment Summary: The TD-2 circuit has an additional one (1) cutout switch overloaded in the Year 3 planning horizon. The DL-3 circuit has an additional one (1) cutout switch overloaded in the Year 3 planning horizon. Additional overloaded mainline protective devices present in the Year 3 analysis is identified and addressed in the base case and Year 1 planning horizons. It is noted that the overloaded protective devices on the DL-3 circuit have also been identified on other configurations including DL-3 Normal Operation and TD-1 to DL-3. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation. Asset replacement can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Primary Low Voltage Summary: The Year 3 analysis did not identify additional miles of conductor on the TD-2 or DL-3 circuits with low voltage violations. Primary low voltage will be re-evaluated after higher priority in this section is completed to confirm low voltage conditions and generate a mitigation action plan. Low voltage violations can be mitigated if TD-2 to DL-3 switching scenario is not used.

D-2/DL-3 Phase Imbalance Summary: Phase imbalance does not increase on the DL-3 circuit from the Year 1 to Year 3 planning horizons. TDPUD will evaluate phase imbalance as projects are implemented. Phase imbalance can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Service Transformer Summary: The Year 3 analysis identifies an additional two (2) service transformers with an overloaded greater than 150% of the rated value on the DL-3 circuit. TDPUD will utilize NISC Operation Analysis tool to validate overload conditions and determine if an equipment upgrade will be required. Additional overloaded service transformers present in the Year 3 analysis is identified and addressed in the base case and Year 1 planning horizons. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation. Asset replacement can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,704 service points on the TD-2 circuit and 2,033 service points on the DL-3 circuit for the Year 3 planning horizon. Secondary low voltage will be re-evaluated to determine if low voltage persists after higher priority projects in this section are implemented. Low voltage can be mitigated if TD-2 to DL-3 switching scenario is not used.

YEAR 5

TD2/DL3 Mainline Conductor Overload Summary: The DL-3 circuit does not have additional overloaded mainline conductor in the Year 5 planning horizon. Mainline overloaded conductor present in the Year 1 analysis is identified and addressed in the base case planning horizon. Reconductoring can be mitigated if TD-2 to DL-3 switching scenario is not used or alternative load transfer configuration is identified.

TD2/DL3 Mainline Protective Device Equipment Summary: The TD-2 circuit has an additional one (1) cutout switch overloaded in the Year 5 planning horizon. The DL-3 circuit has no additional mainline protective devices overloaded in the Year 5 planning horizon. Additional overloaded mainline protective devices present in the Year 5 analysis is identified and addressed in the previous planning horizons. It is noted that the overloaded protective devices on the DL-3 circuit have also been identified on other configurations including DL-3 Normal Operation and TD-1 to DL-3. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation. Asset replacement can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Primary Low Voltage Summary: The Year 5 analysis did not identify additional miles of conductor on the TD-2 or DL-3 circuits with low voltage violations. Primary low voltage will be re-evaluated after higher priority in this section is completed to confirm low voltage conditions and generate a mitigation action plan. Low voltage violations can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Phase Imbalance Summary: Phase imbalance does not increase on the DL-3 circuit from the Year 3 to Year 5 planning horizons. TDPUD will evaluate phase imbalance as projects are implemented. Phase imbalance can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Service Transformer Summary: The Year 5 analysis identifies no additional service transformers with an overloaded greater than 150% of the rated value on the DL-3 circuit. TDPUD will utilize NISC Operation Analysis tool to validate overload conditions and determine if an equipment upgrade will be required. Additional overloaded service transformers present in the Year 5 analysis is identified and addressed in the previous planning horizons. Asset replacement can be mitigated if TD-2 to DL-3 switching scenario is not used.

TD2/DL3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,704 service points on the TD-2 circuit and 2,029 service points on the DL-3 circuit for the Year 5 planning horizon. Secondary low voltage will be re-evaluated to determine if low voltage persists after higher priority projects in this section are implemented. Low voltage can be mitigated if TD-2 to DL-3 switching scenario is not used.

e) Other Contingency Scenarios

The TD-2 to TD-3_1 and TD-2 to TD-3_2 contingency scenarios are not recommended to be utilized during peak loading conditions due to quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize either contingency scenario.

TD-3 CIRCUIT

a) TD-3 Circuit Study Results

TD-3 serves approximately 3.1 MW of load. Protective device overload and primary low voltage violations are noted in the base case as well as in the 1-year, 3-year, and 5-year study horizons.

There are five feeder ties to the following feeders: TD-2, TR-5, DL-3, and two (2) ties to TR-4. Under TD-3 contingency scenarios, the recommended switching options are from TD-3 to TD-2 or from TD-3 to TR-5, as these result in fewer violations than the alternative options. Further evaluation is recommended to assess the feasibility, and system impacts of transferring TD-3 to other adjacent feeders

Table 5-2-4 summarizes the years in which significant violations occur under TD-3 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-2-4: Feeder: TD-3

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TD3 Normal	No issues	BC/1/3/5Y	BC/1/3/5Y	No issues	No issues	No issues
TD3 to TD2	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	5Y	BC/1/3/5Y	BC/1/3/5Y
TD3 to TR5	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC/1/3/5Y	BC/1/3/5Y

TD3 to TR4_1	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y
TD3 to TR4_2	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y
TD3 to DL3	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y

b) TD-3 Normal Operation

Under normal operation, TD-3 experiences mainline protective device equipment overload and primary low voltage violations that must be addressed in all planning horizons

BASE CASE

TD3 Mainline Protective Device Equipment Summary: The TD-3 circuit has four (4) cutout switches overloaded in the base case planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation.

TD3 Primary Low Voltage Summary: The base case analysis identified approximately 8.7 miles of mainline conductor with low voltage on the TD-3 circuit. The TD-3 low voltage will be re-evaluated after higher priority projects in this section are completed to confirm low voltage conditions and generate a mitigation action plan.

YEAR 1

TD3 Mainline Protective Device Equipment Summary: The TD-3 circuit has no additional overloaded mainline protective devices in the Year 1 planning horizon. Mainline overload protective devices present in the Year 1 analysis is identified and addressed in the Base Case planning horizon.

TD3 Primary Low Voltage Summary: The Year 1 analysis identified a reduction of low voltage violations to approximately 7.6 miles of mainline conductor on the TD-3 circuit. Note that a majority of the 7.6 miles of mainline conductor with low voltage is identified and addressed in the base case planning horizon. The TD-3 low voltage will be re-evaluated after higher priority projects and base case mitigation in this section are completed to confirm low voltage conditions and generate a mitigation action plan.

YEAR 3

TD3 Mainline Protective Device Equipment Summary: The TD-3 circuit has no additional overloaded mainline protective devices in the Year 3 planning horizon. Mainline overload protective devices present in the Year 3 analysis is identified and addressed in the base case planning horizon.

TD3 Primary Low Voltage Summary: The Year 3 analysis identified an increase of low voltage violations to approximately 8.1 miles of mainline conductor on the TD-3 circuit. Note that a majority of the 8.1 miles of mainline conductor with low voltage is identified and addressed in the base case and Year 1 planning horizons. The TD-3 low voltage will be re-evaluated after higher priority projects and base case mitigation in this section are completed to confirm low voltage conditions and generate a mitigation action plan.

YEAR 5

TD3 Mainline Protective Device Equipment Summary: The TD-3 circuit has no additional overloaded mainline protective devices in the Year 5 planning horizon. Mainline overload protective devices present in the Year 5 analysis is identified and addressed in the base case planning horizon.

TD3 Primary Low Voltage Summary: The Year 5 analysis identified an increase of low voltage violations to approximately 8.7 miles of mainline conductor on the TD-3 circuit. Note that a majority of the 8.7 miles of mainline conductor with low voltage is identified and addressed in the previous planning horizons. The TD-3 low voltage will be re-evaluated after higher priority projects and base case mitigation in this section are completed to confirm low voltage conditions and generate a mitigation action plan.

c) TD-3 to TD-2 Contingency Scenario

The **TD-3 to TD-2** contingency scenario results in mainline conductor overload, mainline protective device equipment overload, mainline low voltage, phase imbalance and secondary low voltage violations that must be addressed in all planning horizons.

BASE CASE

TD3/TD2 Mainline Conductor Overload Summary: The TD-2 circuit has mainline conductor overload violations on approximately 0.4 miles of conductor in the base case planning horizon. TDPUD will be required to reconductor approximately 0.4 miles of primary conductor to resolve overload conductor violations. Reconductoring can be mitigated if TD-3 to TD-2 switching scenario is not used or alternative load transfer configuration is identified.

TD3/TD2 Protective Device Equipment Summary: The TD-3 circuit has five (5) cutout switches, overloaded in the base case planning horizon. The TD-2 circuit has four (4) cutout switches and two (2) disconnect switches overloaded in the base case planning horizon. It is noted that the overloaded protective devices on the TD-3 and TD-2 circuits have also been identified on other configurations including TD-3 Normal Operation and TD-2 Normal Operation. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation.

TD3/TD2 Primary Low Voltage Summary: The base case analysis identified 14.4 miles of TD-3, and 1.3 miles of TD-2 mainline conductor with low voltage violations. Mainline low voltage will be re-evaluated after higher priority projects in this section are completed to determine if violations persist after cable and asset replacement projects are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TD2 Phase imbalance Summary: A 15% phase imbalance is identified on the TD-2 circuit for the base case planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. TDPUD will develop mitigation plan after higher priority projects in this section are completed. Phase imbalance can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TD2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 773 service points on the TD-3, and 102 service points on the TD-2 circuits for the base case planning horizon. Low voltage will be re-evaluated to determine if violations persist after higher priority projects in this section are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

YEAR 1

TD3/TD2 Mainline Conductor Overload Summary: The TD-2 circuit has no additional mainline conductor overload violations in the Year 1 planning horizon. Mainline conductor overloads present in the Year 1 analysis is identified and addressed in the base case scenario. Reconductoring can be mitigated if TD-3 to TD-2 switching scenario is not used or alternative load transfer configuration is identified.

TD3/TD2 Protective Device Equipment Summary: The TD-3 and TD-2 circuits do not have additional mainline protective device overloads in the Year 1 planning horizon. Mainline protective device overload violations present in the Year 1 analysis is identified and addressed in the base case planning horizon. It is noted that the overloaded protective devices on the TD-3 and TD-2 circuits have also been identified on other configurations including TD-3 Normal Operation and TD-2 Normal Operation.

TD3/TD2 Primary Low Voltage Summary: The Year 1 analysis identified 21.5 miles of TD-3, and 14.9 miles of TD-2 mainline conductor with low voltage violations. Mainline low voltage will be re-evaluated after higher priority projects and base case mitigation in this section are completed to determine if violations persist after cable and asset replacement projects are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TD2 Phase imbalance Summary: A 15% phase imbalance is identified on the TD-2 circuit for the Year 1 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. TDPUD will develop mitigation plan after higher priority projects and base case mitigation in this section are completed. Phase imbalance can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TD2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,290 service points on the TD-3, and 727 service points on the TD-2 circuits for the Year 1 planning horizon. Low voltage will be re-evaluated to determine if violations persist after higher priority projects and base case mitigation in this section are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

YEAR 3

TD3/TD2 Mainline Conductor Overload Summary: The TD-2 circuit has no additional mainline conductor overload violations in the Year 3 planning horizon. Mainline conductor overloads present in the Year 3 analysis is identified and addressed in the base case scenario. Reconductoring can be mitigated if TD-3 to TD-2 switching scenario is not used or alternative load transfer configuration is identified.

TD3/TD2 Protective Device Equipment Summary: The TD-3 and TD-2 circuits do not have additional mainline protective device overloads in the Year 3 planning horizon. Mainline protective device overload violations present in the Year 3 analysis is identified and addressed in the base case planning horizon. It is noted that the overloaded protective devices on the TD-3 and TD-2 circuits have also been identified on other configurations including TD-3 Normal Operation and TD-2 Normal Operation.

TD3/TD2 Primary Low Voltage Summary: The Year 3 analysis identified 15.7 miles of TD-3, and 2.9 miles of TD-2 mainline conductor with low voltage violations. Mainline low voltage will be re-evaluated after higher priority projects and base case mitigation in this section are completed to determine if violations persist after cable and asset replacement projects are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TD2 Phase imbalance Summary: A 15% phase imbalance is identified on the TD-2 circuit for the Year 3 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. TDPUD will develop mitigation plan after higher priority projects and base case mitigation in this section are completed. Phase imbalance can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TD2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 817 service points on the TD-3, and 134 service points on the TD-2 circuits for the Year 3 planning horizon. Low voltage will be re-evaluated to determine if violations persist after higher priority projects and base case mitigation in this section are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

YEAR 5

TD3/TD2 Mainline Conductor Overload Summary: The TD-2 circuit has no additional mainline conductor overload violations in the Year 5 planning horizon. Mainline conductor overloads present in the Year 5 analysis is identified and addressed in the base case scenario. Reconductoring can be mitigated if TD-3 to TD-2 switching scenario is not used or alternative load transfer configuration is identified.

TD3/TD2 Protective Device Equipment Summary: The TD-3 has an additional one (1) cutout switch and one (1) disconnect switch overloaded in the Year 5 planning horizon. The TD-2 circuit does not have additional mainline protective device overloads in the Year 5 planning horizon. Additional mainline protective device overload violations present in the Year 5 analysis is identified and addressed in the base case planning horizon. It is noted that the overloaded protective devices on the TD-3 and TD-2 circuits have also been identified on other configurations including TD-3 Normal Operation and TD-2 Normal Operation. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation.

TD3/TD2 Primary Low Voltage Summary: The Year 5 analysis identified 16.5 miles of TD-3, and 3.5 miles of TD-2 mainline conductor with low voltage violations. Mainline low voltage will be re-evaluated after higher priority projects and base case mitigation in this section are completed to determine if violations persist after cable and asset replacement projects are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TD2 Phase imbalance Summary: A 15% phase imbalance is identified on the TD-2 circuit for the Year 5 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. TDPUD will develop mitigation plan after higher priority projects

and base case mitigation in this section are completed. Phase imbalance can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TD2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 855 service points on the TD-3, and 163 service points on the TD-2 circuits for the Year 5 planning horizon. Low voltage will be re-evaluated to determine if violations persist after higher priority projects and base case mitigation in this section are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

d) TD-3 to TR-5 Contingency Scenario

The **TD-3 to TR-5** contingency scenario is **not recommended** to be utilized because of additional violations. This contingency scenario has mainline conductor overload, protective device equipment overload, mainline low voltage, phase imbalance and secondary low voltage violations that must be addressed in all planning horizons. In the case TD-3 to TR-5 will need to be utilized, following are the proposed solutions to mitigate violations:

BASE CASE

TD3/TR5 Mainline Conductor Overload Replacement Project: The TR-5 circuit has mainline conductor overload violations in approximately 0.1 miles of conductor for the base case planning horizon. TDPUD will be required to reconductor approximately 0.1 miles of primary conductor to resolve overload conductor violations. Reconductoring can be mitigated if TD-3 to TR-5 switching scenario is not used or alternative load transfer configuration is identified.

TD3/TR5 Protective Device Equipment Summary: The TD-3 circuit has four (4) cutout switches overloaded in the base case planning horizon. The TR-5 circuit has three (3) cutout switches, ten disconnect switches and one (1) recloser overloaded in the base case planning horizon. It is noted that the overloaded protective devices on the TD-3 circuit have also been identified on other configurations including TD-3 Normal Operation. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Asset replacement can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Primary Low Voltage Summary: The base case analysis identified 21.5 miles of TD-3, and 28.4 miles of TR-5 mainline conductor with low voltage violations. Mainline low voltage will be re-evaluated after higher priority projects in this section are completed to determine if violations persist after cable and asset replacement projects are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TD-2 switching scenario is not used.

TD3/TR5 Phase Imbalance Summary: A 21% phase imbalance is identified on the TR-5 circuit for the base case planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. TDPUD will develop mitigation plan after higher priority projects in this section are implemented. Phase imbalance can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,415 service points on the TD-3, and 600 service points on the TR-5 circuits for the base case planning horizon. Secondary low voltage will be re-evaluated to determine if violations persist after higher priority projects in this section are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TR-5 switching scenario is not used.

YEAR 1

TD3/TR5 Mainline Conductor Overload Summary: The TR-5 circuit has no additional mainline conductor overload violations in the Year 1 planning horizon. Mainline conductor overloads present in the Year 1 analysis is identified and addressed in the base case scenario. Reconductoring can be mitigated if TD-3 to TR-5 switching scenario is not used or alternative load transfer configuration is identified.

TD3/TR5 Protective Device Equipment Summary: The TD-3 and TR-5 circuits do not have additional mainline protective device overloads in the Year 1 planning horizon. Mainline protective device overload violations present in the Year 1 analysis is identified and addressed in the base case planning horizon. It is noted that the overloaded protective devices on the TD-3 circuit have also been identified on other configurations including TD-3 Normal Operation. Equipment replacement can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Primary Low Voltage Summary: The Year 1 analysis identified 21.5 miles of TD-3, and 30.3 miles of TR-5 mainline conductor with low voltage violations. Mainline low voltage will be re-evaluated after higher priority projects and base case mitigation in this section are completed to determine if violations persist after cable and asset replacement projects are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Phase imbalance Summary: A 21% phase imbalance is identified on the TR-5 circuit for the Year 1 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. TDPUD will develop mitigation plan after higher priority projects and base case mitigation in this section are completed. Phase imbalance can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,419 service points on the TD-3, and 651 service points on the TR-5 circuits for the Year 1 planning horizon. Low voltage will be re-evaluated to determine if violations persist after higher priority projects and base case mitigation in this section are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TR-5 switching scenario is not used.

YEAR 3

TD3/TR5 Mainline Conductor Overload Summary: The TR-5 circuit has no additional mainline conductor overload violations in the Year 3 planning horizon. Mainline conductor overloads present in the Year 3 analysis is identified and addressed in the base case scenario. Reconductoring can be mitigated if TD-3 to TR-5 switching scenario is not used or alternative load transfer configuration is identified.

TD3/TR5 Protective Device Equipment Summary: The TD-3 has an additional one (1) disconnect switch overloaded in the Year 3 planning horizon. The TR-5 circuit has an additional one (1) cutout switch overloaded in the Year 3 planning horizon. Mainline protective device overload violations present in the Year 3 analysis is identified and addressed in the base case planning horizon. It is noted that the overloaded protective devices on the TD-3 circuit have also been identified on other configurations including TD-3 Normal Operation. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation. Not using TD-3 to TR-5 switching scenario mitigates the need for equipment replacement.

TD3/TR5 Primary Low Voltage Summary: The Year 3 analysis identified 21.5 miles of TD-3, and 28.3 miles of TR-5 mainline conductor with low voltage violations. Mainline low voltage will be re-evaluated after higher priority projects and base case mitigation in this section is completed to determine if violations persist after cable and asset replacement projects are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Phase imbalance Summary: A 21% phase imbalance is identified on the TR-5 circuit for the Year 3 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. TDPUD will develop mitigation plan after higher priority projects and base case mitigation in this section is completed. Phase imbalance can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,500 service points on the TD-3, and 672 service points on the TR-5 circuits for the Year 3 planning horizon. Low voltage will be re-evaluated to determine if violations persist after higher priority projects and base case mitigation in this section are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TR-5 switching scenario is not used.

YEAR 5

TD3/TR5 Mainline Conductor Overload Summary: The TR-5 circuit has no additional mainline conductor overload violations in the Year 5 planning horizon. Mainline conductor overloads present in the Year 5 analysis is identified and addressed in the base case scenario. Reconductoring can be mitigated if TD-3 to TR-5 switching scenario is not used or alternative load transfer configuration is identified.

TD3/TR5 Protective Device Equipment Summary: The TD-3 has an additional one (1) cutout switch overloaded in the Year 5 planning horizon. The TD-2 circuit does not have additional mainline protective device overloads in the Year 5 planning horizon. Additional mainline protective device overload violations present in the Year 5 analysis is identified and addressed in the previous planning horizons. It is noted that the overloaded protective devices on the TD-3 circuit have also been identified on other configurations including TD-3 Normal Operation. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment prior to the identified planning year violation. Not using TD-3 to TR-5 switching scenario mitigates the need for equipment replacement.

TD3/TR5 Primary Low Voltage Summary: The Year 5 analysis identified 21.5 miles of TD-3, and 31.6 miles of TR-5 mainline conductor with low voltage violations. Mainline low voltage will be re-evaluated after higher priority projects and base case mitigation in this section is completed to determine if violations persist after cable and asset replacement projects are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Phase imbalance Summary: A 21% phase imbalance is identified on the TR-5 circuit for the Year 5 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance. TDPUD will develop mitigation plan after higher priority projects and base case mitigation in this section is completed. Phase imbalance can be mitigated if TD-3 to TR-5 switching scenario is not used.

TD3/TR5 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 1,470 service points on the TD-3, and 725 service points on the TR-5 circuits for the Year 5 planning horizon. Low voltage will be re-evaluated to determine if violations persist after higher priority projects and base case mitigation in this section are implemented. TDPUD will develop mitigation plan after low voltage re-evaluation is completed. Low voltage can be mitigated if TD-3 to TR-5 switching scenario is not used.

e) Other Contingency Scenarios

The **TD-3 to TR-4_1, TD-3 to TR-4_2 and TD-3 to DL-3** contingency scenarios are not recommended to be utilized during peak loading conditions due to quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize any of these contingency scenarios.

5.3 Truckee Substation Service Area

The Truckee Service Area is served by the TR-1, TR-2, TR-3, TR-4, TR-5 and TR-6 circuits with a combined peak load of 13.7 MW. Load growth on TR-1 TR-2 and TR-4 is projected at 1.66%, and load growth on TR-3, TR-5 and TR-6 is projected at 2.79%. There are existing 3-phase ties between TR-1 and MV-4, TR-2 and MV-3, TR-3 and MV-3, TR-4 and MV-3, TR-4 and TD-3, TR-5 and TD3

SUBSTATION CAPACITY

a) Truckee Substation Capacity Study Results

Truckee Substation has a capacity of 21 MVA. Under normal operating conditions, the transformer will be overloaded to 121% of capacity by 2028 and to 149% in Year 5. The forecasted load on the Truckee Substation is 31.2 MVA in Year 5.

Under contingency conditions, the substation is projected to exceed its capacity under base case in the event of Martis Valley Substation or 607 Transmission Line outage and all switching options will exceed the rating in 2026.

Truckee Substation loading under TD-3, MV-3, MV-4 and Tahoe Donner Substation switching scenarios will exceed emergency capacity from 2028. Table 5-3-1 summarizes forecasted substation loading under normal and switching conditions.

Table 5-3-1 Summary of Truckee Substation Transformer Capacity

Substation Capacity * (kVA)	Scenario	Forecasted Load			
		Base Case	1-Year	3-Year	5-Year
21000	Normal Operation	65%	94%	121%	149%
	Picking Up TD3	80%	109%	136%	165%
	Picking Up TD1, TD2 & TD3(1)	100%	131%	159%	188%
	Picking Up DL3, TD1, TD2 & TD3(2)	121%	152%	182%	212%
	Picking Up MV3	81%	122%	153%	183%
	Picking Up MV4	75%	104%	134%	162%
	Picking Up MV1, MV2, MV3 & MV4(3)	115%	160%	207%	243%

(1) Loss of Tahoe Donner Substation

(2) Loss of 607 T-Line

(3) Loss of Martis Valley Substation

* Substation Capacity with Forced Air Cooling

b) Proposed Solutions

To mitigate the Truckee Substation transformer overload condition starting in the Year 3 planning horizon, existing feeder ties between Truckee feeders and Tahoe Donner feeders can be utilized. TR-4 and TR-5 feeders can be partially offloaded from Truckee to Tahoe Donner via existing Ties with TD-3. In the proposed contingency configuration TR-4, TR-5 and TD-3 will require projects completed to avoid deficiencies and violations with mainline conductor, equipment overloads and other system parameters. The violations are identified in the respective sections below for Truckee Feeders TR-4 and TR-5. The projects required are listed in Section 5.5.

The other existing feeder ties provide the option to move load to Martis Valley Substation. However, Martis Valley Substation starts to exceed its capacity beginning in Year 3 planning horizon when picking up Truckee Substation feeder loads.

Donner Lake Substation has the potential to add additional relief to Truckee Substation overloaded state, however there are currently no viable existing ties between Truckee Substation feeders and Donner Lake Feeders. Future studies will need to be conducted to identify feasibility, scope and potential cost of constructing ties between Donner Lake and Truckee feeders.

A transformer replacement and substation upgrade study is recommended for Truckee Substation due to the forecasted load increase identified in this study. Future studies will, at minimum, need to compare and address capacity requirements, feasibility, and costs of upgrades versus constructing a new substation.

TR-1 CIRCUIT

a. TR-1 Circuit Study Results

TR-1 is serving approximately 1.9 MW of load. Under normal operating conditions, phase imbalance, protective device and service transformer violations are observed in the base case, as well as in the 1-year, 3-year, and 5-year study scenarios.

TR-1 has three feeder ties to the following feeders: TR-2, TR-6 and MV-4. Under TR-1 contingency scenarios, the primary switching option is from TR-1 to MV-4, as it results in fewer violations than the alternative options.

Table 5-3-2 summarizes the years in which significant violations occur under TR-1 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-3-2: Feeder: TR-1

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TR1 Normal	No issues	No issues	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues
TR1 to TR2	3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1Y	No issues
TR1 to MV4	No issues	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1Y	No issues
TR1 to TR6	3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues	5Y

a) TR-1 Circuit Normal Operation

Under normal operation, TR-1 experiences mainline protective device equipment overloads, phase imbalance and service transformer overloads that must be addressed in all planning horizons.

BASE CASE

TR1 Mainline Protective Device Equipment Summary: The TR-1 circuit has three (3) cutout switches overloaded in the base case planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR1 Phase Imbalance Summary: A 25% phase imbalance is identified on the TR-1 circuit for the base case planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR1 Service Transformer Summary: The base case analysis identified two (2) on the TR-1 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

YEAR 1

TR1 Mainline Protective Device Equipment Summary: The TR-1 circuit has no additional protective devices modeled to be overloaded in the Year 1 planning horizon. Mainline protective device overloads present in the Year 1 analysis is identified and addressed in the base case planning horizon.

TR1 Phase Imbalance Summary: A 25% phase imbalance is identified on the TR-1 circuit for the Year 1 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR1 Service Transformer Summary: The Year 1 analysis does not identify additional service transformer overloads on the TR-1 circuit with an overload greater than 150% of the rated value.

YEAR 3

TR1 Mainline Protective Device Equipment Summary: The TR-1 circuit has no additional protective devices modeled to be overloaded in the Year 3 planning horizon. Mainline protective device overloads present in the Year 3 analysis is identified and addressed in the base case planning horizon.

TR1 Phase Imbalance Summary: A 15% phase imbalance is identified on the TR-1 circuit for the Year 3 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR1 Service Transformer Summary: The Year 3 analysis does not identify additional service transformer overloads on the TR-1 circuit with an overload greater than 150% of the rated value.

YEAR 5

TR1 Mainline Protective Device Equipment Summary: The TR-1 circuit has no additional protective devices modeled to be overloaded in the Year 5 planning horizon. Mainline protective device overloads present in the Year 5 analysis is identified and addressed in the base case planning horizon.

TR1 Phase Imbalance Summary: A 15% phase imbalance is identified on the TR-1 circuit for the Year 3 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR1 Service Transformer Summary: The Year 5 analysis does not identify additional service transformer overloads on the TR-1 circuit with an overload greater than 150% of the rated value.

b) TR-1 to MV-4 Contingency Scenario

The **TR-1 to MV-4** contingency scenario results in mainline protective device equipment overloads, mainline low voltage, phase imbalance and service transformer overloads that must be addressed in all planning horizons.

BASE CASE

TR1/MV4 Protective Device Equipment Summary: The TR-1 circuit has three (3) cutout switches overloaded in the base case planning horizon. The MV-4 circuit has eight (8) disconnect switches overloaded in the base case planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation. It is noted that the overloaded protective devices on the

TR-1 circuit have also been identified on other configurations including TR-1 Normal Operation.

TR1/MV4 Primary Low Voltage Summary: The base case has identified approximately 1.5 miles of MV-4 conductor with low voltage violations. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist on MV-4. The violations can be mitigated if the TR1/MV4 configuration is not utilized.

TR1/MV4 Service Transformer Summary: TR-1 has two (2) service transformers overloaded 150% or more of the nameplate rated value in the base case analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation.

TR1/MV4 Phase imbalance Summary: Under TR-1 to MV-4 scenario, MV-4 has a 12% phase imbalance in the base case and improves in the later planning study years. The phase imbalance will need to be monitored, and mitigation determined if it does not improve. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

YEAR 1

TR1/MV4 Protective Device Equipment Summary: The TR-1 and MV-4 circuits do not have additional mainline protective device overloads in the Year 1 planning horizon. Additional mainline protective device overload violations present in the Year 1 analysis is identified and addressed in the base case planning horizon. It is noted that the overloaded protective devices on the TR-1 circuit have also been identified on other configurations including TR-1 Normal Operation.

TR1/MV4 Primary Low Voltage Summary: The Year 1 analysis has identified approximately an additional 0.9 miles of MV-4 conductor with low voltage violations. Additional mainline low voltage violations present in the Year 1 analysis have been identified in the base case. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist on MV-4. The violations can be mitigated if the TR1/MV4 configuration is not utilized.

TR1/MV4 Service Transformer Summary: The Year 1 analysis does not identify additional service transformer overloads on the TR-1 circuit with an overload greater than 150% of the rated value.

TR1/MV4 Phase imbalance Summary: Under TR-1 to MV-4 scenario, MV-4 has a 12% phase imbalance in the Year 1 analysis and improves in the later planning study years. The phase imbalance will need to be monitored, and mitigation determined if it does not improve. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

YEAR 3

TR1/MV4 Protective Device Equipment Summary: The TR-1 circuit does not have additional mainline protective device overloads in the Year 3 planning horizon. The MV-4 circuit has an additional one (1) cutout switch overloaded in the Year 3 planning horizon. Additional mainline protective device overload violations present in the Year 3 analysis is identified and addressed in the base case planning horizon. It is noted that the overloaded

protective devices on the TR-1 circuit have also been identified on other configurations including TR-1 Normal Operation. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified planning year violation.

TR1/MV4 Primary Low Voltage Summary: The Year 3 analysis has identified approximately an additional 12.7 miles of MV-4 and 0.8 miles of TR-1 conductor with low voltage violations. Additional mainline low voltage violations present in the Year 1 analysis have been identified in the base case. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist on MV-4. The violations can be mitigated if the TR1/MV4 configuration is not utilized

TR1/MV4 Service Transformer Summary: The Year 1 analysis does not identify additional service transformer overloads on the TR-1 circuit with an overload greater than 150% of the rated value.

YEAR 5

TR1/MV4 Protective Device Equipment Summary: The TR-1 and MV-4 circuits do not have additional mainline protective device overloads in the Year 5 planning horizon. Additional mainline protective device overload violations present in the Year 1 analysis is identified and addressed in the previous planning horizons. It is noted that the overloaded protective devices on the TR-1 circuit have also been identified on other configurations including TR-1 Normal Operation.

TR1/MV4 Primary Low Voltage Summary: The Year 5 analysis has identified approximately a reduction of 1.3 miles of MV-4 and reduction of 0.1 miles of TR-1 conductor with low voltage violations, if previous low voltage violations are not addressed. Additional mainline low voltage violations present in the Year 1 analysis have been identified in the base case . Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist on MV-4. The violations can be mitigated if the TR1/MV4 configuration is not utilized.

TR1/MV4 Service Transformer Summary: The Year 1 analysis does not identify additional service transformer overloads on the TR-1 circuit with an overload greater than 150% of the rated value.

c) Other Contingency Scenarios

The **TR-1 to TR-2 and TR-1 to TR-6** contingency scenarios are not recommended to be utilized during peak loading conditions due to quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize the configuration scenarios.

TR-2 CIRCUIT

a) TR-2 Circuit Study Results

TR-2 serves approximately 0.9 MW of load. Under normal operating conditions, phase imbalance violations are observed in the base case but are resolved by the 1-year forecast.

TR-2 has three feeder ties to the following feeders: TR-1, TR-3 and MV-3. Under TR-2 contingency scenarios, the recommended switching option is from TR-2 to TR-3, as that scenario results in fewer violations than the alternative options.

Table 5-3-3 summarizes the years in which significant violations occur under TR-2 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-3-3: Feeder: TR-2

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TR2 Normal	No issues	No issues	5Y	No issues	BC	No issues
TR2 to TR1	5Y	BC/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1Y	No issues
TR2 to MV3	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues	1/3/5Y
TR2 to TR3	5Y	No issues	BC/1/3/5Y	BC/1/3/5Y	BC/1/3Y	No issues

b) TR-2 Circuit Normal Operations

Under normal operation, TR-2 experiences protective device equipment overload violations in Year 5 and phase imbalance violations in the base case.

BASE CASE

TR2 Phase Imbalance Improvement Summary: A 12% phase imbalance is identified on the TR-2 circuit and is shown to resolve with load growth between Year 1 through Year 5 planning horizons. Phase imbalance will be monitored at this time, no mitigation required.

YEAR 5

TR2 Protective Device Equipment Summary: The TR-2 circuit has three (3) disconnect switches overloaded in the Year 5 study horizon. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified Year 5 violations.

c) TR-2 to TR-3 Contingency Scenario

The **TR-2 to TR-3** contingency scenario results in mainline conductor overload in Year 5, protective device equipment violations in all years, phase imbalance violations in base case through Year 3, and service transformer overloads in all planning horizons.

BASE CASE

TR2/TR3 Protective Device Equipment Summary: The TR-2 circuit has one (1) cutout switch, and the TR-3 circuit has one (1) cutout switch that are overloaded in the base case for TR2/TR3 switching scenario. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Violations can be mitigated if switching scenario TR2/TR3 is not utilized.

TR2/TR3 Phase Imbalance Summary: Phase imbalance of 10% is identified on TR-3 circuit for the base case planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR2/TR3 Service Transformer Summary: The base case analysis identified two (2) service transformers on the TR-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment

upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

YEAR 1

TR2/TR3 Protective Device Equipment Summary: The TR-3 circuit has one (1) additional cutout switch, and three (3) disconnect switches that are overloaded in the Year 1 planning horizon for TR2/TR3 switching scenario. Additional protective device overloads depicted in the Year 1 analysis have been identified in the base case . TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Violations can be mitigated if switching scenario TR2/TR3 is not utilized.

TR2/TR3 Phase Imbalance Summary: Phase imbalance increases to 17% on TR-3 circuit for the Year 1 planning horizon if not previously addressed. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR2/TR3 Service Transformer Summary: The Year 1 analysis does not identify additional service transformers with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

YEAR 3

TR2/TR3 Protective Device Equipment Summary: The TR-3 circuit has one (1) additional cutout switch overloaded in the Year 3 planning horizon for TR2/TR3 switching scenario. Additional protective device overloads depicted in the Year 3 analysis have been identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Violations can be mitigated if switching scenario TR2/TR3 is not utilized.

TR2/TR3 Phase Imbalance Summary: Phase imbalance decreases down to 13% on TR-3 circuit for the Year 3 planning horizon if not previously addressed. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR2/TR3 Service Transformer Summary: The Year 3 analysis does not identify additional service transformers with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

YEAR 5

TR2/TR3 Mainline Conductor Overload Summary: The TR-2 circuit has approximately 0.1 miles and the TR-3 circuit has approximately 0.1 miles of overloaded conductor in Year 5. Mainline conductor overload for TR-2 and TR-3 circuits were evaluated with all viable configurations and projects identified within Section 5.6 III of this Master Plan. Reconductoring can be mitigated if TR-2 to TR-3 switching scenario is not used or alternative load transfer configuration is identified.

TR2/TR3 Protective Device Equipment Summary: The TR-2 circuit has two (2) disconnect switches overloaded in the Year 5 planning horizon for TR2/TR3 switching scenario. The TR-3 circuit has one (1) additional disconnect switch and one (1) recloser overloaded in the Year 5 planning horizon for TR2/TR3 switching scenario. Additional protective device overloads depicted in the Year 5 analysis have been identified in the previous planning horizons. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Violations can be mitigated if switching scenario TR2/TR3 is not utilized.

TR2/TR3 Service Transformer Summary: The Year 5 analysis does not identify additional service transformers with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

d) TR-2 to MV-3 Contingency Scenario

The **TR-2 to MV-3** contingency scenario results in mainline conductor overloads in Year 1 through Year 5, protective device equipment and mainline low voltage violations in all planning horizons, service transformer overloads and secondary low voltage violations in all Year 1 through Year 5 planning horizons.

BASE CASE

TR2/MV3 Protective Device Equipment Summary: The MV-3 circuit has four (4) cutout switches and three (3) disconnect switches that are identified as overloaded in the base case planning horizon. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Violations can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Primary Low Voltage Summary: The base case has identified approximately 5.0 miles of MV-3 conductor with low voltage violations. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist on MV-3. The violations can be mitigated if the TR2/MV3 configuration is not utilized.

YEAR 1

TR2/MV3 Mainline Conductor Overload Summary: The MV-3 circuit has approximately 0.5 miles of overloaded conductor in the Year 1 analysis. Mainline conductor overload for TR-2 and MV-3 circuits were evaluated with all viable configurations and projects identified within Section 5.6 III of this Master Plan. Reconductoring can be mitigated if TR-2 to MV-3 switching scenario is not used or alternative load transfer configuration is identified.

TR2/MV3 Protective Device Equipment Summary: The MV-3 circuit has an additional one (1) cutout switch, eleven (11) disconnect switches and one (1) recloser that are identified as overloaded in the Year 1 planning horizon. Additional protective device overloads identified in the Year 1 analysis are identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Violations can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Primary Low Voltage Summary: The Year 1 analysis has identified approximately an additional 2.0 miles of MV-3 conductor with low voltage violations. Additional mainline low voltage violations present in the Year 1 analysis have been identified in the base case. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist on MV-3. The violations can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Service Transformer Summary: The Year 1 analysis identified one (1) service transformer on the MV-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation. Service transformer violation can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Secondary Low Voltage Summary: Secondary low voltage has been identified on 569 service points on the MV-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if TR2/MV3 switching scenario is not used or alternative load transfer configuration is identified.

YEAR 3

TR-2/MV-3 Mainline Conductor Overload Summary: The is no additional overloaded conductor on TR-2 or MV-3 identified in the Year 3 analysis. Mainline conductor overload for TR-2 and MV-3 circuits were evaluated with all viable configurations and projects identified within Section 5.6 III of this Master Plan. Reconductoring can be mitigated if TR-2 to MV-3 switching scenario is not used or alternative load transfer configuration is identified.

TR2/MV3 Protective Device Equipment Summary: There are no additional protective device overloads identified in the Year 3 planning horizon. Protective device overloads identified in the Year 3 analysis are identified in the base case and Year 1 planning horizons. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Violations can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Primary Low Voltage Summary: The Year 3 analysis has identified approximately an additional 1.23 miles of MV-3 conductor and 0.62 miles of TR-2 conductor with low voltage violations. Additional mainline low voltage violations present in the Year 3 analysis have been identified in the base case or Year 1 planning horizons. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist on MV-3. The violations can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Service Transformer Summary: The Year 3 analysis did not identify additional service transformers with an overload greater than 150% of the rated value. The other service transformer overload violation present in the Year 3 analysis is previously identified in the Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset

replacement program to install appropriately sized service transformers prior to the identified planning year violation. Service transformer violation can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Secondary Low Voltage Summary: Secondary low voltage has been identified on 583 service points on the MV-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results. Secondary low voltage can be mitigated if TR2/MV3 switching scenario is not used or alternative load transfer configuration is identified.

YEAR 5

TR2/MV3 Mainline Conductor Overload Summary: The TR-2 circuit has approximately 0.1 miles and MV-3 circuit has approximately an additional 1.1 miles of overloaded conductor in the Year 5 analysis. Additional identified overloaded conductor in Year 5 analysis has been identified in the previous planning horizons. Mainline conductor overload for TR-2 and MV-3 circuits were evaluated with all viable configurations and projects identified within Section 5.6 III of this Master Plan. Reconductoring can be mitigated if TR-2 to MV-3 switching scenario is not used or alternative load transfer configuration is identified.

TR2/MV3 Protective Device Equipment Summary: The MV-3 circuit has an additional two (2) disconnect switches identified as overloaded in the Year 5 planning horizon. Additional protective device overloads identified in the Year 5 analysis also are identified in the previous planning horizons. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. Violations can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Primary Low Voltage Summary: The Year 5 analysis has identified approximately an additional 2.59 miles of MV-3 conductor and 1.91 miles of TR-2 conductor with low voltage violations. Additional mainline low voltage violations present in the Year 5 analysis have been identified in the previous planning horizons. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist on MV-3. The violations can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Service Transformer Summary: The Year 5 analysis identified an additional one (1) service transformer on the MV-3 circuit with an overload greater than 150% of the rated value. The other service transformer overload violation present in the Year 5 analysis is previously identified in the Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation. Service transformer violation can be mitigated if the TR2/MV3 configuration is not utilized.

TR2/MV3 Secondary Low Voltage Summary: Secondary low voltage has been identified on 23 service points on the TR-2 circuit and 656 service points on the MV-3 circuit. Secondary low voltage will be re-evaluated to determine if violations persist after the higher priority projects listed in this section are executed. TDPUD will utilize NISC Operations Analysis to determine validity of the analysis secondary low voltage results.

Secondary low voltage can be mitigated if TR2/MV3 switching scenario is not used or alternative load transfer configuration is identified.

e) Other Contingency Scenarios

The **TR-2 to TR-1** contingency scenario is not recommended to be utilized during peak loading conditions due to the quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize the configuration scenarios.

TR-3 CIRCUIT

a) TR-3 Circuit Study Results

TR-3 serves approximately 1.9 MW of load. Under normal operating conditions, phase imbalance and protective device and service transformer violations are observed in the base case as well as in the 1-year, 3-year, and 5-year study horizons.

TR-3 has three feeder ties to the following feeders: TR-2, TR-4 and MV-3. Under TR-3 contingency scenarios, the recommended switching option is from TR-3 to TR-2, as it results in fewer violations than the alternative options.

Table 5-3-4 summarizes the years in which significant violations occur under TR-3 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-3-4: Feeder: TR-3

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TR3 Normal	5Y	No issues	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues
TR3 to TR2	No issues	No issues	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues
TR3 to TR4	5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y
TR3 to MV3	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues	1/3/5Y

b) TR-3 Circuit Normal Operation

Under normal operation, TR-3 experiences protective device equipment and service transformer overload violations in all years, as well as phase imbalance violations from Year 1 to Year 5. Additionally, cable overload violations occur in Year 5 of the planning horizon.

BASE CASE

TR3 Mainline Protective Device Equipment Summary: The TR-3 circuit has one (1) cutout switch identified as overloaded in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR3 Service Transformer Summary: The base case analysis identified two (2) service transformers on the TR-3 circuit with an overload 150% greater than the rated value.

TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 1

TR3 Mainline Protective Device Equipment Summary: The TR-3 circuit has an additional one (1) cutout switch identified as overloaded in the Year 1 planning horizon. Other overloaded protective device equipment present in the Year 1 analysis have been previously identified in the base case analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR3 Phase Imbalance Summary: A phase imbalance of 26% is identified on TR-3 circuit for the Year 1 planning horizon. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR3 Service Transformer Summary: The Year 1 analysis did not identify additional service transformers on the TR-3 circuit with an overload 150% greater than the rated value. Service transformer overload present in the Year 1 analysis is previously identified in the base case planning horizon. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 3

TR3 Mainline Protective Device Equipment Summary: The TR-3 circuit has an additional one (1) cutout switch identified as overloaded in the Year 3 planning horizon. Other overloaded protective device equipment present in the Year 3 analysis have been previously identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR3 Phase Imbalance Summary: No additional phase imbalance is identified for the Year 3 analysis. A phase imbalance of 26% identified on the TR-3 circuit for the Year 1 analysis will be present if not addressed in Year 1. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR3 Service Transformer Summary: The Year 3 analysis did not identify additional service transformers on the TR-3 circuit with an overload 150% greater than the rated value. Service transformer overload present in the Year 1 analysis also is previously identified in the base case planning horizon. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 5

TR3 Mainline Conductor Overload Summary: TR-3 feeder has cable overload violations in a short section of underground cable in Year 5. Conductor overload for this short section will require periodic monitoring to determine if it rises to the level of

replacement within the Year 5 planning horizon. This section and other sections of the TR-3 circuit that is identified as overloaded will be consolidated into one or more projects in Section 5.6 III of this Master Plan.

TR3 Mainline Protective Device Equipment Summary: The TR-3 circuit has no additional protective device equipment identified as overloaded in the Year 5 planning horizon. Overloaded protective device equipment present in the Year 5 analysis have been previously identified in the base case, Year 1 and Year 3 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR3 Phase Imbalance Summary: The phase imbalance is reduced to 23% on the TR-3 circuit for the Year 5 analysis if not addressed in Year 1 or Year 3. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR3 Service Transformer Summary: The Year 5 analysis did not identify additional service transformers on the TR-3 circuit with an overload 150% greater than the rated value. Service transformer overload present in the Year 1 analysis are previously identified in the base case planning horizon. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

c) TR-3 to TR-2 Contingency Scenario

The TR-3 to TR-2 contingency scenario results in protective device equipment and service transformer overload violations in all planning horizons, as well as phase imbalance violations occurring in the Year 1 through Year 5 planning horizons.

BASE CASE

TR3/TR2 Protective Device Equipment Summary: The TR-3 circuit has one (1) cutout switch identified as overloaded in the base case. The TR-2 circuit has one (1) cutout switch identified as overloaded in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. The protective device equipment violations can be mitigated if the TR3/TR2 configuration is not utilized.

TR3/TR2 Service Transformer Summary: The TR-3 circuit has two (2) service transformers that have an overload greater than 150% of the rated value in the Base Case for the TR3/TR2 configuration. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 1

TR3/TR2 Protective Device Equipment Summary: The TR-3 circuit has an additional one (1) cutout switch identified as overloaded in the Year 1 analysis. The TR-2 circuit has an additional three (3) disconnect switches identified as overloaded in the Year 1 analysis. Other protective device equipment overloads present in the Year 1 analysis is identified in the base case planning horizon. TDPUD will initiate an asset replacement program to

install appropriately sized protective device equipment prior to the identified planning year violation. The protective device equipment violations can be mitigated if the TR3/TR2 configuration is not utilized.

TR3/TR2 Phase Imbalance Summary: There is a 16% phase imbalance identified on the TR-2 circuit under TR-3 to TR-2 scenario in Year 1 planning horizon. The phase imbalance does improve over time and therefore will be monitored status and determined if any mitigation will be recommended. No mitigation required at this time.

TR3/TR2 Service Transformer Summary: There are no additional service transformers that have an overload greater than 150% of the rated value in the Year 1 analysis for the TR3/TR2 configuration. Service transformer overloads present in the Year 1 analysis is previously identified in the base case planning horizon. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 3

TR3/TR2 Protective Device Equipment Summary: The TR-3 circuit has an additional one (1) cutout switch identified as overloaded in the Year 3 analysis. The TR-2 circuit has no additional protective device equipment identified as overloaded in the Year 3 analysis. Other protective device equipment overloads present in the Year 3 analysis is identified in the base case and Year 1 planning horizons. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. The protective device equipment violations can be mitigated if the TR3/TR2 configuration is not utilized.

TR3/TR2 Phase Imbalance Summary: The phase imbalance reduces to a 13% imbalance on the TR-2 circuit under TR-3 to TR-2 scenario in Year 3 planning horizon. The phase imbalance does improve over time and therefore will be monitored status and determined if any mitigation will be recommended. No mitigation required at this time.

TR3/TR2 Service Transformer Summary: There are no additional service transformers that have an overload greater than 150% of the rated value in the Year 3 analysis for the TR3/TR2 configuration. Service transformer overloads present in the Year 3 analysis is previously identified in the base case planning horizon. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 5

TR3/TR2 Protective Device Equipment Summary: The TR-3 circuit has no additional protective device equipment identified as overloaded in the Year 5 analysis. The TR-2 circuit has an additional two (2) disconnect switches and one (1) recloser identified as overloaded in the Year 5 analysis. Other protective device equipment overloads present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 planning horizons. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation. The protective device equipment violations can be mitigated if the TR3/TR2 configuration is not utilized.

TR3/TR2 Phase Imbalance Summary: The phase imbalance reduces below the violation threshold level on the TR-2 circuit under TR-3 to TR-2 scenario in Year 5 planning horizon. No mitigation required at this time.

TR3/TR2 Service Transformer Summary: There are no additional service transformers that have an overload greater than 150% of the rated value in the Year 5 analysis for the TR3/TR2 configuration. Service transformer overloads present in the Year 5 analysis is previously identified in the base case planning horizon. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

d) TR-3 to MV-3 Contingency Scenario

The TR-3 to MV-3 contingency scenario results in mainline conductor overload violations occurring in Year 1 through Year 5, protective device equipment, mainline primary low voltage and service transformer violations in all planning horizons, as well as secondary low voltage violations in Year 1 through Year 5.

BASE CASE

TR3/MV3 Protective Device Equipment Summary: The TR-3 circuit has one (1) cutout switch, and the MV-3 circuit has four (4) cutout switches and four (4) disconnect switches that are overloaded in the base case under the TR3/MV3 configuration. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR3/MV3 Primary Low Voltage Summary: The base case has identified approximately 1.6 miles of TR-3 conductor and 6.2 miles of MV-3 conductor with low voltage violations. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist. The violations can be mitigated if the TR3/MV3 configuration is not utilized.

TR3/MV3 Service Transformer Summary: The base case analysis identified two (2) service transformers on the TR-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

YEAR 1

TR3/MV3 Mainline Conductor Overload Summary: The MV-3 circuit experiences mainline conductor overload violations in approximately 0.7 miles of primary conductor in the Year 1 analysis under TR3/MV3 configuration. TDPUD will be required to reconductor approximately 0.7 miles of primary conductor to resolve overloaded conductor violations. Reconductoring can be mitigated if TR3/MV3 switching scenario is not used or alternative load transfer configuration is identified.

TR-3/MV-3 Protective Device Equipment Summary: The TR-3 circuit has an additional two (2) cutout switches, and the MV-3 circuit has an additional one (4) cutout switch, ten (10) disconnect switches and one (1) recloser that are overloaded in the Year 1 analysis under the TR3/MV3 configuration. Other protective device overloads present

in the Year 1 analysis are previously identified in the Base Case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR3/MV3 Primary Low Voltage Summary: The Year 1 analysis has identified an additional 3.6 miles of TR-3 conductor and 1.3 miles of MV-3 conductor with low voltage violations. Other low voltage violations present in the Year 1 analysis is previously identified in the base case. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist. The violations can be mitigated if the TR3/MV3 configuration is not utilized.

TR3/MV3 Service Transformer Summary: The Year 1 analysis identified an additional one (1) service transformers on the MV-3 circuit with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 1 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR3/MV3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 74 service points on the TR-3 circuit and 585 service points on the MV-3 circuit for the base case. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

YEAR 3

TR3/MV3 Mainline Conductor Overload Summary: The MV-3 circuit experiences mainline conductor overload violations in an additional 0.5 miles of primary conductor in the Year 3 analysis under TR3/MV3 configuration. Other mainline conductor overload violations present in the Year 3 analysis is previously identified in the Year 1 analysis. TDPUD will be required to reconductor approximately 0.5 miles of primary conductor to resolve overloaded conductor violations. Reconductoring can be mitigated if TR3/MV3 switching scenario is not used or alternative load transfer configuration is identified.

TR3/MV3 Protective Device Equipment Summary: There are no additional protective device overloads on the TR-3 or MV-3 circuits in the Year 3 analysis under the TR3/MV3 configuration. Other protective device overloads present in Year 3 is previously identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR3/MV3 Primary Low Voltage Summary: The Year 3 analysis has identified an additional 0.8 miles of MV-3 conductor with low voltage violations. Other low voltage violations present in the Year 3 analysis is previously identified in the base case and Year 1 analysis. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist. The violations can be mitigated if the TR3/MV3 configuration is not utilized.

TR3/MV3 Service Transformer Summary: The Year 3 analysis did not identify additional service transformers with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset

replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR3/MV3 Service Transformer Summary: The base case identified two (2) service transformers on the TR-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR3/MV3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 80 service points on the TR-3 circuit and 606 service points on the MV-3 circuit for the base case. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

YEAR 5

TR3/MV3 Mainline Conductor Overload Summary: There are no additional mainline conductor overload violations identified in the Year 5 analysis under TR3/MV3 configuration. Mainline conductor overload violations present in the Year 5 analysis is previously identified in the Year 1 and Year 3 analysis. Reconductoring can be mitigated if TR3/MV3 switching scenario is not used or alternative load transfer configuration is identified.

TR3/MV3 Protective Device Equipment Summary: There are no additional protective device overloads on the TR-3 or MV-3 circuits in the Year 5 analysis under the TR3/MV3 configuration. Other protective device overloads present in Year 5 is previously identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR3/MV3 Primary Low Voltage Summary: The Year 5 analysis identified an additional 0.3 miles of MV-3 conductor with low voltage violations. Other low voltage violations present in the Year 5 analysis is previously identified in the base case, Year 1 and Year 3 analysis. Low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage violations persist. The violations can be mitigated if the TR3/MV3 configuration is not utilized.

TR3/MV3 Service Transformer Summary: The Year 5 analysis identified an additional one (1) service transformers on the MV-3 circuit with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 5 analysis is identified in the base case and Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR3/MV3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 112 service points on the TR-3 circuit and 660 service points on the MV-3 circuit for the base case. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

e) Other Contingency Scenarios

The **TR-3 to TR-4** contingency scenario is not recommended to be utilized during peak loading conditions due to the quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize the configuration scenarios.

TR-4 CIRCUIT

a) TR-4 Circuit Study Results

TR-4 serves approximately 3.6 MW of load. Under normal operating conditions, protective device and service transformer violations are observed in the base case and primary low voltage and phase imbalance violations occur in the 1-year, 3-year, and 5-year study horizons.

TR-4 has four feeder ties to the following feeders: TR-2 and MV-3, and two (2) ties to TD-3. Under TR-4 contingency scenarios, the primary switching options TR-4 toTR-3, as it results in fewer violations than other options.

Table 5-3-5 summarizes the years in which significant violations occur under TR-4 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-3-5: Feeder: TR-4

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TR4 Normal	No issues	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues
TR4 to TR3	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	BC/1/3/5Y
TR4 to TD3_1	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y
TR4 to TD3_2	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y
TR4 to MV3	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues	BC/1/3/5Y

b) TR-4 Circuit Normal Operation

Under normal operation, TR-4 experiences protective device equipment and service transformer overload violations in all years, as well as phase imbalance and primary low voltage violations occurring in Year 1 to Year 5 of the planning horizon.

BASE CASE

TR4 Protective Device Equipment Summary: The TR-4 circuit has one (1) cutout switch overloaded in the base case analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR4 Service Transformer Summary: The base case analysis identified one (1) service transformer with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 1

TR4 Protective Device Equipment Summary: The TR-4 circuit has an additional one (1) cutout switch and nine (9) disconnect switches that identified as overloaded in the Year 1 analysis. Other protective device violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR4 Primary Low Voltage Summary: The Year 1 analysis identified approximately 1.0 miles of TR-4 primary conductor with low voltage violations. TDPUD will investigate low voltage violations on the feeder and determine appropriate upgrades needed to mitigate low voltage violations.

TR4 Phase Imbalance Summary: There is a 15% phase imbalance identified on the TR-4 circuit in the Year 1 analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4 Service Transformer Summary: The Year 1 analysis did not identify additional service transformers greater than 150% of the rated value. Other service transformer overload violations present in the Year 1 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 3

TR4 Protective Device Equipment Summary: The TR-4 circuit has no additional protective device equipment identified as overloaded in the Year 3 analysis. Other protective device violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR4 Primary Low Voltage Summary: The Year 3 analysis identified approximately 0.3 miles of TR-4 primary conductor with low voltage violations. Additional low voltage violations present in the Year 3 analysis is identified in the Year 1 analysis. TDPUD will investigate low voltage violations on the feeder and determine appropriate upgrades needed to mitigate low voltage violations.

TR4 Phase Imbalance Summary: The phase imbalance identified in Year 1 analysis remains constant if not addressed through the Year 3 analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4 Service Transformer Summary: The Year 3 analysis did not identify additional service transformers greater than 150% of the rated value. Other service transformer overload violations present in the Year 3 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

YEAR 5

TR-4 Protective Device Equipment Summary: The TR-4 circuit has no additional protective device equipment identified as overloaded in the Year 5 analysis. Other protective device violations present in the Year 5 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR4 Primary Low Voltage Summary: The Year 5 analysis identified approximately 1.6 miles of TR-4 primary conductor with low voltage violations. Additional low voltage violations present in the Year 5 analysis is identified in Year 1 and Year 3 analysis. TDPUD will investigate low voltage violations on the feeder and determine appropriate upgrades needed to mitigate low voltage violations.

TR4 Phase Imbalance Summary: The phase imbalance identified in Year 1 analysis remains constant if not addressed through the Year 5 analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4 Service Transformer Summary: The Year 5 analysis did not identify additional service transformers greater than 150% of the rated value. Other service transformer overload violations present in the Year 5 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

c) TR-4 to TR-3 Contingency Scenario

The TR-4 to TR-3 contingency scenario experiences mainline conductor overload, protective device equipment overload, mainline primary low voltage, service transformer overloads, and secondary low voltage violations in all planning horizons. Additionally, phase imbalance violations occur in Year 1 through Year 5 planning horizons.

BASE CASE

TR4/TR3 Mainline Conductor Overload Summary: The TR-3 circuit experiences mainline conductor overload violations on approximately 0.1 miles of primary conductor. TDPUD will be required to reconductor approximately 0.1 miles of primary conductor to resolve overload conductor violations for the base case planning horizon.

TR4/TR3 Protective Device Equipment Summary: The TR-4 circuit has one (1) cutout switch and the TR-3 circuit has one (1) cutout switch and sixteen (16) disconnect switches that are overloaded in the base case under the TR4/TR3 configuration. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR4/TR3 Primary Low Voltage Summary: The base case has identified approximately 11.4 miles of TR-4 conductor with low voltage violations. TDPUD will investigate low voltage violations on the feeder and determine appropriate upgrades needed to mitigate low voltage violations. Low voltage violations can be mitigated if the TR4/TR3 configuration is not utilized.

TR4/TR3 Service Transformer Summary: The base case analysis identified one (1) service transformer on the TR-4 circuit and two (2) service transformers on the TR-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC

Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR4/TR3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 162 services points on the TR-4 circuit and 34 service points on the TR-3 circuit. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

YEAR 1

TR4/TR3 Mainline Conductor Overload Summary: The TR-3 circuit experiences mainline conductor overload violations on approximately an additional 0.3 miles of primary conductor. Other mainline conductor overload violations present in the Year 1 analysis is identified in the base case. TDPUD will be required to reconductor approximately 0.3 miles of primary conductor to resolve overload conductor violations for the Year 1 planning horizon.

TR4/TR3 Protective Device Equipment Summary: The TR-4 circuit has an additional one (1) cutout switch and five (5) disconnect switches and the TR-3 circuit has two (2) cutout switches and one (1) recloser that are overloaded in Year 1 under the TR4/TR3 configuration. Other protective device equipment violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR4/TR3 Primary Low Voltage Summary: The Year 1 analysis has identified an additional 1.3 miles of TR-4 conductor and 2.0 miles of TR-3 conductor with low voltage violations. Other mainline primary low voltage violations present in the Year 1 analysis is identified in the base case. TDPUD will investigate low voltage violations on the feeder and determine appropriate upgrades needed to mitigate low voltage violations. Low voltage violations can be mitigated if the TR4/TR3 configuration is not utilized.

TR4/TR3 Phase Imbalance Summary: A phase imbalance of 19% is identified on TR-3 circuit for the Year 1 analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4/TR3 Service Transformer Summary: The Year 1 analysis did not identify additional service transformers with an overload greater than 150% of the rated value. Other service transformer violations present in the Year 1 analysis is identified in the base case analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR4/TR3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 410 services points on the TR-4 circuit and 43 service points on the TR-3 circuit. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

YEAR 3

TR4/TR3 Mainline Conductor Overload Summary: The TR-3 circuit experiences mainline conductor overload violations on approximately an additional 0.3 miles of primary conductor. Other mainline conductor overload violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will be required to reconductor approximately 0.3 miles of primary conductor to resolve overload conductor violations for the Year 3 planning horizon.

TR4/TR3 Protective Device Equipment Summary: The are no additional protective device equipment that are overloaded in Year 3 under the TR4/TR3 configuration. Other protective device equipment violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR4/TR3 Primary Low Voltage Summary: The Year 3 analysis has identified an additional 0.2 miles of TR-3 conductor with low voltage violations. Other mainline primary low voltage violations present in the Year 3 analysis is identified in the base case and Year 1 planning horizons. TDPUD will investigate low voltage violations on the feeder and determine appropriate upgrades needed to mitigate low voltage violations. Low voltage violations can be mitigated if the TR4/TR3 configuration is not utilized.

TR4/TR3 Phase Imbalance Summary: The phase imbalance of 19% identified on TR-3 circuit does not change in the Year 3 analysis if not addressed in Year 1. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4/TR3 Service Transformer Summary: The Year 3 analysis did not identify additional service transformers with an overload greater than 150% of the rated value. Other service transformer violations present in the Year 3 analysis is identified in the base case analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR4/TR3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 499 services points on the TR-4 circuit and 45 service points on the TR-3 circuit. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

YEAR 5

TR4/TR3 Mainline Conductor Overload Summary: The TR-3 circuit experiences mainline conductor overload violations on approximately an additional 0.3 miles of primary conductor. Other mainline conductor overload violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will be required to reconductor approximately 0.3 miles of primary conductor to resolve overload conductor violations for the Year 3 planning horizon.

TR4/TR3 Protective Device Equipment Summary: The are no additional protective device equipment that are overloaded in Year 5 under the TR4/TR3 configuration. Other protective device equipment violations present in the Year 5 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install

appropriately sized protective device equipment prior to the identified planning year violation.

TR4/TR3 Primary Low Voltage Summary: The Year 5 analysis has identified a reduction of 0.2 miles of TR-3 conductor with low voltage violations. Other mainline primary low voltage violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 planning horizons. TDPUD will investigate low voltage violations on the feeder and determine appropriate upgrades needed to mitigate low voltage violations. Low voltage violations can be mitigated if the TR4/TR3 configuration is not utilized.

TR4/TR3 Phase Imbalance Summary: The phase imbalance identified on TR-3 circuit improves down to 18% in the Year 5 analysis if not addressed in Year 1 or Year 3. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4/TR3 Service Transformer Summary: The Year 5 analysis did not identify additional service transformers with an overload greater than 150% of the rated value. Other service transformer violations present in the Year 5 analysis is identified in the base case analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR4/TR3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 477 services points on the TR-4 circuit and 45 service points on the TR-3 circuit. Low voltage will be re-evaluated as the asset replacement program is executed and mitigated if low voltage violations persist.

d) TR-4 to TD-3_1 and TR-4 to TD-3_2 Contingency Scenarios

The TR-4 to TD-3_1 and TR-4 to TD-3_2 contingency scenarios result in mainline conductor, protective device equipment, and service transformer overloads, as well as low voltage and phase imbalance violations in all planning horizons.

BASE CASE

TR4/TD3_1 & TR4/TD-3_2 Mainline Conductor Overload Summary: The base case analysis identified approximately 12 feet of TR-4 circuit and 38 feet of TD-3 circuit with conductor overload violations in the TR4/TD-3_1 & _2 configurations. Spans identified as overloaded will be monitored and evaluated to determine if reconductoring is the best course of action. Reconductoring can be mitigated if both TR-4 to TD-3 tie-in configurations is not used or alternative load transfer configuration is identified.

TR4/TD3_1 & TR4/TD3_2 Protective Device Equipment Summary: The base case analysis identified two (2) closeout switches on the TR-4 circuit and four (4) cutout switches, seven (7) disconnect switches and one (1) recloser on the TD-3 circuit overloaded in the TR4/TD3_1 & _2 configurations. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR4/TD3_1 & TR4/TD3_2 Primary Low Voltage Summary: The base case analysis identified approximately 4.7 miles of TR-4 conductor and 9.2 miles of TD-3 conductor with mainline primary low voltage violations in the TD4/TD3_1 & _2 configurations.

Mainline primary low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage persists. The violations can be mitigated if the TR4/TD3_1 & _2 configurations are not utilized.

TR4/TD3_1 & TR4/TD3_2 Phase Imbalance Summary: There is a 13% phase imbalance identified on the TR-3 circuit for the base case analysis under the TR4/TD3_1 & _2 configurations. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4/TD3_1 & TD3_2 Service Transformer Summary: The base case analysis identified one (1) service transformer on the TR-4 circuit with an overload greater than 150% of the rated value under the TR4/TD3_1 & _2 configurations. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR4/TD3_1 & TR4/TD3_2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 82 service points on the TR-4 circuit and 382 service points on the TD-3 circuit for the base case. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist. Secondary low voltage violations can be mitigated if the TR4/TD3_1 & _2 configurations are not utilized.

YEAR 1

TR4/TD3_1 & TR4/TD-3_2 Mainline Conductor Overload Summary: The Year 1 analysis identified an additional 48 feet of TD-3 circuit with conductor overload violations in the TR4/TD-3_1 & _2 configurations. Spans identified as overloaded will be monitored and evaluated to determine if reconductoring is the best course of action. Other mainline conductor overload violations present in the Year 1 analysis is identified in the base case. Reconductoring can be mitigated if both TR-4 to TD-3 tie-in configurations is not used or alternative load transfer configuration is identified.

TR4/TD3_1 & TR4/TD3_2 Protective Device Equipment Summary: The Year 1 analysis identified an additional one (1) closeout switches and three (3) disconnect switches on the TR-4 circuit overloaded in the TR4/TD3_1 & _2 configurations. Other protective device overload violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR4/TD3_1 & TR4/TD3_2 Primary Low Voltage Summary: The Year 1 analysis identified an additional 7.7 miles of TR-4 conductor and 0.9 miles of TD-3 conductor with mainline primary low voltage violations in the TD4/TD3_1 & _2 configurations. Other mainline primary low voltage violations present in the Year 1 analysis is identified in the base case. Mainline primary low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage persists. The violations can be mitigated if the TR4/TD3_1 & _2 configurations are not utilized.

TR4/TD3_1 & TR4/TD3_2 Phase Imbalance Summary: There is no change in phase imbalance identified on the TR-3 circuit for the Year 1 analysis under the TR4/TD3_1 & _2 configurations. Phase imbalance present in the Year 1 analysis is identified in the base case. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4/TD3_1 & TD3_2 Service Transformer Summary: The Year 1 analysis did not identify additional service transformers with an overload greater than 150% of the rated value under the TR4/TD3_1 & _2 configurations. Service transformer overload violations present in the Year 1 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR4/TD3_1 & TR4/TD3_2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 285 service points on the TR-4 circuit and 512 service points on the TD-3 circuit for the Year 1 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist. Secondary low voltage violations can be mitigated if the TR4/TD3_1 & _2 configurations are not utilized.

YEAR 3

TR4/TD3_1 & TR4/TD-3_2 Mainline Conductor Overload Summary: The Year 3 analysis did not identify additional conductor overload violations in the TR4/TD-3_1 & _2 configurations. Spans identified as overloaded will be monitored and evaluated to determine if reconductoring is the best course of action. Other mainline conductor overload violations present in the Year 3 analysis is identified in the base case and Year 1. Reconductoring can be mitigated if both TR-4 to TD-3 tie-in configurations is not used or alternative load transfer configuration is identified.

TR4/TD3_1 & TR4/TD3_2 Protective Device Equipment Summary: The Year 3 analysis did not identify additional protective device equipment overloaded in the TR4/TD3_1 & _2 configurations. Other protective device overload violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR4/TD3_1 & TR4/TD3_2 Primary Low Voltage Summary: The Year 3 analysis identified an additional 0.6 miles of TR-4 conductor and 0.7 miles of TD-3 conductor with mainline primary low voltage violations in the TD4/TD3_1 & _2 configurations. Other mainline primary low voltage violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. Mainline primary low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage persists. The violations can be mitigated if the TR4/TD3_1 & _2 configurations are not utilized.

TR4/TD3_1 & TR4/TD3_2 Phase Imbalance Summary: There is no change in phase imbalance identified on the TR-3 circuit for the Year 3 analysis under the TR4/TD3_1 & _2 configurations. Phase imbalance present in the Year 3 analysis is identified in the base case. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4/TD3_1 & TD3_2 Service Transformer Summary: The Year 5 analysis did not identify additional service transformers with an overload greater than 150% of the rated value under the TR4/TD3_1 & _2 configurations. Service transformer overload violations present in the Year 5 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR4/TD3_1 & TR4/TD3_2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 354 service points on the TR-4 circuit and 601 service points on the TD-3 circuit for the Year 3 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist. Secondary low voltage violations can be mitigated if the TR4/TD3_1 & _2 configurations are not utilized.

YEAR 5

TR4/TD3_1 & TR4/TD-3_2 Mainline Conductor Overload Summary: The Year 5 analysis did not identify additional conductor overload violations in the TR4/TD-3_1 & _2 configurations. Spans identified as overloaded will be monitored and evaluated to determine if reconductoring is the best course of action. Other mainline conductor overload violations present in the Year 5 analysis is identified in the base case and Year 1. Reconductoring can be mitigated if both TR-4 to TD-3 tie-in configurations is not used or alternative load transfer configuration is identified.

TR4/TD3_1 & TR4/TD3_2 Protective Device Equipment Summary: The Year 5 analysis did not identify additional protective device equipment overloaded in the TR4/TD3_1 & _2 configurations. Other protective device overload violations present in the Year 5 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR4/TD3_1 & TR4/TD3_2 Primary Low Voltage Summary: The Year 5 analysis identified an additional 0.9 miles of TD-3 conductor with mainline primary low voltage violations in the TD4/TD3_1 & _2 configurations. Other mainline primary low voltage violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. Mainline primary low voltage will be re-evaluated after higher priority projects are executed and mitigated if low voltage persists. The violations can be mitigated if the TR4/TD3_1 & _2 configurations are not utilized.

TR4/TD3_1 & TR4/TD3_2 Phase Imbalance Summary: There is no change in phase imbalance identified on the TR-3 circuit for the Year 5 analysis under the TR4/TD3_1 & _2 configurations. Phase imbalance present in the Year 5 analysis is identified in the base case. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR4/TD3_1 & TD3_2 Service Transformer Summary: The Year 5 analysis did not identify additional service transformers with an overload greater than 150% of the rated value under the TR4/TD3_1 & _2 configurations. Service transformer overload violations present in the Year 5 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR4/TD3_1 & TR4/TD3_2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 448 service points on the TR-4 circuit and 603 service points on the TD-3 circuit for the Year 5 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist. Secondary low voltage violations can be mitigated if the TR4/TD3_1 & _2 configurations are not utilized.

e) Other Contingency Scenarios

The **TR-4 to MV-3** contingency scenario is not recommended to be utilized during peak loading conditions due to the quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize the configuration scenarios.

TR-5 CIRCUIT

a) TR-5 Circuit Study Results

TR-5 serves approximately 3.8 MW of load. Under normal operating conditions, phase imbalance, protective device equipment overload and primary low voltage violations are observed in the base case. Service transformer overloads and secondary low voltage violations occur s in the 3-year and 5-year study horizons.

TR-5 has five feeder ties to the following feeders: TD-3 and four (4) ties to TR-6. Under TR-5 contingency scenarios, the primary switching options are TR5 to TR6_1 or TR5 to TR6_3, as these result in minor violations when compared to other contingency scenarios.

Table 5-3-6 summarizes the years in which significant violations occur under TR-5 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-3-6: Feeder: TR-5

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TR5 Normal	No issues	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC/1/3/5Y	3/5Y
TR5 to TR6_1	3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC	BC/1/3/5Y
TR5 to TR6_2	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC	BC/1/3/5Y
TR5 to TR6_3	3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC	BC/1/3/5Y
TR5 to TR6_4	3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC	BC/1/3/5Y
TR5 to TD3	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC/1/3/5Y	BC/1/3/5Y

b) TR-5 Circuit Normal Operation

Under normal operation, TR-5 experiences mainline protective device equipment overload, mainline primary low voltage, and phase imbalance violations in all years of the planning horizon. Additionally, service transformer overload and secondary low voltage violations occur in Year 3 through Year 5 planning horizons.

BASE CASE

TR5 Mainline Protective Device Equipment Summary: The TR-5 circuit has one (1) cutout switch and six (6) disconnect switches that are overloaded in the base case under

TR5 Normal Operation. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR5 Primary Low Voltage Summary: The base case analysis identified approximately 3.9 miles of TR-5 circuit with mainline low voltage violations. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

TR5 Phase Imbalance Summary: A phase imbalance of 20% is identified on the TR-5 circuit for the base case analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

YEAR 1

TR5 Mainline Protective Device Equipment Summary: The TR-5 circuit has no additional mainline protective device equipment that is overloaded in the Year 1 analysis under TR5 Normal Operation. Other mainline protective device equipment violations present in Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR5 Primary Low Voltage Summary: The Year 1 analysis identified an additional approximately 0.3 miles of TR-5 circuit with mainline low voltage violations. Other mainline low voltage violations present in the Year 1 analysis is identified in the base case. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

TR5 Phase Imbalance Summary: No additional phase imbalance is identified in the Year 1 analysis. The phase imbalance present in Year 1 is identified in the base case analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

YEAR 3

TR5 Mainline Protective Device Equipment Summary: The TR-5 circuit has no additional mainline protective device equipment that is overloaded in the Year 3 analysis under TR5 Normal Operation. Other mainline protective device equipment violations present in Year 3 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR5 Primary Low Voltage Summary: The Year 3 analysis identified an additional approximately 1.3 miles of TR-5 circuit with mainline low voltage violations. Other mainline low voltage violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

TR5 Phase Imbalance Summary: No additional phase imbalance is identified in the Year 3 analysis. The phase imbalance present in Year 3 is identified in the base case analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR5 Service Transformer Summary: The Year 3 analysis identified one (1) service transformer with an overload greater than 150% of the rated value on the TR-5 circuit.

TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

TR5 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 136 service points on the TR-5 circuit for the Year 3 analysis. TDPUD will investigate secondary low voltage violations as higher priority projects are executed and mitigate if secondary low voltage violations persist.

YEAR 5

TR5 Mainline Protective Device Equipment Summary: The TR-5 circuit has an additional one (1) cutout switch and one (1) disconnect switch that are overloaded in the Year 5 analysis under TR5 Normal Operation. Other mainline protective device equipment violations present in Year 5 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR5 Primary Low Voltage Summary: The Year 5 analysis identified an additional approximately 0.1 miles of TR-5 circuit with mainline low voltage violations. Other mainline low voltage violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

TR5 Phase Imbalance Summary: No additional phase imbalance is identified in the Year 5 analysis. The phase imbalance present in Year 5 is identified in the base case analysis. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR5 Service Transformer Summary: The Year 5 analysis identified did not identify additional service transformers with an overload greater than 150% of the rated value on the TR-5 circuit. The service transformer overload greater than 150% of the rated value present in the Year 5 analysis is identified in the Year 3 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified violations.

TR5 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 173 service points on the TR-5 circuit for the Year 5 analysis. TDPUD will investigate secondary low voltage violations as higher priority projects are executed and mitigate if secondary low voltage violations persist.

c) TR-5 to TR-6_1 and TR-5 to TR-6_3 Contingency Scenarios

The TR5/TR6_1 and TR5/TR6_3 contingency scenarios result in protective device equipment overload, mainline primary low voltage and secondary low voltage violations in all planning horizons. Additionally, mainline primary conductor overload and service transformer overload violations occur in the Year 3 and Year 5 planning horizons. With phase imbalance violations present only in the base case.

BASE CASE

TR5/TR6_1 & TR5/TR6_3 Protective Device Equipment Summary: The base case analysis identified one (1) cutout switch and one (1) disconnect switch on the TR-5 circuit and thirteen (13) disconnect switches on the TR-6 circuit under the TR5/TR6_1 and _3 configurations. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR5/TR6_1 & TR5/TR6_3 Primary Low Voltage Summary: The base case analysis identified approximately 8.2 miles of low voltage violations on the TR-5 circuit. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

TR5/TR6_1 & TR5/TR6_3 Phase Imbalance Summary: A phase imbalance of 11% is present on TR-6 in the base case analysis. The phase imbalance present on TR-6 improves as the model conditions change in subsequent analysis years. The phase imbalance will be monitored, no mitigation required at this time.

TR5/TR6_1 & TR5/TR6_3 Secondary Low Voltage Summary: The base case analysis identifies approximately 175 service points with secondary low voltage violations on the TR-5 circuit. TDPUD will investigate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 1

TR5/TR6_1 & TR5/TR6_3 Protective Device Equipment Summary: The Year 1 analysis identified an additional one (1) cutout switch and one (1) recloser on the TR-6 circuit under the TR5/TR6_1 and _3 configurations. Other protective device overload violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR5/TR6_1 & TR5/TR6_3 Primary Low Voltage Summary: The Year 1 analysis identified an additional approximately 3.4 miles of low voltage violations on the TR-5 circuit. Other mainline primary low voltage violations present in the Year 1 analysis is identified in the base case. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

TR5/TR6_1 & TR5/TR6_3 Secondary Low Voltage Summary: The Year 1 analysis identifies approximately 253 service points with secondary low voltage violations on the TR-5 circuit. TDPUD will investigate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 3

TR5/TR6_1 & TR5/TR6_3 Mainline Conductor Overload Summary: The Year 3 analysis identifies mainline conductor overload violations on approximately 0.1 miles of TR-6 circuit. TDPUD will be required to reconductor approximately 0.1 miles of primary conductor to resolve overload conductor violations. Reconductoring can be mitigated if TR5/TR6_1 & TR5/TR6 switching scenarios are not used or alternative load transfer configuration is identified.

TR5/TR6_1 & TR5/TR6_3 Protective Device Equipment Summary: The Year 3 analysis identified an additional one (1) cutout switch and two (2) disconnect switches on the TR-6 circuit under the TR5/TR6_1 and _3 configurations. Other protective device

overload violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR5/TR6_1 & TR5/TR6_3 Primary Low Voltage Summary: The Year 3 analysis identified an additional approximately 1.6 miles of low voltage violations on the TR-5 circuit. Other mainline primary low voltage violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

TR5/TR6_1 & TR5/TR6_3 Service Transformer Summary: The Year 3 analysis identifies one (1) service transformer on the TR-5 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR5/TR6_1 & TR5/TR6_3 Secondary Low Voltage Summary: The Year 3 analysis identifies approximately 337 service points with secondary low voltage violations on the TR-5 circuit. TDPUD will investigate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 5

TR5/TR6_1 & TR5/TR6_3 Mainline Conductor Overload Summary: The Year 5 analysis does not identify additional mainline conductor overload violations. Other mainline conductor overload violations present in the Year 5 analysis is identified in the Year 3 analysis. Reconductoring can be mitigated if TR5/TR6_1 & TR5/TR6 switching scenarios are not used or alternative load transfer configuration is identified.

TR5/TR6_1 & TR5/TR6_3 Protective Device Equipment Summary: The Year 5 analysis identified an additional five (5) disconnect switches on the TR-6 circuit under the TR5/TR6_1 and _3 configurations. Other protective device overload violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR5/TR6_1 & TR5/TR6_3 Primary Low Voltage Summary: The Year 5 analysis identified an additional approximately 1.0 miles of low voltage violations on the TR-5 circuit and 1.2 miles of low voltage violations on the TR-6 circuit. Other mainline primary low voltage violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

TR5/TR6_1 & TR5/TR6_3 Service Transformer Summary: The Year 5 analysis does not identify additional service transformers with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR5/TR6_1 & TR5/TR6_3 Secondary Low Voltage Summary: The Year 5 analysis identifies approximately 503 service points with secondary low voltage violations on the TR-5 circuit. TDPUD will investigate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

d) TR-5 to TD-3 Contingency Scenario

The TR-5 to TD-3 contingency scenario results in mainline conductor overload, protective device equipment overload, mainline primary low voltage, phase imbalance and secondary low voltage violations in all planning years. Additionally, service transformer overload violations occur in Year 3 through Year 5 planning years.

BASE CASE

TR5/TD3 Mainline Conductor Overload Summary: The TD-3 circuit experiences mainline conductor overload violations on approximately 1.3 miles of conductor. TDPUD will be required to reconductor approximately 1.3 miles of TD-3 conductor to resolve overloaded primary conductor violations. Reconductoring can be mitigated if TR5/TD3 switching scenario is not used or alternative load transfer configuration is identified.

TR5/TD3 Protective Device Equipment Summary: The base case analysis identifies four (4) cutout switches on the TR-5 circuit and four (4) cutout switches, five (5) disconnect switches and one (1) recloser overloaded under the TR5/TD3 configuration. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR5/TD3 Primary Low Voltage Summary: The base case analysis identifies approximately 42.0 miles of TR-5 circuit and 13.8 miles of TD-3 circuit with mainline conductor overload violations under the TR5/TD3 configuration. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

TR5/TD3 Phase Imbalance Summary: A 22% phase imbalance is identified on the TD-3 circuit in the base case under the TR5/TD3 configuration. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR5/TD3 Secondary Low Voltage Summary: The base case analysis identifies 1,652 service points on the TR-5 circuit and 898 service points on the TD-3 circuit with secondary low voltage violations under the TR5/TD3 configuration. TDPUD will re-evaluate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 1

TR5/TD3 Mainline Conductor Overload Summary: The Year 1 analysis does not identify additional mainline conductor overload violations. Other mainline conductor overload violations present in Year 1 is identified in the base case. Reconductoring can be mitigated if TR5/TD3 switching scenario is not used or alternative load transfer configuration is identified.

TR5/TD3 Protective Device Equipment Summary: The Year 1 analysis identifies no additional overloaded protective device equipment under the TR5/TD3 configuration.

Other protective device equipment overload violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR5/TD3 Primary Low Voltage Summary: The Year 1 analysis does not identify additional mainline conductor overload violations under the TR5/TD3 configuration. Other mainline low voltage violations present in the Year 1 analysis is identified in the base case. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

TR5/TD3 Phase Imbalance Summary: The Year 1 analysis identifies no change in the phase imbalance identified in the base case under the TR5/TD3 configuration. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR5/TD3 Secondary Low Voltage Summary: The Year 1 analysis identifies 1,666 service points on the TR-5 circuit and 922 service points on the TD-3 circuit with secondary low voltage violations under the TR5/TD3 configuration. TDPUD will re-evaluate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 3

TR5/TD3 Mainline Conductor Overload Summary: The Year 3 analysis does not identify additional mainline conductor overload violations. Other mainline conductor overload violations present in Year 3 is identified in the base case. Reconductoring can be mitigated if TR5/TD3 switching scenario is not used or alternative load transfer configuration is identified.

TR5/TD3 Protective Device Equipment Summary: The Year 3 analysis identifies an additional one (1) cutout switch overloaded under the TR5/TD3 configuration. Other protective device equipment overload violations present in the Year 3 analysis is identified in the base caseTDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR5/TD3 Primary Low Voltage Summary: The Year 3 analysis identifies an additional 0.1 miles of TD-3 circuit with mainline conductor overload violations under the TR5/TD3 configuration. Other mainline low voltage violations present in the Year 3 analysis is identified in the base case. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

TR5/TD3 Phase Imbalance Summary: The Year 3 analysis identifies no change in the phase imbalance identified in the base case under the TR5/TD3 configuration. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR5/TD3 Service Transformer Summary: The Year 3 analysis identifies one (1) service transformer on the TR-5 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR5/TD3 Secondary Low Voltage Summary: The Year 3 analysis identifies 1,689 service points on the TR-5 circuit and 998 service points on the TD-3 circuit with secondary low voltage violations under the TR5/TD3 configuration. TDPUD will re-evaluate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 5

TR5/TD3 Mainline Conductor Overload Summary: The Year 5 analysis does not identify additional mainline conductor overload violations on TD-3 circuit. TR-5 develops an overload violation in Year 5 across a single span; conductor overload will be monitored periodically to determine if mitigation will be required. Other mainline conductor overload violations present in Year 5 are identified in the base case. Reconductoring can be mitigated if TR5/TD3 switching scenario is not used or alternative load transfer configuration is identified.

TR5/TD3 Protective Device Equipment Summary: The Year 5 analysis identifies no additional overloaded protective device equipment under the TR5/TD3 configuration. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case and Year 3 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR5/TD3 Primary Low Voltage Summary: The Year 5 analysis does not identify additional mainline conductor overload violations under the TR5/TD3 configuration. Other mainline low voltage violations present in the Year5 analysis is identified in the base case and Year 3 analysis. TDPUD will investigate mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

TR5/TD3 Phase Imbalance Summary: The Year 5 analysis identifies no change in the phase imbalance identified in the base case under the TR5/TD3 configuration. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

TR5/TD3 Service Transformer Summary: The Year 5 analysis identifies an additional one (1) service transformer on the TR-5 circuit and one (1) service transformer on the TD-3 circuit with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized service transformers prior to the identified planning year violation.

TR5/TD3 Secondary Low Voltage Summary: The Year 5 analysis identifies 1,671 service points on the TR-5 circuit and 1,018 service points on the TD-3 circuit with secondary low voltage violations under the TR5/TD3 configuration. TDPUD will re-evaluate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

e) Other Contingency Scenarios

The **TR-5 to TR-6_2 and TR-5 to TR-6_4** contingency scenarios are not recommended to be utilized during peak loading conditions due to the quantity and severity of violations

present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize the configuration scenarios.

TR-6 CIRCUIT

a) TR-6 Circuit Study Results

TR-6 serves approximately 1.6 MW of load. Under normal operating conditions, phase imbalance violations occur in the base case. Protective device equipment overload violations occur in the Year 1 through Year 5 study horizons. Additionally, primary conductor overload and primary low voltage violations occur as in 3-year and 5-year study horizons.

TR-6 has five feeder ties to the following feeders: TR-1, and four (4) ties to TR-5. Under TR-6 contingency scenarios, the primary switching options are TR-6 to TR5_1 or TR-6 to TR5_2, as these result in minor violations as compared to other contingency options.

Table 5-3-7 summarizes the years in which significant violations occur under TR-6 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-3-7: Feeder: TR-6

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
TR6 Normal	5Y	5Y	1/3/5Y	No issues	BC	No issues
TR6 to TR1	3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues	1/3/5Y
TR6 to TR5_1	3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC	BC/1/3/5Y
TR6 to TR5_2*	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues	No issues	BC/1/3/5Y
TR6 to TR5_3	3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC	BC/1/3/5Y
TR6 to TR5_4	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	3/5Y	BC	BC/1/3/5Y

*NISC model analysis on year 3 and 5 failed due to significant voltage drop

b) TR-6 Circuit Normal Operation

Under normal operation, TR-6 experiences mainline conductor overload and primary low voltage violations in Year 5, protective device equipment overload violations in Year 1 through Year 5, and phase imbalance violations in the base case.

BASE CASE

TR6 Phase imbalance Summary: The base case analysis identifies a 13% phase imbalance on TR-6 circuit. The phase imbalance improves below violation thresholds in subsequent planning year analysis due to planning parameters. Phase imbalance will be monitored, no mitigation required at this time.

YEAR 1

TR6 Protective Device Equipment Summary: The Year 1 analysis identifies one (1) cutout switch and one (1) disconnect switch on the TR-6 circuit with overload violations. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 3

TR6 Protective Device Equipment Summary: The Year 3 analysis identifies an additional one (1) cutout switch and two (2) disconnect switches on the TR-6 circuit with overload violations. Other protective device overload violations present in the Year 3 analysis is identified in the Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 5

TR6 Mainline Conductor Overload Summary: TR-6 feeder experiences primary conductor overload violations on approximately 0.1 mile of conductor. TDPUD will be required to reconductor approximately 0.1 miles of conductor to resolve overload conductor violations.

TR6 Protective Device Equipment Summary: The Year 5 analysis identifies an additional nine (9) disconnect switches and one (1) recloser on the TR-6 circuit with overload violation. Other protective device overload violations present in the Year 5 analysis is identified in the Year 1 and Year 3 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

TR6 Primary Low Voltage Summary: The Year 5 analysis identifies approximately 12.8 miles of TR-6 conductor with low voltage violations. Low voltage will be monitored and re-evaluated after asset replacement and reconductoring to determine extent of the required mitigation.

c) TR-6 to TR-5_1 and TR-6 to TR-5_3 Contingency Scenario

The TR-6 to TR-5_1 and TR-6 to TR-5_3 contingency scenarios result in mainline conductor overload and service transformer overload violations in Year 3 and Year 5. Protective device equipment overload, mainline primary low voltage and secondary low voltage violations occur in all planning horizons; and phase imbalance violations occur in the base case.

BASE CASE

TR6/TR5_1 & TR6/TR5_3 Protective Device Equipment Summary: The base case analysis identifies one (1) cutout switch and six (6) disconnect switches for TR-5 with overload violations. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR6/TR5_1 & TR6/TR5_3 Primary Low Voltage Summary: The base case analysis identifies approximately 10.5 miles of TR-5 circuit with primary low voltage violations. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

TR6/TR5_1 & TR6/TR5_3 Phase Imbalance Summary: The base case analysis identifies phase imbalance of 11% for TR-5 under the TR6/TF5_1 & _3 configuration. The load imbalance improves over time; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

TR6/TR5_1 & TR6/TR5_3 Secondary Low Voltage Summary: The base case analysis identifies 209 service points on the TR-5 circuit with secondary low voltage violations under the TR6/TR5_1 & _3 configurations. TDPUD will re-evaluate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 1

TR6/TR5_1 & TR6/TR5_3 Protective Device Equipment Summary: The Year 1 analysis identifies an additional one (1) cutout switch and nine (9) disconnect switches for TR-6; and one (1) recloser for TR-5 with overload violations. Other protective device equipment overload violations present in the Year 1 analysis is identified in the Base Case analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR6/TR5_1 & TR6/TR5_3 Primary Low Voltage Summary: The Year 1 analysis identifies an additional 2.1 miles of TR-6 circuit and 4.0 miles of TR-5 circuit with primary low voltage violations. Other mainline primary low voltage violations present in the Year 1 analysis is identified in the base case analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

TR6/TR5_1 & TR6/TR5_3 Secondary Low Voltage Summary: The Year 1 analysis identifies 3 service points on the TR-6 circuit and 420 service points on the TR-5 circuit with secondary low voltage violations under the TR6/TR5_1 & _3 configurations. TDPUD will re-evaluate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 3

TR6/TR5_1 & TR6/TR5_3 Mainline Conductor Overload Summary: The Year 3 analysis identifies approximately 0.1 miles of TR-6 and 0.7 miles of TR-5 mainline conductor overload violations under the TR6/TR5_1 & _3 configurations. TDPUD will be required to reconductor approximately 0.1 miles of TR-6 circuit and 0.7 miles of TR-5 circuit to resolve overload conductor violations. The reconductoring can be partially mitigated if the TR6/TR5_1 & _3 configurations are not utilized.

TR6/TR5_1 & TR6/TR5_3 Protective Device Equipment Summary: The Year 3 analysis identifies an additional one (1) cutout switch and six (6) disconnect switches for TR-6; and one (1) cutout switch for TR-5 with overload violations. Other protective device equipment overload violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR6/TR5_1 & TR6/TR5_3 Primary Low Voltage Summary: The Year 3 analysis identifies an additional 3.4 miles of TR-6 circuit and 6.3 miles of TR-5 circuit with primary low voltage violations. Other mainline primary low voltage violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

TR6/TR5_1 & TR6/TR5_3 Service Transformer Summary: The Year 3 analysis identifies one (1) service transformer for TR-5 with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

TR6/TR5_1 & TR6/TR5_3 Secondary Low Voltage Summary: The Year 3 analysis identifies 3 service points on the TR-6 circuit and 557 service points on the TR-5 circuit with secondary low voltage violations under the TR6/TR5_1 & _3 configurations. TDPUD will re-evaluate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 5

TR6/TR5_1 & TR6/TR5_3 Mainline Conductor Overload Summary: The Year 5 analysis identifies an additional 0.1 miles of TR-6 mainline conductor overload violations under the TR6/TR5_1 & _3 configurations. Other mainline conductor overload violations present in the Year 5 analysis is identified in the Year 3 analysis. TDPUD will be required to reconductor approximately 0.1 miles of TR-6 circuit to resolve overload conductor violations. The reconductoring can be partially mitigated if the TR6/TR5_1 & _3 configurations are not utilized.

TR6/TR5_1 & TR6/TR5_3 Protective Device Equipment Summary: The Year 5 analysis identifies an additional five (5) disconnect switches for TR-6; and two (2) disconnect switches for TR-5 with overload violations. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

TR6/TR5_1 & TR6/TR5_3 Primary Low Voltage Summary: The Year 5 analysis identifies an additional 8.7 miles of TR-6 circuit and 16.8 miles of TR-5 circuit with primary low voltage violations. Other mainline primary low voltage violations present in the Year 5 analysis is identified in the base case, Year 1 Year 3 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

TR6/TR5_1 & TR6/TR5_3 Service Transformer Summary: The Year 5 analysis identifies no additional service transformers with an overload greater than 150% of the rated value. Other service transformer overload violations greater than 150% of the rated value are identified in the Year 3 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

TR6/TR5_1 & TR6/TR5_3 Secondary Low Voltage Summary: The Year 5 analysis identifies eight (8) service points on the TR-6 circuit and 744 service points on the TR-5 circuit with secondary low voltage violations under the TR6/TR5_1 & _3 configurations. TDPUD will re-evaluate secondary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

d) Other Contingency Scenarios

The **TR-6 to TR-5_2, TR-6 to TR-5_4 and TR-6 to TR1** contingency scenarios are not recommended to be utilized during peak loading conditions due to the quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize the configuration scenarios.

5.4 Martis Valley Substation Service Area

The Martis Valley Service Area is served by the MV-1, MV-2, MV-3 and MV-4 circuits with a combined peak load of 10.3 MW. Load growth on MV-1 and MV-2 are projected at 1.66%, while load growth on MV-3 and MV-4 are projected at 2.22%. There are existing 3-phase ties between TR-1 and MV-4, TR-2 and MV-3, TR-3 and MV-3, TR-4 and MV-3, and DL-1 and MV-3.

MARTIS VALLEY SUBSTATION CAPACITY

a) Martis Valley Substation Capacity Study Results

Martis Valley Substation has a capacity of 18.75MVA. Under Normal Operating conditions, the transformer is forecasted to become overloaded to 105% of capacity in Year 5. The forecasted load on Donner Lake Substation is 19.7 MVA in Year 5.

Under contingency conditions, the substation is projected to exceed its capacity as early as 2028 when picking up the load of adjacent feeders. Table 5-4-1 summarizes forecasted substation loading percentage under normal and switching conditions.

Table 5-4-1 Summary of Martis Valley Substation Transformer Capacity

Substation Capacity * (kVA)	Scenario	Forecasted Load			
		Base Case	1-Year	3-Year	5-Year
18750	Normal Operation	55%	73%	97%	105%
	Picking Up DL1	61%	80%	103%	112%
	Picking Up DL1 & DL2(1)	70%	88%	112%	121%
	Picking Up TR1	66%	84%	114%	123%
	Picking Up TR2	60%	84%	115%	134%
	Picking Up TR3	66%	85%	109%	120%
	Picking Up TR4	74%	100%	124%	134%
	Picking Up TR1, TR2, TR3 & TR6(2)	89%	131%	182%	219%

(1) Loss of Donner Lake Substation & 607 T-Line

(2) Loss of Truckee Substation

* Substation Capacity with Forced Air Cooling

b) Martis Valley Substation Proposed Solutions

To mitigate the Martis Valley Substation transformer overload condition starting in the Year 5 planning horizon, existing feeder ties between Donner Lake feeders and Truckee feeders can be utilized. Donner Lake has available capacity throughout the study plan

period. MV-3 feeder can be partially offloaded onto Donner Lake Substation via an existing feeder tie with DL-1. In the proposed contingency configuration DL-1 and MV-3 will require projects completed to avoid deficiencies and violations with mainline conductor, equipment overloads and other system parameters. The projects are identified in the respective sections below for Martis Valley feeder MV-3.

The other existing feeder ties provide the option to move load to Truckee Substation however; Truckee Substation starts to exceed its capacity begging in Year 3 planning horizon under normal operations and in Year 1 when picking up Martis Valley Substation feeder loads.

Donner Lake and Tahoe Donner Substations have available substation capacity to provide additional relief to Martis Valley Substation, however, additional feeder ties between Martis Valley and Donner Lake feeders and new feeder ties between Tahoe Donner and Martis Valley feeders would be required. Given the region's geography and the separation between these substations and distribution feeders, developing additional feeder ties between Martis Valley and Tahoe Donner, or between Martis Valley and Donner Lake, is inherently difficult. Further studies will need to be conducted to identify feasibility, scope, and potential costs of constructing ties from Martis Valley feeders to Donner Lake and Tahoe Donner feeders.

A transformer replacement and substation upgrade study is recommended based on the forecasted load identified in this study and the ongoing upgrade projects to Martis Valley Substation. At a minimum, the study should compare and evaluate the capacity needs, feasibility, and costs associated with upgrading the existing substation versus constructing a new one.

MV-1 CIRCUIT

a) MV-1 Circuit Study Results

MV-1 serves approximately 1.4 MW of load. Under normal operating conditions, the phase imbalance violation is observed in the base case; however, it is resolved in the 3-year scenario. Protective device overload violations occur starting in 2028.

MV-1 has two feeder ties to the following feeders: MV-2 and MV-3. Under MV-1 contingency scenarios, the primary switching option is from MV-1 to MV-2, as it results in fewer mainline overload and low-voltage violations compared to switching from MV-1 to MV-3.

Table 5-4-2 summarizes the years in which significant violations occur under MV-1 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-4-2: Feeder: MV-1

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
MV1 Normal	No issues	No issues	3/5Y	No issues	BC/1Y	No issues
MV1 to MV2	5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1Y	No issues
MV1 to MV3	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues	1/3/5Y

b) MV-1 Circuit Normal Operation

Under normal operation, MV-1 experiences protective device equipment overload violations in Year 3 and Year 5; phase imbalance violations occur in the base case and Year 1 planning horizons.

BASE CASE

MV1 Phase Imbalance Summary: The base case identifies a 14% phase imbalance on the MV-1 circuit. The load imbalance improves over time; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

YEAR 1

MV1 Phase Imbalance Summary: The Year 1 analysis remains at 14% on the MV-1 circuit. The load imbalance improves over time; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

YEAR 3

MV1 Protective Device Equipment Summary: The Year 3 analysis identifies one (1) cutout switch overloaded on MV-1 circuit. TDPUD will monitor and initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

YEAR 5

MV1 Protective Device Equipment Summary: The Year 5 analysis does not identify additional overloaded protective device equipment on MV-1 circuit. Other protective device equipment overload violations present in the Year 5 analysis is identified in the Year 3 analysis. TDPUD will monitor and initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified planning year violation.

c) MV-1 to MV-2 Contingency Scenario

The MV-1 to MV-2 contingency scenario results in mainline conductor overload violations in the Year 5 planning horizon; protective device equipment, mainline primary low voltage and service transformer overloads violations in all years; and phase imbalance violations occur in the Base Case and Year 1.

BASE CASE

MV1/MV2 Protective Device Equipment Summary: The base case analysis identifies four (4) cutout switches and two (2) disconnect switches on the MV-2 circuit with overload violations. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV1/MV2 Primary Low Voltage Summary: The base case identifies approximately 1.3 miles of MV-2 circuit with mainline low voltage violations. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV1/MV2 Phase Imbalance Summary: The base case analysis identifies a 16% phase imbalance on the MV-2 circuit under the MV1/MV2 configuration. The load imbalance improves over time; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

MV1/MV2 Service Transformer Summary: The base case analysis identifies one (1) service transformer on MV-2 with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 1

MV1/MV2 Protective Device Equipment Summary: The Year 1 analysis identifies an additional two (2) disconnect switches on the MV-2 circuit with overload violations. Other protective device equipment overload violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV1/MV2 Primary Low Voltage Summary: The Year 1 analysis identifies an additional 0.1 miles of MV-2 circuit with mainline low voltage violations. Other mainline low voltage violations present in the Year 1 analysis is identified in the base case. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV1/MV2 Phase Imbalance Summary: The Year 1 analysis identifies a 14% phase imbalance on the MV-2 circuit under the MV1/MV2 configuration. The load imbalance improves over time; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

MV1/MV2 Service Transformer Summary: The Year 1 analysis identifies no additional service transformer with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 1 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 3

MV1/MV2 Protective Device Equipment Summary: The Year 3 analysis identifies an additional one (1) cutout switch on the MV-1 circuit and one (1) cutout switch, one (1) disconnect switch and one (1) recloser on the MV-2 circuit with overload violation. Other protective device equipment overload violations present in the Year 3 analysis is identified

in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV1/MV2 Primary Low Voltage Summary: The Year 3 analysis identifies an additional 5.6 miles of MV-2 circuit with mainline low voltage violations. Other mainline low voltage violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV1/MV2 Service Transformer Summary: The Year 3 analysis identifies one (1) additional service transformer with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 3 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 5

MV1/MV2 Mainline Conductor Overload Summary: The Year 5 analysis identifies approximately 0.4 miles of MV-2 mainline conductor overloads. TDPUD is required to reconductor approximately 0.4 miles of MV-2 mainline conductor to resolve the violations. The mainline conductor overload violations can be mitigated if the MV1/MV2 configuration is not utilized.

MV1/MV2 Protective Device Equipment Summary: The Year 5 analysis identifies an additional fifteen (15) disconnect switches on the MV-2 circuit with overload violations. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV1/MV2 Primary Low Voltage Summary: The Year 5 analysis identifies an additional 1.1 miles of MV-2 circuit with mainline low voltage violations. Other mainline low voltage violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV1/MV2 Service Transformer Summary: The Year 5 analysis identifies no additional service transformers with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 5 analysis is identified in the base case and Year 3 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

d) Other Contingency Scenarios

The **MV-1 to MV-3** contingency scenario is not recommended to be utilized during peak loading conditions due to the quantity and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize the configuration scenarios.

MV-2 CIRCUIT

a) MV-5 Circuit Study Results

MV-2 serves approximately 3.6 MW of load. Under normal operating conditions, phase imbalance, protective device and service transformer overloads violations are observed. These violations are present in the base case and persist through the one-, three-, and five-year forecasts.

MV-2 has one (1) tie to MV-1. Under MV-2 contingency scenarios, multiple types of violations are observed in the base case, as well as in the one-, three-, and five-year study scenarios.

Table 5-4-3 summarizes the years in which significant violations occur under MV-2 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-4-3: Feeder: MV-2

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
MV2 Normal	No issues	5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues
MV2 to MV1	5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1Y	No issues

b) MV-2 Circuit Normal Operation

Under normal operation, MV-2 experiences protective device equipment overload, phase imbalance and service transformer overload violations in all planning year horizons; as well as mainline primary low voltage violations in the Year 5 planning horizon.

BASE CASE

MV2 Protective Device Equipment Summary: The base case analysis identifies four (4) cutout switches and two (2) disconnect switches on the MV-2 circuit with overload violations. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV2 Phase imbalance Summary: The base case identifies a 20% phase imbalance on the MV-2 circuit. The phase imbalance improves slightly over the planning horizons. TDPUD will re-evaluate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

MV2 Service Transformer Summary: The base case analysis identifies one (1) service transformer on MV-2 with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 1

MV2 Protective Device Equipment Summary: The Year 1 analysis identifies an additional two (2) disconnect switches on the MV-2 circuit with overload violations. Other protective device equipment overload violations present in the Year 1 analysis is identified

in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV2 Phase imbalance Summary: The Year 1 analysis identifies a reduction to 17% phase imbalance on the MV-2 circuit. The phase imbalance improves slightly over the planning horizons. TDPUD will re-evaluate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

MV2 Service Transformer Summary: The Year 1 analysis identifies no additional service transformers with an overload greater than 150% of the rated value. Other service transformer overloads present in the Year 1 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 3

MV2 Protective Device Equipment Summary: The Year 3 analysis identifies an additional one (1) cutout switch and one (1) disconnect switch on the MV-2 circuit with overload violations. Other protective device equipment overload violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV2 Phase imbalance Summary: The Year 3 analysis identifies no change in the 17% phase imbalance on the MV-2 circuit. The phase imbalance improves slightly over the planning horizons. TDPUD will re-evaluate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

MV2 Service Transformer Summary: The Year 3 analysis identifies an additional one (1) service transformer on the MV-2 circuit with an overload greater than 150% of the rated value. Other service transformer overloads present in the Year 3 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 5

MV2 Protective Device Equipment Summary: The Year 5 analysis identifies an additional fifteen (1) disconnect switches on the MV-2 circuit with overload violations. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV2 Primary Low Voltage Summary: Year 5 analysis identifies approximately 1.1 miles of MV-2 mainline primary low voltage violations. TDPUD will re-evaluate the mainline primary low voltage violations after higher priority projects are executed and mitigate if low voltage violations persist.

MV2 Phase imbalance Summary: The Year 5 analysis identifies no change in the 17% phase imbalance on the MV-2 circuit. The phase imbalance improves slightly over the

planning horizons. TDPUD will re-evaluate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases to reduce the imbalance.

MV2 Service Transformer Summary: The Year 5 analysis identifies no additional service transformers with an overload greater than 150% of the rated value. Other service transformer overloads present in the Year 5 analysis is identified in the base case and Year 3 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

c) MV-2 to MV-1 Contingency Scenario

The MV-2 to MV-1 contingency scenario experiences mainline conductor overload violations in the Year 5 planning horizon; protective device equipment overload, mainline primary low voltage, and service transformer overload violations in all planning horizon; and phase imbalance violations in the base case and Year 1 planning horizons.

BASE CASE

MV2/MV1 Protective Device Equipment Summary: The base case analysis identifies four (4) cutout switches and one (1) disconnect switch for MV-2; and two (2) disconnect switches for MV-1 with overload violations. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV2/MV1 Primary Low Voltage Summary: The base case identifies approximately 1.3 miles of MV-2 circuit with mainline low voltage violations. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV2/MV1 Phase imbalance Summary: The base case analysis identifies a 16% phase imbalance for MV-1 circuit under the MV2/MV1 configuration. The load imbalance improves over time; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

MV2/MV1 Service Transformer Summary: The base case analysis identifies one (1) service transformer for MV-2 with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 1

MV2/MV1 Protective Device Equipment Summary: The Year 1 analysis identifies an additional two (2) disconnect switches for MV-2 with overload violations. Other protective device equipment overload violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV2/MV1 Primary Low Voltage Summary: The Year 1 analysis identifies an additional 0.1 miles of MV-2 circuit with mainline low voltage violations. Other mainline primary low voltage violations present in the Year 1 analysis is identified in the base case.

TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV2/MV1 Phase imbalance Summary: The Year 1 analysis identifies a 14% phase imbalance for MV-1 circuit under the MV2/MV1 configuration. The load imbalance improves over time; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

MV2/MV1 Service Transformer Summary: The Year 1 analysis identifies no additional service transformers with an overload greater than 150% of the rated value. Other service transformer violations present in the Year 1 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 3

MV2/MV1 Protective Device Equipment Summary: The Year 3 analysis identifies an additional one (1) cutout switch and one (1) disconnect switch for MV-2; and one (1) cutout switch and one (1) recloser for MV-1 with overload violations. Other protective device equipment overload violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV2/MV1 Primary Low Voltage Summary: The Year 3 analysis identifies an additional 5.6 miles of MV-2 circuit with mainline low voltage violations. Other mainline primary low voltage violations present in the Year 3 analysis is identified in the base case and Year 1. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV2/MV1 Service Transformer Summary: The Year 3 analysis identifies an additional one (1) service transformers for MV-2 with an overload greater than 150% of the rated value. Other service transformer violations present in the Year 3 analysis is identified in the base case. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 5

MV2/MV1 Mainline Conductor Overload Summary: The Year 5 analysis identifies approximately 0.4 miles of MV-1 underground conductor with overload violations in the Year 5 analysis. TDPUD is required to reconductor approximately 0.4 miles of MV-1 mainline conductor to resolve the violations. The mainline conductor overload violations can be mitigated if the MV2/MV1 configuration is not utilized.

MV2/MV1 Protective Device Equipment Summary: The Year 5 analysis identifies an additional fifteen (15) disconnect switches for MV-2 with overload violations. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 5 analysis. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV2/MV1 Primary Low Voltage Summary: The Year 5 analysis identifies an additional 1.0 miles of MV-2 circuit with mainline low voltage violations. Other mainline

primary low voltage violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV2/MV1 Service Transformer Summary: The Year 5 analysis identifies no additional service transformers with an overload greater than 150% of the rated value. Other service transformer violations present in the Year 3 analysis is identified in the base case and Year 3 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV-3 CIRCUIT

a) MV-3 Circuit Capacity Study Results

MV-3 is serving approximately 3.4 MW of load. Under normal operating conditions, protective device overloads and primary low-voltage violations are observed in the base case and multiple violations are identified in the 1-year, 3-year, and 5-year study scenarios.

MV-3 has one (1) tie to MV-1, MV-4, DL-1, TR-2, TR-3 and TR-4. Under MV-3 contingency scenarios, the primary switching option is from MV-3 to TR-2, as it results in fewer violations than the alternative options.

Table 5-4-4 summarizes the years in which significant violations occur under MV-3 normal and contingency scenarios. The quantity of violations is available in Appendix C.

Table 5-4-4: Feeder: MV-3

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
MV3 Normal	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues	1/3/5Y
MV3 to MV1	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues	1/3/5Y
MV3 to DL1	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	BC	BC/1/3/5Y
MV3 to TR2	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues	1/3/5Y
MV3 to TR3	1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues	1/3/5Y
MV3 to TR4	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	No issues	BC/1/3/5Y
MV3 to MV4	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	1/3/5Y	No issues	BC/1/3/5Y

b) MV-3 Circuit Normal Operation

Under normal operation, MV-3 experiences mainline conductor overload, service transformer overload and secondary low voltage violations in Year 1 through Year 5 planning horizons; as well as protective device equipment and mainline primary low voltage violations in all planning horizons.

BASE CASE

MV3 Protective Device Equipment Summary: The base case analysis identifies four (4) cutout switches on the MV-3 circuit with overload violations. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3 Primary Low Voltage Summary: The base case analysis identifies approximately 2.4 miles of MV-3 circuit with mainline primary low voltage violations. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 1

MV3 Mainline Conductor Overload Summary: The Year 1 analysis identifies approximately 0.1 mile of mainline conductor overload for MV-3. TDPUD is required to reconductor approximately 0.1 miles of MV-3 mainline conductor to resolve the violations.

MV3 Protective Device Equipment Summary: The Year 1 analysis identifies an additional one (1) cutout switch and fourteen (14) disconnect switches on the MV-3 circuit with overload violations. Other protective device equipment overload violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3 Primary Low Voltage Summary: The Year 1 analysis identifies an additional 3.5 miles of MV-3 circuit with mainline primary low voltage violations. Other mainline primary low voltage violations present in the Year 1 analysis is identified in the base case. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3 Service Transformer Summary: The Year 1 analysis identifies one (1) service transformers for MV-3 with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 502 service points for MV-3 in the Year 1 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

YEAR 3

MV3 Mainline Conductor Overload Summary: The Year 3 analysis identifies an additional 0.4 miles of mainline conductor overload for MV-3. Other mainline conductor overload violations present in the Year 3 analysis is identified in the Year 1 analysis. TDPUD is required to reconductor approximately 0.4 miles of MV-3 mainline conductor to resolve the violations.

MV3 Protective Device Equipment Summary: The Year 3 analysis identifies no additional protective device equipment on the MV-3 circuit with overload violations. Other protective device equipment overload violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3 Primary Low Voltage Summary: The Year 3 analysis identifies an additional 0.4 miles of MV-3 circuit with mainline primary low voltage violations. Other mainline primary low voltage violations present in the Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3 Service Transformer Summary: The Year 3 analysis identifies no additional service transformers with an overload greater than 150% of the rated value. Other service transformer violations present in the Year 3 analysis is identified in the Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 540 service points for MV-3 in the Year 3 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

YEAR 5

MV3 Mainline Conductor Overload Summary: The Year 5 analysis does not identify additional mainline conductor overload for MV-3. Other mainline conductor overload violations present in the Year 5 analysis is identified in the Year 1 and Year 3 analysis.

MV3 Protective Device Equipment Summary: The Year 5 analysis identifies no additional protective device equipment on the MV-3 circuit with overload violations. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3 Primary Low Voltage Summary: The Year 5 analysis identifies an additional 0.4 miles of MV-3 circuit with mainline primary low voltage violations. Other mainline primary low voltage violations present in the Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3 Service Transformer Summary: The Year 5 analysis identifies an additional one (1) service transformers for MV-3 with an overload greater than 150% of the rated value. Other service transformer violations present in the Year 5 analysis is identified in the Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV3 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 565 service points for MV-3 in the Year 5 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

c) MV-3 to TR-2 Contingency Scenario

The **MV-3 to TR-2** contingency scenario results in mainline conductor overload, service transformer overload and secondary low voltage violations in Year 1 through Year 5

planning horizons; as well as mainline primary low voltage and protective device equipment overload violations in all planning horizons.

BASE CASE

MV3/TR2 Protective Device Equipment Summary: The base case analysis identifies four (4) cutout switches for MV-3; and three (3) disconnect switches for TR-2 with overload violations. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3/TR2 Primary Low Voltage Summary: The base case identifies approximately 2.3 miles of MV-3 circuit with mainline low voltage violations. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

YEAR 1

MV3/TR2 Mainline Conductor Overload Summary: The Year 1 analysis identifies approximately 0.1 miles of MV-3 circuit with mainline conductor overload violations. TDPUD will reconduct approximately 0.1 miles of conductor to resolve the violations. The mainline conductor overload violations can be mitigated if the MV3/TR2 configuration is not utilized.

MV3/TR2 Protective Device Equipment Summary: The Year 1 analysis identifies an additional one (1) cutout switch and thirteen (13) disconnect switches for MV-3; and one (1) disconnect switch and one (1) recloser for TR-2 with overload violations. Other protective device equipment overload violations present in the Year 1 analysis is identified in the base case analysis. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3/TR2 Primary Low Voltage Summary: The Year 1 analysis identifies an additional 3.6 miles of MV-3 circuit with mainline low voltage violations. Other mainline primary low voltage violations present in Year 1 analysis is identified in the base case. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3/TR2 Service Transformer Summary: The Year 1 analysis identifies one (1) service transformer on MV-3 with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV3/TR2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 503 service points for MV-3 in the Year 1 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

YEAR 3

MV3/TR2 Mainline Conductor Overload Summary: The Year 3 analysis identifies an additional 0.4 miles of MV-3 circuit and 0.1 miles of TR-2 circuit with mainline conductor overload violations. Other mainline conductor overload violations present in the Year 3 analysis is identified in the Year 1 analysis. TDPUD will reconduct approximately 0.4 miles of MV-3 circuit and 0.1 miles of TR-2 circuit to resolve the violations. The mainline

conductor overload violations can be mitigated if the MV3/TR2 configuration is not utilized.

MV3/TR2 Protective Device Equipment Summary: The Year 3 analysis identifies no additional protective device equipment with overload violations. Other protective device equipment overload violations present in the Year 3 analysis is identified in the base case and Year 1 analyses. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3/TR2 Primary Low Voltage Summary: The Year 3 analysis identifies an additional 0.3 miles of MV-3 circuit with mainline low voltage violations. Other mainline primary low voltage violations present in Year 3 analysis is identified in the base case and Year 1 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3/TR2 Service Transformer Summary: The Year 3 analysis identifies no additional service transformer with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 3 analysis is identified in the Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV3/TR2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 528 service points for MV-3 in the Year 3 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

YEAR 5

MV3/TR2 Mainline Conductor Overload Summary: The Year 5 analysis does not identify additional mainline conductor overload violations. Other mainline conductor overload violations present in the Year 5 analysis is identified in the Year 1 and Year 3 analysis. The mainline conductor overload violations can be mitigated if the MV3/TR2 configuration is not utilized.

MV3/TR2 Protective Device Equipment Summary: The Year 5 analysis identifies no additional protective device equipment with overload violations. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case and Year 1 analysis. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3/TR2 Primary Low Voltage Summary: The Year 5 analysis identifies an additional 0.1 miles of MV-3 circuit with mainline low voltage violations. Other mainline primary low voltage violations present in Year 5 analysis is identified in the base case, Year 1 and Year 3 analyses. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3/TR2 Service Transformer Summary: The Year 5 analysis identifies an additional one (1) service transformer on MV-3 with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 5 analysis is identified in the Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement

program to install appropriately sized protective device equipment prior to the identified violations.

MV3/TR2 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 545 service points for MV-3 in the Year 5 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

d) MV-3 to DL-1 Contingency Scenario

The MV-3 to DL-1 contingency scenario is not one of the recommended switching scenarios based on the feeder violations presented in the study analysis. However, due to the constraints of Truckee Substation capacity beyond the base case analysis and Donner Lake having available capacity. This contingency scenario has proposed projects summarized to understand the full system constraints. Mainline conductor overload and service transformer overload violations are present in Year 1 through Year 5; as well as protective device equipment overloads, mainline primary low voltage and secondary low voltage violations are present in all planning year horizons. Additionally, there is phase imbalance in the base case planning horizon.

BASE CASE

MV3/DL1 Protective Device Equipment Summary: The base case analysis identifies four (4) cutout switches for MV-3; and nine (9) disconnect switches for DL-1 with overload violations. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3/DL1 Primary Low Voltage Summary: The base case analysis identifies approximately 10.6 miles of MV-3 circuit and 1.4 miles of DL-1 circuit with mainline low voltage violations. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3/DL1 Phase imbalance Summary: The base case analysis identifies a 14% phase imbalance for DL-1 circuit under the MV3/DL1 configuration. The load imbalance improves over time and is not present beyond the base case; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

MV3/DL1 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 592 service points for MV-3 and 40 service points for DL-1 in the base case analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

YEAR 1

MV3/DL1 Mainline Conductor Overload Summary: The Year 1 analysis identifies approximately 0.1 miles of MV-3 circuit and 0.5 miles of DL-1 circuit with mainline conductor overload violations. TDPUD is required to reconductor approximately 0.1 miles of MV-3 circuit and 0.5 miles of DL-1 circuit to resolve the violations. The mainline conductor overload violations can be mitigated if the MV3/DL1 configuration is not utilized.

MV3/DL1 Protective Device Equipment Summary: The Year 1 analysis identifies an additional one (1) cutout switch and one (1) disconnect switch for MV-3; and one (1) disconnect switch and one (1) recloser for DL-1 with overload violations. Other protective device equipment overload violations present in the Year 1 analysis is identified in the Base Case. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3/DL1 Primary Low Voltage Summary: The Year 1 analysis identifies an additional 2.6 miles of DL-1 circuit with mainline low voltage violations. Other mainline primary low voltage violations present in Year 1 analysis is identified in the base case analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3/DL1 Service Transformer Summary: The Year 1 analysis identifies one (1) service transformer for MV-3 with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV3/DL1 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 816 service points for MV-3 and 209 service points for DL-1 in the Year 1 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

YEAR 3

MV3/DL1 Mainline Conductor Overload Summary: The Year 3 analysis identifies no additional mainline conductor overload violations. Other mainline conductor overload violations present in the Year 3 analysis is identified in the Year 1 analysis. The mainline conductor overload violations can be mitigated if the MV3/DL1 configuration is not utilized.

MV3/DL1 Protective Device Equipment Summary: The Year 1 analysis identifies an additional one (1) disconnect switch for MV-3 with an overload violation. Other protective device equipment overload violations present in the Year 3 analysis is identified in the base case and Year 1 analyses. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3/DL1 Primary Low Voltage Summary: The Year 3 analysis identifies an additional 0.1 miles of DL-1 circuit with mainline low voltage violations. Other mainline primary low voltage violations present in Year 3 analysis is identified in the base case and Year 1 analyses. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3/DL1 Service Transformer Summary: The Year 3 analysis identifies no additional service transformers with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 3 analysis is identified in the Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV3/DL1 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 825 service points for MV-3 and 311 service points for DL-1 in the Year 1

analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

YEAR 5

MV3/DL1 Mainline Conductor Overload Summary: The Year 5 analysis identifies no additional mainline conductor overload violations. Other mainline conductor overload violations present in the Year 5 analysis is identified in the Year 1 analysis. The mainline conductor overload violations can be mitigated if the MV3/DL1 configuration is not utilized.

MV3/DL1 Protective Device Equipment Summary: The Year 5 analysis identifies an additional one (1) recloser for MV-3 with an overload violation. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case , Year 1 and Year 3 analyses. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV3/DL1 Primary Low Voltage Summary: The Year 5 analysis identifies no additional mainline low voltage violations. Other mainline primary low voltage violations present in Year 5 analysis is identified in the base case, Year 1 and Year 3 analyses. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV3/DL1 Service Transformer Summary: The Year 5 analysis identifies an additional one (1) service transformer with an overload greater than 150% of the rated value. Other service transformer overload violations present in the Year 5 analysis is identified in the Year 1 analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

MV3/DL1 Secondary Low Voltage Summary: Secondary low voltage violations are identified on 825 service points for MV-3 and 365 service points for DL-1 in the Year 1 analysis. Secondary low voltage will be re-evaluated after higher priority projects are executed and mitigate if violations persist.

e) Other Contingency Scenarios

The **MV-3 to MV-1, MV-4, TR-3** and **TR-4** contingency scenario are not recommended to be utilized during peak loading conditions due to number and severity of violations present during study years. Further evaluation is recommended to assess the feasibility; system impacts and mitigation projects required to utilize the configuration scenarios.

MV-4 CIRCUIT

a) MV-5 Circuit Study Results

In the base case, MV-4 is serving approximately 4.1 MW of load. Under normal operating conditions, no violations are identified within the first three years.

MV-4 has one (1) tie to TR-1. When picking up MV-4 loads, multiple violations occur under base case.

Table 5-4-5 summarizes the years in which significant violations occur under normal and contingency scenarios for MV-4. The quantity of violations is available in Appendix C.

Table 5-4-5: Feeder: MV-4

Scenarios	Primary Conductor Overload	Primary Low Voltage	Protective Device Overload	Service Transformer Overload	Phase Imbalance	Secondary Low Voltage
MV4 Normal	No issues	No issues	3/5Y	No issues	No issues	No issues
MV4 to TR1	No issues	BC/1/3/5Y	BC/1/3/5Y	BC/1/3/5Y	BC/1Y	No issues

b) MV-4 Normal Operation

Under normal operation, MV-4 experiences protective device equipment overload violations in Year 3 and Year 5 planning horizons.

YEAR 3

MV4 Protective Device Equipment Summary: The Year 3 analysis identifies one (1) cutout switch for MV-4 with an overload violation. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

YEAR 5

MV4 Protective Device Equipment Summary: The Year 5 analysis identifies no additional protective device equipment with an overload violation. Other protective device equipment overload violations present in the Year 5 analysis is identified in the Year 3 analysis. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

c) MV-4 to TR-1 Contingency Scenario

The **MV-4 to TR-1** contingency scenario results in protective device equipment overload, mainline primary low voltage and service transformer violations in all planning year horizons; and phase imbalance violations in the base case and Year 1 planning horizons.

BASE CASE

MV4/TR1 Protective Device Equipment Summary: The base case analysis identifies three (3) cutout switches and nine (9) disconnect switches for TR-1 with an overload violation. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV4/TR1 Primary Low Voltage Summary: The base case analysis identifies approximately 5.7 miles of TR-1 circuit with mainline primary low voltage violations. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV4/TR1 Phase imbalance Summary: The base case analysis identifies a 13% phase imbalance for TR-1 circuit under the MV3/TR1 configuration. The load imbalance improves over time and is not present beyond the Year 1 analysis; phase imbalance will

be monitored and mitigation determined in the future. No mitigation recommended at this time.

MV4/TR1 Service Transformer Summary: The base case analysis identifies two (2) service transformers with an overload greater than 150% of the rated value. No additional service transformers with overloads greater than 150% of the rated value are present beyond the base case analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 1

MV4/TR1 Protective Device Equipment Summary: The Year 1 analysis identifies no additional protective device equipment with an overload violation. Other protective device equipment overload violations present in the Year 1 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV4/TR1 Primary Low Voltage Summary: The Year 1 analysis identifies a reduction to 1.4 miles of TR-1 circuit with mainline primary low voltage violations, of the violations are not addressed from the base case. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV4/TR1 Phase imbalance Summary: The Year 1 analysis identifies a reduction to 12% phase imbalance for TR-1 circuit under the MV3/TR1 configuration. The load imbalance improves over time and is not present beyond the Year 1 analysis; phase imbalance will be monitored and mitigation determined in the future. No mitigation recommended at this time.

MV4/TR1 Service Transformer Summary: The Year 1 analysis does not identify additional service transformers with overloads greater than 150% of the rated value. Service transformer overloads greater than 150% of the rated value are identified in the base case analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 3

MV4/TR1 Protective Device Equipment Summary: The Year 3 analysis identifies an additional cutout switch for MV-4 with an overload violation. Other protective device equipment overload violations present in the Year 3 analysis is identified in the base case. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV4/TR1 Primary Low Voltage Summary: The Year 3 analysis identifies an additional 6.6 miles of MV-4 circuit and 12.0 miles of TR-1 circuit with mainline primary low voltage violations. Other mainline primary low voltage violations present in Year 3 analysis is identified in the base case, and Year 1 analyses. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV4/TR1 Service Transformer Summary: The Year 3 analysis does not identify additional service transformers with overloads greater than 150% of the rated value. Service transformer overloads greater than 150% of the rated value are identified in the Base Case analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

YEAR 5

MV4/TR1 Protective Device Equipment Summary: The Year 5 analysis identifies no additional protective device equipment with an overload violation. Other protective device equipment overload violations present in the Year 5 analysis is identified in the base case and Year 3 analyses. TDPUD will initiate an asset replacement program to install appropriately sized equipment prior to the identified violations.

MV4/TR1 Primary Low Voltage Summary: The Year 5 analysis identifies no additional mainline primary low voltage violations. Other mainline primary low voltage violations present in Year 5 analysis is identified in the base case, Year 1 and Year 3 analysis. TDPUD will re-evaluate mainline primary low voltage violations after higher priority projects are executed and mitigate low voltage if violations persist.

MV4/TR1 Service Transformer Summary: The Year 5 analysis does not identify additional service transformers with overloads greater than 150% of the rated value. Service transformer overloads greater than 150% of the rated value are identified in the base case analysis. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required. TDPUD will initiate an asset replacement program to install appropriately sized protective device equipment prior to the identified violations.

5.5 Proposed Projects

The violations were analyzed by circuit feeder and violation type to identify overlaps and eliminate redundancies related to both the violation and circuit location. Based on this assessment, projects were categorized into the following types: Mainline Conductor Overload Replacement, Protective Device Equipment Replacement, Primary Low Voltage Improvement, Phase Imbalance Improvement, Service Transformer Upgrade, and Secondary Low Voltage Improvement.

After removing redundancies, projects were defined according to the specific violation resolutions and associated circuit feeders. These projects were then organized into two tiers. Tier 1 projects include those for which costs will be identified and detailed scopes will be further developed as part of a future Capital Work Plan. Tier 2 projects will be evaluated separately following the implementation of Tier 1 projects and will not have costs developed at this stage.

Budgetary cost estimates for Tier 1 projects were established by applying unit cost assumptions to the respective project types and quantities after redundancy elimination.

Donner Lake Service Area

DL-1

a. DL-1 Tier 1 Projects

DL1 Mainline Conductor Overload Replacement Project

The DL-1 circuit has approximately 0.5 miles of mainline conductor overloaded due to Switching configuration MV3/DL1 that appears in Year 1 planning horizon and persists through Year 3 and Year 5. TDPUD will reconductor approximately 0.5 miles of mainline conductor.

Estimate Cost: $ 500,000

DL1 Protective Device Equipment Replacement Project

The DL-1 circuit has ten (10) disconnect switches and one (1) recloser that is identified as overloaded due to switching configuration MV3/DL1. Nine (9) of the ten (10) overloaded disconnect switches are identified in the base case study horizon, with the additional disconnect switch overload identified in the Year 1 study horizon. All ten (10) overloaded disconnect switches carry through Year 3 and Year 5 study horizons if not addressed. The overloaded recloser is identified in the Year 1 study horizon and carry over to Year 3 & Year 5 if not addressed. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment

Estimate Cost: $ 457,355

b. DL-1 Tier 2 Projects

DL1 Primary Low Voltage Improvement Project

The DL-1 circuit has 6.5 miles of mainline conductor with low voltage due to DL1/MV3 and MV3/DL1 switching configurations. The violations initially appear in the base case study horizon and persist through Year 1, Year 3 and Year 5 horizons if not addressed. DL-1 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan.

DL1 Phase Imbalance Improvement Project

Phase imbalance is identified on the DL-1 circuit due to DL1 Normal Operation, DL1/MV3 and MV3/DL1 switching configurations in the base case study horizon. Phase imbalance violations due to DL1/MV3 and MV3/DL1 switching configurations dematerialize after the Year 1 study horizon. Phase imbalance during DL-1 normal operation persists throughout the 5 year planning window. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

DL1 Service Transformer Upgrade Project

The DL-1 circuit has one (1) service transformer identified with an overload greater than 150% of the rated value, first occurring in the Year 1 study horizon and persisting through the Year 3 and Year 5 horizons if not addressed. The overload occurs in the DL1 Normal Operation (no sub fail), DL1/DL2, DL1/MV3, DL2/DL1 and MV3/DL1 switching configurations. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

DL1 Secondary Low Voltage Improvement Project

The DL1 circuit has clusters of secondary low voltage under DL1/DL2, DL1/MV3 and MV3/DL1 switching configurations. Secondary low voltage violations are identified at 637 service points in the base case and increase to 712 service points in the Year 1, Year 3 and Year 5 analysis.

DL-2

a. DL-2 Tier 1 Projects

The DL-1 circuit has no Tier 1 projects identified.

b. DL-2 Tier 2 Projects

DL2 Primary Low Voltage Improvement Project

The DL-2 circuit has 0.3 miles of mainline conductor with low voltage due to DL2/DL1 switching configuration. The violations is identified in the Year 5 horizon. DL-2 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations are completely mitigated if DL2/DL1 switching configuration is not utilized.

DL2 Phase Imbalance Improvement Project

Phase imbalance is identified on the DL-2 circuit due to DL2 Normal Operation configurations in all study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

DL-3

a. DL-3 Tier 1 Projects

DL3 Mainline Conductor Overload Replacement Project

The DL-3 circuit has approximately 1.5 miles of mainline conductor overloaded due to DL1 Normal Operation, DL3/TD3, TD1/DL3, and TD2/DL3 switching configurations. The mainline conductor overload appears in the base case study horizon and persists throughout the study horizons if not addressed. TDPUD will reconductor approximately 1.5 miles of mainline conductor to eliminate the violations. The reconductor length can be reduced to 0.8 miles and pushed to the Year 3 study horizon if TD2/DL3 switching configuration is not utilized

Estimate Cost: $ 1,500,000

DL3 Protective Device Equipment Replacement Project

The DL-3 circuit has seven (7) cutout switches, eight (8) disconnect switches and one (1) recloser that is identified as overloaded due to DL3 Normal Operation, DL3/TD3, TD1/DL3, and TD2/DL3 switching configurations. Four (4) of the seven (7) cutout switches are identified as overloaded in the base case study horizon, with two (2) additional identified in the Year 1 study horizon and the final one (1) identified in Year 3.

All eight (8) disconnect switches and one (1) recloser are identified as overloaded in all study horizons. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 604,755

b. DL-3 Tier 2 Projects

DL3 Primary Low Voltage Improvement Project

The DL-3 circuit has 25.9 miles of mainline conductor with low voltage due to DL3 Normal Operation, DL3/TD3, TD1/DL3, and TD2/DL3 switching configurations. The violations initially appear in the base case study horizon and persist through Year 1, Year 3 and Year 5 horizons if not addressed. DL-3 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be reduced down to 21.5 miles of mainline conductor if DL3/TD3, TD1/DL3, and TD2/DL3 switching configurations are not utilized.

DL3 Phase Imbalance Improvement Project

Phase imbalance is identified on the DL-3 circuit due to DL3 Normal Operation, TD1/DL3 and TD2/DL3 switching configurations in all study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

DL3 Service Transformer Upgrade Project

The DL-3 circuit has five (5) service transformers identified with an overload greater than 150% of the rated value, occurring in the DL1 Normal Operation, DL3/TD3, TD1/DL3 and TD2/DL3 switching configurations. Two (2) of the five (5) transformers are identified as overloaded in the base case study horizon, one (1) is identified in Year 1 and the final two (2) are identified in Year 3. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

DL3 Secondary Low Voltage Improvement Project

The DL3 circuit has clusters of secondary low voltage under DL3 Normal Operations, DL3/TD3, TD1/DL3 and TD2/DL3 switching configurations. Secondary low voltage violations are identified at 1,994 service points in the base case and increase to 1,999 service points in Year 1, 2,038 service points in Year 3, and 2,045 service points in Year 5 analysis.

Tahoe Donner Service Area

TD-1 CIRCUIT

a. TD-1 Tier 1 Projects

TD1 Protective Device Equipment Replacement Project

The TD-1 circuit has two (2) cutout switches and two (2) disconnect switches that are identified as overloaded due to TD1 Normal Operation, TD1/DL3, TD1/TD2 and

TD2/TD1 switching configurations. All overloaded cutout and disconnect switches are identified in the Base Case study horizon, and persist through Year 1, Year 3 and Year 5 study horizons if not addressed. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 117,920

b. TD-1 Tier 2 Projects

TD1 Primary Low Voltage Improvement Project

The TD-1 circuit has 4.9 miles of mainline conductor with low voltage due to TD1/DL3 switching configuration. The violations initially appear in the base case study horizon and persist through Year 1, Year 3 and Year 5 horizons if not addressed. TD-1 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan.

TD1 Phase Imbalance Improvement Project

Phase imbalance is identified on the TD-1 circuit due to TD1 Normal Operation, DL3/TD1, and TD2/TD1 switching configurations in the base case study horizon and persist throughout the 5-year planning window if not addressed. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TD1 Service Transformer Upgrade Project

The TD-1 circuit does not have service transformer identified with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required in the future. No projects or equipment upgrades identified in this study.

TD1 Secondary Low Voltage Improvement Project

The TD1 circuit has clusters of secondary low voltage under TD1 Normal Operations, TD1/TD2, TD1/DL3 and TD2/TD1 switching configurations. Secondary low voltage violations are identified at 458 service points in the base case, 392 service points in Year 1, 473 service points in Year 3, and 494 service points in Year 5 analysis.

TD-2 CIRCUIT

a. TD-2 Tier 1 Projects

TD2 Mainline Conductor Overload Replacement Project

The TD-2 circuit has approximately 0.4 miles of mainline conductor overloaded due to TD3/TD2 switching configuration. The mainline conductor overload appears in the base case study horizon and persists throughout the study horizons if not addressed. TDPUD will reconductor approximately 0.4 miles of mainline conductor to eliminate the violations. The reconductor length can be eliminated if TD2/DL3 switching configuration is not utilized

Estimate Cost: $ 400,000

TD2 Protective Device Equipment Replacement Project

The TD-2 circuit has seven (7) cutout switches, and three (3) disconnect switches that is identified as overloaded due to TD2 Normal Operation, TD2/TD1, TD2/DL3, TD1/TD2, and TD3/TD2 switching configurations. Two (2) of the three (3) cutout switches are identified as overloaded in the base case study horizon, with the one (1) additional identified in the Year 1 study horizon. Five (5) of the seven (7) disconnect switches are identified in the base case study horizon, one (1) additional in Year 3 and the final one (1) identified in Year 5. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 294,800

b. TD-2 Circuit Tier 2 Projects

TD2 Primary Low Voltage Improvement Project

The TD-2 circuit has 15.9 miles of mainline conductor with low voltage due to TD2/TD3 and TD3/TD2 switching configurations. The violations are identified in the base case horizon. TD-2 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be partially or completely mitigated if TD2/TD3 or TD3/TD2 switching configuration are not utilized.

TD2 Phase Imbalance Improvement Project

Phase imbalance is identified on the TD-2 circuit due to TD2 Normal Operation, TD1/TD2, TD3/TD2, and DL3/TD2 switching configurations in the base case study horizon and persists throughout the 5-year planning window if not addressed. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TD2 Service Transformer Upgrade Project

The TD-2 circuit does not have service transformer identified with an overload greater than 150% of the rated value. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required in the future. No projects or equipment upgrades identified in this study.

TD2 Secondary Low Voltage Improvement Project

The TD2 circuit has clusters of secondary low voltage under TD2 Normal Operations, TD2/TD1, TD2/DL3, TD1/TD2 and TD3/TD2 switching configurations. Secondary low voltage violations are identified at approximately 1,700 service points in all study horizons.

TD-3 CIRCUIT

a. TD-3 Tier 1 Projects

TD3 Mainline Conductor Overload Replacement Project

The TD-3 circuit has approximately 2.4 miles of mainline conductor overloaded due to DL3/TD3, TR5/TD3, TR4/TD3_1, and TR4/TD3_2 switching configurations. The

mainline conductor overload appears in the base case study horizon and persists throughout the study horizons if not addressed. TDPUD will reconductor approximately 2.4 miles of mainline conductor to eliminate the violations. Most of the overloaded conductor is driven by the DL3/TD3 (1.1 miles) and TR5/TD3 (1.29 miles) switching configurations, and the remaining overload is caused by TR4/TD3_1 and TR4/TD3_2. The reconductor length can be reduced if the switching configurations listed above are not utilized

Estimate Cost: $ 2,400,000

TD3 Protective Device Equipment Replacement Project

The TD-3 circuit has seven (7) cutout switches, thirteen (13) disconnect switches and one (1) recloser that is identified as overloaded due to TD3 Normal Operation, TD3/TD2, TD3/TR5, TR4/TD3_1, TR4/TD3_2, TR5/TD3 and DL3/TD3 switching configurations. Six (6) of the seven (7) cutout switches are identified as overloaded in the base case study horizon, with one (1) additional identified in the Year 3 study horizon. Twelve (12) of the thirteen (13) disconnect switches are identified as overloaded in the base case study horizon, with one (1) additional identified in the Year 5 study horizon. The one (1) recloser is identified as overloaded in all study horizons. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 752,155

b. TD-3 Circuit Tier 2 Projects

TD3 Primary Low Voltage Improvement Project

The TD-3 circuit has 19.1 miles of mainline conductor with low voltage due to TD3 Normal Operation, TD3/TD2, TD3/TR5, TR4/TD3_1, TR4/TD3_2, TR5/TD3 and DL3/TD3 switching configurations. The violations initially appear in the base case study horizon and persist through Year 1, Year 3 and Year 5 horizons if not addressed. TD-3 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be reduced if switching configurations are not utilized.

TD3 Phase Imbalance Improvement Project

Phase imbalance is identified on the TD-3 circuit due to TD3 Normal Operation, TR4/TD3_1, TR4/TD3_2, TR5/TD3 and DL3/TD3 switching configurations in all study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TD3 Service Transformer Upgrade Project

The TD-3 circuit has one (1) service transformers identified with an overload greater than 150% of the rated value, occurring in the TD3 Normal Operation, TD3/TD2, TD3/TR5, TR4/TD3_1, TR4/TD3_2, TR5/TD3 and DL3/TD3 switching configurations. The transformer is identified as overloaded in the Year 5 study horizon. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

TD3 Secondary Low Voltage Improvement Project

The TD3 circuit has clusters of secondary low voltage under TD3 Normal Operations, TD3/TD2, TD3/TR5, DL3/TD3, TR4/TD3_1, TR4/TD3_2 and TR5/TD3 switching configurations. Secondary low voltage violations are identified at approximately 1,686 service points in all study horizons.

Truckee Service Area

TR-1

a. TR-1 Tier 1 Projects

TR1 Protective Device Equipment Replacement Project

The TR-1 circuit has three (3) cutout switches, and nine (9) disconnect switches that are identified as overloaded due to TR1 Normal Operation, TR1/MV4, and MV4/TR1 switching configurations across all study horizons. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 353,760

b. TR-1 Tier 2 Projects

TR1 Primary Low Voltage Improvement Project

The TR-1 circuit has approximately 14.3 miles of mainline conductor with low voltage due to TR1/MV4 switching configuration. The violations initially appear in the base case (1.49 miles) study horizon, increases in Year 1 (1.36 miles), and again in Year 3 (11.47 miles). TR-1 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be eliminated if TR1/MV4 switching configurations is not utilized.

TR1 Phase Imbalance Improvement Project

Phase imbalance is identified on the TR-1 circuit due to TR1 Normal Operation, TR2/TR1 and MV4/TR1_switching configurations in all study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TR1 Service Transformer Upgrade Project

The TR-1 circuit has two (2) service transformers identified with an overload greater than 150% of the rated value, occurring in the TR1 Normal Operation, TR1/MV4, and MV4/TR1 switching configurations. The two (2) transformers are identified as overloaded in all study horizons. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

TR1 Secondary Low Voltage Improvement Project

The TR1 circuit has clusters of secondary low voltage under TR1 Normal Operations, TR1/MV4, and MV4/TR1 switching configurations. Secondary low voltage violations are identified at 203 service points in Year 1, 303 service points in Year 3 and 447 service points in Year 5.

TR-2 CIRCUIT

a. TR-2 Tier 1 Projects

TR2 Mainline Conductor Overload Replacement Project

The TR-2 circuit has approximately 0.3 miles of mainline conductor overloaded due to TR2/TR3, TR2/MV3, and MV3/TR2 switching configurations. The mainline conductor overload appears in the Year 3 study horizon and increases in the Year 5 study horizon. TDPUD will reconductor approximately 0.3 miles of mainline conductor to eliminate the violations. The reconductor length can be reduced or eliminated if the switching configurations listed above are not utilized

Estimate Cost: $ 300,000

TR2 Protective Device Equipment Replacement Project

The TR-2 circuit has one (1) cutout switches, five (5) disconnect switches, and one (1) recloser that are identified as overloaded due to TR2 Normal Operation, TR2/TR3, TR3/TR2, and MV3/TR2 switching configurations. The one (1) cutout switch and one (1) recloser are present across all study horizons. Three (3) of the five (5) disconnect switches appear in the base case study horizon, increases by one (1) in Year 1 and increases by one (1) in Year 5. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 339,435

b. TR-2 Tier 2 Projects

TR2 Primary Low Voltage Improvement Project

The TR-2 circuit has approximately 2.5 miles of mainline conductor with low voltage due to TR2/MV4 switching configuration. The violations initially appear in Year 3 (0.6 miles) study horizon and increase in Year 5 (1.9 miles). TR-2 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be eliminated if TR2/MV4 switching configurations is not utilized.

TR2 Phase Imbalance Improvement Project

Phase imbalance is identified on the TR-2 circuit due to TR2 Normal Operation, and TR3/TR2 switching configurations in all study horizons. The phase imbalance improves for Year 1, Year 3 and Year 5 under TR2 Normal Operation. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TR2 Secondary Low Voltage Improvement Project

The TR2 circuit has clusters of secondary low voltage under TR2 Normal Operations, and TR2/MV3 switching configurations. Secondary low voltage violations are identified at 94 service points in Year 5.

TR-3 CIRCUIT

a. TR-3 Tier 1 Projects

TR3 Mainline Conductor Overload Replacement Project

The TR-3 circuit has approximately 1.0 miles of mainline conductor overloaded due to TR3 Normal Operation, TR2/TR3, and TR4/TR3 switching configurations. The mainline conductor overload appears in the base case study horizon and increases in each subsequent study horizon. TDPUD will reconductor approximately 1.0 miles of mainline conductor to eliminate the violations. The reconductor length is mainly driven by TR4/TR3 switching configuration and can be reduced if the TR4/TR3 switching configuration is not utilized.

Estimate Cost: $ 1,000,000

TR3 Protective Device Equipment Replacement Project

The TR-3 circuit has three (3) cutout switches, sixteen (16) disconnect switches, and one (1) recloser that are identified as overloaded due to TR3 Normal Operation, TR3/TR2, TR3/MV3, and TR2/TR3 switching configurations. One (1) of three (3) cutout switches is identified in the base case study horizon, the additional two (2) appear in Year 1 and persist through the remaining study horizons. Fifteen (15) of the sixteen (16) disconnect switches appear in the base case study horizon, the additional disconnect switch overload identified in Year 5 study horizon. The single overloaded recloser is identified in Year 1 study horizon. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 722,675

b. TR-3 Tier 2 Projects

TR3 Primary Low Voltage Improvement Project

The TR-3 circuit has approximately 5.2 miles of mainline conductor with low voltage due to TR3/MV3 and TR4/TR3 switching configurations. The violations initially appear in the base case (1.6 miles) study horizon and increase in Year 1 (3.6 miles). TR-3 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be partially or completely eliminated if TR3/MV3 or TR4/TR3 switching configurations are not utilized.

TR3 Phase Imbalance Improvement Project

Phase imbalance is identified on the TR-3 circuit due to TR3 Normal Operation, TR2/TR3 and TR4/TR3 switching configurations in all study horizons. The phase imbalance appears in the base case study horizon due to TR2/TR3 switching configuration. Phase imbalance persists in Year 1, Year 3 and Year 5 under TR3 Normal Operation, TR4/TR3 and TR2/TR3 configurations. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TR3 Service Transformer Upgrade Project

The TR-3 circuit has two (2) service transformers identified with an overload greater than 150% of the rated value, occurring in the TR3 Normal Operation, TR3/TR2, TR3/MV3, TR2/TR3, and TR4/TR3 switching configurations. The two (2) transformers are identified as overloaded in all study horizons. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

TR3 Secondary Low Voltage Improvement Project

The TR3 circuit has clusters of secondary low voltage under TR3 Normal Operations, TR3/MV3, TR3/TR2, TR4/TR3 and TR2/TR3 switching configurations. Secondary low voltage violations are identified at 54service points in the base case , 74 service points in Year 1, 80 service points in Year 3 and 117 service points in Year 5.

TR-4 CIRCUIT

a. TR-4 Circuit Tier 1 Projects

TR4 Mainline Conductor Overload Replacement Project

The TR-4 circuit has approximately 12 feet (2 spans) of mainline conductor overloaded due to TR4/TD3_1 switching configuration. The mainline conductor overload appears in all study horizons. TDPUD will evaluate how to effectively and efficiently address the 12 feet of mainline conductor to eliminate the violations. The overload can be eliminated if the TR4/TD3_1 switching configuration is not utilized.

Estimate Cost: $ 2,273

TR4 Protective Device Equipment Replacement Project

The TR-4 circuit has three (3) cutout switches, and twelve (12) disconnect switches that are identified as overloaded due to TR4 Normal Operation, TR4/TR3, TR4/TD3_1 and TR4/TD3_2 switching configurations. Two (2) of three (3) cutout switches are identified in the base case study horizon, an additional one (1) appears in Year 1 and the final one (1) is identified in Year 5. All twelve (12) disconnect switches appear in Year 1, Year 3 and Year 5 study horizons. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 442,200

b. TR-4 Circuit Tier 2 Projects

TR4 Primary Low Voltage Improvement Project

The TR-4 circuit has approximately 12.7 miles of mainline conductor with low voltage due to TR4/TR3, TR4/TD3_1 and TR4/TD3_2 switching configurations. The violations initially appear in the base case (11.4 miles) study horizon and increase in Year 1 (1.3 miles). TR-4 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be eliminated if the switching configurations listed in this section are not utilized.

TR4 Phase Imbalance Improvement Project

Phase imbalance is identified on the TR-4 circuit due to TR3 Normal Operation, and TR3/TR4 switching configurations in Year 1, Year 3 and Year 5 study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TR4 Service Transformer Upgrade Project

The TR-4 circuit has one (1) service transformer identified with an overload greater than 150% of the rated value, occurring in the TR4 Normal Operation, TR4/TR3, TR4/TD3_1 and TR4/TD3_2 switching configurations. The transformer is identified as overloaded in all study horizons. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

TR4 Secondary Low Voltage Improvement Project

The TR4 circuit has clusters of secondary low voltage under TR4 Normal Operations, TR4/TD3_1, TR4/TD3_2, and TR4/TR3 switching configurations. Secondary low voltage violations are identified at 162 service points in the base case , 420 service points in Year 1, 504 service points in Year 3 and 734 service points in Year 5.

TR-5 CIRCUIT

a. TR-5 Circuit Tier 1 Projects

TR5 Mainline Conductor Overload Replacement Project

The TR-5 circuit has approximately 0.8 miles of mainline conductor overloaded due to TR5/TD3, TR6/TR5_1, TR6/TR5_3 and TD3/TR5 switching configurations. The mainline conductor overload appears in the base case study horizon due to TD3/TR5 (0.1 miles) and increases Year 3 study horizon due to TR6/TR5_1 and TR6/TR5_3 (0.7 miles). TDPUD will reconductor approximately 0.8 miles of mainline conductor to eliminate the violations. The reconductor length can be reduced or eliminated if the switching configuration listed in this section is not utilized.

Estimate Cost: $ 800,000

TR5 Protective Device Equipment Replacement Project

The TR-5 circuit has four (4) cutout switches, ten (10) disconnect switches, and one (1) recloser that are identified as overloaded due to TR5 Normal Operation, TR5/TD3, TR5/TR6_1, TR5/TR6_3, TR6/TR5_1, TR6/TR5_3 and TD3/TR5 switching configurations. All protective equipment listed in this section is overloaded in all study horizons. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 575,275

b. TR-5 Tier 2 Projects

TR5 Primary Low Voltage Improvement Project

The TR-5 circuit has approximately 41.9 miles of mainline conductor with low voltage due to TR5 Normal Operation, TR5/TD3, TR5/TR6_1, TR5/TR6_3, TR6/TR5_1, TR6/TR5_3 and TD3/TR5 switching configurations. The violations appear in the base case study horizon. TR-5 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be mitigated if the switching configurations listed in this section are not utilized. Most of the low voltage is being driven by TR5/TD3 and TD3/TR5 switching configurations.

TR5 Phase Imbalance Improvement Project

Phase imbalance is identified on the TR-5 circuit due to TR5 Normal Operation, TR5/TD3, TR6/TR5_1, TR6/TR5_3 and TD3/TR5 switching configurations in all study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TR5 Service Transformer Upgrade Project

The TR-5 circuit has two (2) service transformers identified with an overload greater than 150% of the rated value, occurring in the TR5 Normal Operation, TR5/TD3, TR6/TR5_1, TR6/TR5_3 and TD3/TR5 switching configurations. The service transformer overloads are identified in Year 3 and Year 5 study horizons. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

TR5 Secondary Low Voltage Improvement Project

The TR5 circuit has clusters of secondary low voltage under TR5 Normal Operations, TR5/TD3, TR5/TR6_1, TR5/TR6_3, TR6/TR5_1, TR6/TR5_3 and TD3/TR5 switching configurations. Secondary low voltage violations are identified at 1,652 service points in the Base Case, 1,666 service points in Year 1, 1,669 service points in Year 3 and 1,671 service points in Year 5.

TR-6 CIRCUIT

a. TR-6 Circuit Tier 1 Projects

TR6 Mainline Conductor Overload Replacement Project

The TR-6 circuit has approximately 0.2 miles of mainline conductor overloaded due to TR6 Normal Operation, TR6TR5_1, TR6/TR5_3, TR5/TR6_1 and TR5/TR6_3 switching configurations. The mainline conductor overload appears in Year 3 and Year 5 study horizons. TDPUD will reconductor approximately 0.2 miles of mainline conductor to eliminate the violations. The reconductor length can be reduced 0.1 miles if the switching configurations TR6TR5_1, TR6/TR5_3, TR5/TR6_1 and TR5/TR6_3 are not utilized.

Estimate Cost: $ 200,000

TR6 Protective Device Equipment Replacement Project

The TR-6 circuit has two (2) cutout switches, twenty-one (21) disconnect switches, and one (1) recloser that are identified as overloaded due to TR6 Normal Operation, TR6/TR5_1, TR6/TR5_3, TR5/TR6_1 and TR5/TR6_3 switching configurations. One (1) of two (2) cutout switches is identified in Year 1 study horizon, the second is identified in Year 3 study horizon. Fourteen (14) of twenty-one (21) disconnect switches are identified in the base case study horizon, two (2) in Year 3, and the remaining five (5) disconnect switches identified in Year 5. The one (1) recloser is identified in Year 1 study horizon. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 840,595

b. TR-6 Tier 2 Projects

TR6 Primary Low Voltage Improvement Project

The TR-6 circuit has approximately 11.4 miles of mainline conductor with low voltage due to TR6/TR5_1, and TR6/TR5_3 switching configurations. The violations appear in Year 1 (2.1 miles) study horizon and increase in Year 3 (3.0 miles) and Year 5 (6.3 miles) study horizons. TR-6 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be mitigated if the switching configurations listed in this section are not utilized.

TR6 Phase Imbalance Improvement Project

Phase imbalance is identified on the TR-6 circuit due to TR6 Normal Operation, TR5/TR6_1, and TR5/TR6_3 switching configurations in the base case study horizon. The phase imbalance is resolved in Year 1, Year 3 and Year 5 study horizons for the switching configurations listed in this section. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

TR6 Secondary Low Voltage Improvement Project

The TR6 circuit has clusters of secondary low voltage under TR6 Normal Operations, TR6/TR5_1, TR6/TR5_3, TR5/TR6_1, and TR5/TR6_3 switching configurations. Secondary low voltage violations are identified at 254 service points in Year 1 and Year 5.

Martis Valley Service Area

MV-1 CIRCUIT

a. MV-1 Tier 1 Projects

MV1 Mainline Conductor Overload Replacement Project

The MV-1 circuit has approximately 0.4 miles of mainline conductor overloaded due to MV2/MV1 switching configuration. The mainline conductor overload appears in Year

5 study horizon. TDPUD will reconductor approximately 0.4 miles of mainline conductor to eliminate the violations. The reconductor can be eliminated if the switching configurations MV2/MV1 is not utilized.

Estimate Cost: $ 400,000

MV1 Circuit Protective Device Equipment Replacement Project

The MV-1 circuit has one (1) cutout switch, two (2) disconnect switches, and one (1) recloser that are identified as overloaded due to MV1 Normal Operation, MV1/MV2 and MV2/MV1 switching configurations. The one (1) cutout switch is identified in Year 1 study horizon. The two (2) disconnect switches are identified in the base case study horizon. The one (1) recloser is identified in Year 3 study horizon. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 250,995

b. MV-1 Circuit Tier 2 Projects

MV1 Phase Imbalance Improvement Project

Phase imbalance is identified on the MV-1 circuit due to MV-1 Normal Operation, and MV2/MV1 switching configurations in the base case and Year 1 study horizons. The phase imbalance is resolved in Year 3 and Year 5 study horizons for the switching configurations listed in this section. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

MV1 Secondary Low Voltage Improvement Project

The MV1 circuit has clusters of secondary low voltage under MV1 Normal Operations, MV1/MV2, and MV2/MV1 switching configurations. Secondary low voltage violations are identified at 14 service points in the base case , 16 service points in Year 1, 41 service points in Year 3 and 33 service points in Year 5.

MV-2 CIRCUIT

a. MV-2 Tier 1 Projects

MV2 Mainline Conductor Overload Replacement Project

The MV-2 circuit has approximately 0.4 miles of mainline conductor overloaded due to MV1/MV2 switching configuration. The mainline conductor overload appears in Year 5 study horizon. TDPUD will reconductor approximately 0.4 miles of mainline conductor to eliminate the violations. The reconductor can be eliminated if the switching configurations MV1/MV2 are not utilized.

Estimate Cost: $ 400,000

MV2 Protective Device Equipment Replacement Project

The MV-2 circuit has five (5) cutout switches, twenty-one (21) disconnect switches, and one (1) recloser that are identified as overloaded due to MV2 Normal Operation,

MV2/MV1 and MV1/MV2 switching configurations. Four (1) of the five (5) cutout switches are identified in base case study horizon and the additional one (1) cutout switch is identified in Year 3 study horizon. Three (3) of twenty-one (21) disconnect switches are identified in the base case study horizon, an additional two (2) are identified in Year 1, an additional one (1) is identified in Year 3 and the final fifteen (15) are identified in Year 5. The one (1) recloser is identified in Year 3 study horizon. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 929,035

b. MV-2 Circuit Tier 2 Projects

MV2 Primary Low Voltage Improvement Project

The MV-2 circuit has approximately 7.5 miles of mainline conductor with low voltage due to MV2/MV1, and MV1/MV2 switching configurations. The violations appear in base case (1.3 miles), Year 1 (0.1 miles), Year 3 (5.1 miles) and Year 5 (1.1 miles) study horizons. MV-2 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be mitigated if the switching configurations listed in this section are not utilized.

MV2 Phase Imbalance Improvement Project

Phase imbalance is identified on the MV-2 circuit due to MV2 Normal Operation, and MV1/MV2 switching configurations in all study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

MV2 Service Transformer Upgrade Project

The MV-2 circuit has two (2) service transformers identified with an overload greater than 150% of the rated value, occurring in the MV2 Normal Operation, MV2/MV1 and MV1/MV2 switching configurations. The service transformer overloads are identified in all study horizons for one transformer and in Year 3 and Year 5 study horizons for the second transformer. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

MV2 Secondary Low Voltage Improvement Project

The MV2 circuit has clusters of secondary low voltage under MV2 Normal Operations, MV2/MV1, and MV1/MV2 switching configurations. Secondary low voltage violations are identified at 28 service points in the base case , 27 service points in Year 1, 51 service points in Year 3 and 83 service points in Year 5.

MV-3

a. MV-3 Tier 1 Projects

MV 3 Mainline Conductor Overload Replacement Project

The MV-3 circuit has approximately 3.8 miles of mainline conductor overloaded due to MV3 Normal Operation, MV3/TR2, MV3/DL1, DL1/MV3, TR2/MV3 and TR3/MV3

switching configuration. The mainline conductor overload appears in all study horizons. TDPUD will reconductor approximately 3.8 miles of mainline conductor to eliminate the violations. The reconductor can be reduced to 0.5 miles if circuit configuration is limited to MV3 Normal Operation, MV3/DL1 and MV3/TR2.

Estimate Cost: $3,800,000

MV3 Protective Device Equipment Replacement Project

The MV-3 circuit has five (5) cutout switches, nineteen (19) disconnect switches, and two (2) reclosers that are identified as overloaded due to MV3 Normal Operation, MV3/TR2, MV3/DL1, DL1/MV3, TR2/MV3 and TR3/MV3 switching configurations. Four (4) of the five (5) cutout switches are identified in Base Case study horizon and the additional one (1) cutout switch is identified in Year 1 study horizon. Ten (10) of nineteen (19) disconnect switches are identified in the base case study horizon, an additional seven (7) are identified in Year 1, and the final two (2) are identified in Year 5. One (1) recloser is identified in Year 1 study horizon and the second is identified in Year 5. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 1,032,630

b. MV-3 Circuit Tier 2 Projects

MV3 Primary Low Voltage Improvement Project

The MV-3 circuit has approximately 10.6 miles of mainline conductor with low voltage due to MV3 Normal Operation, MV3/TR2, MV3/DL1, DL1/MV3, TR2/MV3 and TR3/MV3 switching configurations. The violations appear in the base case study horizon. MV-3 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be mitigated if the switching configurations listed in this section are not utilized.

MV3 Phase Imbalance Improvement Project

Phase imbalance is identified on the MV-3 circuit due to DL1/MV3 switching configuration in base case and Year 1 study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

MV3 Service Transformer Upgrade Project

The MV-3 circuit has two (2) service transformers identified with an overload greater than 150% of the rated value, occurring in the MV3 Normal Operation, MV3/TR2, MV3/DL1, DL1/MV3, TR2/MV3 and TR3/MV3 switching configurations. The service transformer overload is identified in Year1, Year 3 and year 5 study horizons for one transformer and in Year 5 study horizons for the second transformer. TDPUD will utilize NISC Operations Analysis tool to determine if an equipment upgrade would be required.

MV3 Secondary Low Voltage Improvement Project

The MV3 circuit has clusters of secondary low voltage under MV3 Normal Operations, MV3/DL1, MV3/TR2, TR2/MV3, TR3/MV3 and DL1/MV3 switching configurations.

Secondary low voltage violations are identified at 690 service points in the base case, 820 service points in Year 1, 824 service points in Year 3 and Year 5.

MV-4 CIRCUIT

a. MV-4 Circuit Tier 1 Projects

MV4 Protective Device Equipment Replacement Project

The MV-4 circuit has one (1) cutout switch, and eight (8) disconnect switches that are identified as overloaded due to MV4 Normal Operation, MV4/TR1, and TR1/MV4 switching configurations. The one (1) cutout switch is identified in Year 1 study horizon. The eight (8) disconnect switches are identified in the Base Case study horizon and persist through the remaining study horizons if not addressed. TDPUD will initiate an asset replacement program to install appropriately sized protection device equipment.

Estimate Cost: $ 265,320

b. MV-4 Circuit Tier 2 Projects

MV4 Primary Low Voltage Improvement Project

The MV-4 circuit has approximately 0.8 miles of mainline conductor with low voltage due to TR1/MV4 switching configuration. The violations appear in the Year 3 study horizon. MV-4 mainline low voltage will be re-evaluated after higher priority projects on this circuit are completed to confirm mainline low voltage conditions and generate mitigation action plan. The low voltage violations can be mitigated if the TR1/MV4 switching configuration is not utilized.

MV4 Phase Imbalance Improvement Project

Phase imbalance is identified on the MV-4 circuit due to TR1/MV4 switching configuration in base case and Year 1 study horizons. TDPUD will investigate the load on each phase to quantify the imbalance and determine if load transfers can be completed between phases.

6.0 2026-2030 CAPITAL BUDGET PLANNING

The Master Plan developed planning-level budgetary cost estimates using the unit costs described in Section 6.1. These estimates were prepared solely for **Tier 1 projects** to align with TDPUD's current priorities and to allow for a future reassessment of **Tier 2 projects** following the implementation of the Tier 1 improvements. This phased approach will provide an opportunity to evaluate system performance after completion of the Tier 1 projects and develop more accurate cost estimates and project requirements for Tier 2 improvements.

Upon completion and adoption of the Master Plan, the identified Tier 1 projects will be further evaluated and prioritized based on system needs, operational constraints, and overall benefit to the distribution system. Following this prioritization process, a Capital Improvement Plan (CIP) will be developed to establish the implementation schedule and funding requirements. The planning-level budgetary costs presented in this Master Plan will then be refined and updated to reflect the final project scope, priorities, and implementation strategy.

6.1 Unit Cost Breakdown

Unit costs were developed through a review of available cost data from California utilities, supplemented by available TDPUD cost information and, where applicable, other industry unit cost indices. For California utility sources, the primary references were the March 2025 Unit Cost Guides published by Pacific Gas and Electric Company (PG&E), San Diego Gas & Electric Company (SDG&E), and Southern California Edison (SCE) (collectively referred to herein as the **IOU Unit Cost Guides**). These guides provide representative costs for facilities commonly required to support interconnection projects and are published pursuant to Attachment A of CPUC Decision D.16-06-052.

Unit cost development was limited to **Tier 1 projects**, specifically mainline primary conductor reconductoring and protective device equipment replacement. For each unit cost item, comparable equipment and construction activities were identified across the three IOU Unit Cost Guides. The published 2025 costs were escalated to 2026 dollars using appropriate cost escalation factors, and an average value was calculated from the three utility sources to establish the representative unit cost.

No additional unit cost data sources outside of California were utilized for distribution-level facilities or equipment. Available TDPUD unit cost information was used as a benchmarking tool to validate and assess the reasonableness of the calculated unit costs.

7.0 MAJOR PROJECTS AND INITIATIVES

The District's Capital Projects Program is implemented through a ten-year Capital Improvement Plan (CIP), which is updated on a biennial basis as part of the District's budgeting process. This planning cycle enables the District to incorporate updated system performance data, asset condition assessments, wildfire risk modeling, and evolving operational requirements into its long-term capital investment strategy.

The CIP serves as the primary implementation framework for translating system planning objectives into funded projects. It provides a forward-looking view of anticipated infrastructure investments while maintaining flexibility to adjust priorities based on changing system conditions, regulatory requirements, and emerging operational needs.

Capital planning within this framework is guided by a risk-informed and data-driven approach that integrates system reliability performance metrics, wildfire hazard and consequence modeling, asset condition evaluation, operational constraints, and long-term system needs.

Projects included in the Capital Projects Program are generally organized into the following categories:

1) System Reliability**; Operational Capital and System Modernization;** and Wildfire Mitigation Programs – focused on **improving system reliability;** lifecycle asset replacement, system automation, and modernization of protection, control, and SCADA-enabled infrastructure**; and** reducing ignition risk and strengthening infrastructure in high fire threat areas.
2) Major Capital Projects – large-scale infrastructure investments with significant system impact, including substations, new feeder ties, and system reconfiguration projects.

The Capacity and Contingency Scenario Study developed as part of this Master Plan will serve as a key input into the next CIP update cycle in 2027. Outputs from that study, along with the programs and projects identified within this Capital Projects section, will be used to refine project prioritization, scope development, and investment planning for future capital budgets.

System Reliability / Wildfire Mitigation

Overhead System Hardening

The Overhead System Hardening Program is a core component of the District's wildfire mitigation and resilience strategy. The program is designed to reduce ignition risk, improve system reliability, and enhance public safety outcomes by reconstructing overhead distribution facilities in accordance with hardened construction standards, particularly within Tier 2 and Tier 3 High Fire Threat District (HFTD) areas.

System hardening projects typically involve full or targeted rebuilds of existing overhead infrastructure using updated District construction standards. These standards include the use of steel or ductile iron poles, composite or fiberglass crossarms, polymer insulators, and covered conductors. Additional protective measures—such as wildlife guards, equipment protection, and enhanced clearances—are incorporated to further reduce fault likelihood and ignition potential under adverse conditions.

Project identification, prioritization, and ranking are based on a risk-informed framework that integrates multiple data sources, including historical system reliability performance (e.g., outage frequency and duration), wildfire risk mapping derived from weather intelligence and fire behavior modeling, vegetation risk assessments informed by LiDAR data, and system constraints or deficiencies identified through capacity planning efforts in this Master Plan.

In addition to wildfire risk reduction, the program supports broader resilience objectives by targeting circuits and segments that serve critical community infrastructure, including evacuation routes and essential services. Where feasible, hardening efforts are coordinated with system sectionalizing and operational strategies to enable more targeted de-energization during Preemptive Power Shutoff (PPS) or Public Safety Outage Management (PSOM) events while maintaining service to critical loads.

The District currently targets approximately six miles of overhead system hardening annually, with project selection focused on the highest-risk and highest-consequence areas of the system. This approach is intended to maximize risk reduction per dollar invested while advancing long-term system resilience goals.

Targeted Overhead Reliability Projects

The District's Targeted Overhead Reliability Program focuses on improving system performance through corrective actions at specific locations identified as repeat contributors to outages or operational inefficiencies. Unlike broad system hardening initiatives, this program is highly localized and data-driven, addressing discrete line segments, structures, or devices with a documented history of performance issues.

Project identification is based on detailed analysis of outage and operations data, including repeat interruption frequency, outage duration, protection system activity, and field-reported conditions. Common drivers include areas subject to snow and ice loading, conductor clashing or galloping, vegetation-related faults, and recurring protection operations resulting from transient or permanent faults.

Mitigation measures are tailored to the specific issue and location. Typical improvements include conductor re-sagging or tension adjustments, flat-top or vertical construction conversions to increase phase separation, pole replacement or structural reinforcement, and targeted reconductoring where appropriate. Operational improvements may include the installation or coordination of protective devices such as reclosers, sectionalizers, trip savers, or fuse-saving schemes to reduce outage duration and customer impact.

This program emphasizes continuous system monitoring and iterative improvement. Performance data is regularly evaluated to identify emerging trends and repeat outage locations, allowing the District to proactively implement targeted solutions. By addressing the most persistent and localized sources of outages, the program provides a cost-effective means of improving overall system reliability and customer service.

Glenshire Overcurrent Device Replacement & Wildfire Risk Reduction

The Glenshire Overcurrent Device Replacement and Wildfire Risk Reduction Project targets aging, obsolete, and high-risk distribution protection devices that no longer align with current reliability, operational, and wildfire mitigation standards. Replacing these devices enhances system protection performance, reduces the likelihood of equipment failure, and improves the District's ability to detect, isolate, and restore faults efficiently.

This effort supports both reliability objectives and wildfire risk reduction by minimizing fault-related ignition potential and improving protection system coordination.

The primary focus of this project is the elimination of expulsion-type fuses within the Glenshire system. These devices present an elevated wildfire ignition risk due to their expulsion-based operation, which can release hot gases and particulate matter during fault interruption. Consistent with the District's Wildfire Mitigation Plan, a system-wide transition to non-expulsion overcurrent protection has been implemented across much of the 12.47 kV system.

However, field implementation in Glenshire has identified a key constraint: non-expulsion fuse technologies are not currently available across all required size ranges for the District's 15 kV-class applications in this portion of the system. As a result, full one-for-one replacement of expulsion-type devices is not feasible in all locations using standard fuse solutions.

To address this limitation, the District is implementing a risk-informed, adaptive approach that includes:

- Deployment of non-expulsion fuse technologies where compatible and available
- Targeted application of electronic protection devices (e.g., reclosers, trip savers, or fuse-saving schemes) to replace or supplement fuse protection
- Protection coordination updates to maintain selectivity and minimize fault energy release
- Evaluation of alternative equipment configurations or system modifications where necessary to eliminate or reduce reliance on expulsion devices

These measures allow the District to continue progressing toward its wildfire mitigation objectives while maintaining reliable system operation and appropriate protection coverage. Importantly, these upgrades are implemented without requiring significant changes to feeder sources or overall system topology.

This project reflects the District's commitment to balancing wildfire risk reduction, equipment limitations,

The Operational and system reliability through practical, field-informed engineering solutions.

Operational Capital and System Modernization Projects

Capital and System Modernization Projects provides a consolidated framework for ongoing capital investments that support wildfire resilience, system reliability, and strategic modernization of the electric distribution system. This program integrates targeted automation deployments, SCADA-enabled field device expansion, and lifecycle replacement of aging infrastructure to maintain safe, reliable, and operationally effective system performance across the service territory.

While modernization initiatives are included, the primary objective of this program is to reduce wildfire ignition risk and improve operational resiliency under high-risk environmental conditions. Secondary emphasis is placed on improving system reliability through enhanced fault isolation and service restoration capabilities, with modernization efforts serving as an enabling component for these outcomes.

a) System Automation and Switching Expansion

This component of the program focuses on the deployment of distribution automation devices, including overhead line reclosers, pad-mounted switches, and other remotely operable sectionalizing equipment. These devices are prioritized in high wildfire risk areas to reduce fault exposure duration, improve system sectionalization, and limit the potential geographic extent of outage or ignition events.

When integrated with SCADA communications, these devices provide enhanced operational flexibility and allow for remote switching and isolation of faulted segments. This improves both wildfire risk mitigation capabilities and system reliability by reducing dependency on manual field operations during high-risk or emergency conditions.

b) SCADA-Enabled Field Device Upgrades

This element of the program expands SCADA visibility and control capabilities beyond the substation boundary into the distribution system. The objective is to improve real-time system awareness and enable remote monitoring and operation of key field devices, particularly in areas of elevated wildfire risk and critical load importance.

These upgrades are closely aligned with the District's SCADA Reliability Improvement Project (SRIP), which provides the underlying fiber optic communications infrastructure required to support expanded device connectivity. Together, these efforts establish the foundation for improved system observability, faster fault response, and more controlled system operations during both normal and high-risk conditions.

c) Lifecycle Equipment Replacement

Lifecycle Equipment Replacement projects address the systematic renewal of distribution assets that are no longer capable of meeting current wildfire resilience, safety, or reliability standards due to age, condition, or technological obsolescence.

This includes replacement of aging switching, protection, and distribution equipment that may present elevated failure or ignition risk under stress conditions. Prioritization is driven by asset condition, operational history, and exposure to high wildfire threat environments.

Proactive replacement of end-of-life infrastructure reduces the likelihood of unplanned outages and equipment failures, improves system reliability performance, and supports long-term operational stability. Where feasible, replacements are coordinated with automation and communications upgrades to improve construction efficiency and reduce future field disruption.

SCADA Reliability Improvement Project (SRIP)

The SCADA Reliability Improvement Project (SRIP) is a District initiative to develop a District owned and operated dark fiber communications network to support both electric and water utility operations. The program is intended to enhance operational visibility, improve system reliability, and provide a scalable communications backbone to support current and future supervisory control, monitoring, and automation needs.

At present, the District maintains fiber optic connectivity to all substations, enabling reliable communications for substation-level data acquisition functions. However, a significant communications gap exists beyond the substation boundary, as the majority of distribution field devices, including switches, reclosers, and other automation-capable equipment, do not currently have dedicated fiber communications. Most field devices currently do not possess communications hardware and the few that do rely primarily on non-fiber solutions, limiting real-time visibility, bandwidth, and redundancy.

SRIP addresses this gap by expanding the District's fiber network from substations into the distribution system to strategically selected field locations. The resulting network is designed as a future-ready dark fiber backbone that aligns with existing overhead and underground electric infrastructure corridors. Network routing is intentionally coordinated with planned system upgrades, including joint trench opportunities, pole loading and structural analysis, and other infrastructure improvements associated with distribution hardening and capacity projects. In areas not captured through coordinated construction activities, SRIP is implemented as a standalone capital program.

A key design feature of SRIP is the development of redundant loop communication architecture, providing multiple pathways for data flow and significantly improving system resiliency. This configuration reduces single points of failure and enhances communication reliability in both normal and emergency operating conditions.

From an electric operations perspective, SRIP is intended to close the substation-to-field visibility gap and significantly increase real-time situational awareness of the distribution system. Improved communications infrastructure will support enhanced monitoring and supervisory control of field devices, improve outage response and system restoration capabilities, and enable more effective coordination of switching operations.

In addition, SRIP establishes a foundational communications platform to support future distribution automation initiatives, including potential implementation of FLISR (Fault Location, Isolation, and Service Restoration), advanced switching schemes, and expanded remote device control capabilities. The fiber network is also designed with sufficient scalability to accommodate future operational technologies as they are adopted by the District.

Overall, SRIP represents a critical enabling infrastructure program that supports modernization of both electric and water utility systems by providing a secure, high-reliability, District-owned communications backbone aligned with long-term operational and resilience objectives.

SCADA & Grid Technology

The SCADA & Grid Technology program encompasses the District's integrated operational technology investments that support real-time system visibility, operational control, and data-driven decision-making across the electric distribution system. This program is a key enabler of wildfire resilience and system reliability by improving situational awareness, accelerating operational response, and enhancing understanding of system conditions across both normal and contingency operations.

The program is structured around four core focus areas: distribution system sensors, SCADA hardware upgrades, SCADA software and user interface modernization, and field

device communications. Together, these components form a layered operational technology framework supporting both real-time system operations and longer-term planning and performance analysis.

a. Distribution System Sensors

Distribution system sensors enhance real-time visibility of system conditions across the distribution network by providing continuous monitoring of circuit loading, fault activity, and operational anomalies. These devices improve the District's ability to identify, locate, and understand system disturbances as they occur, supporting faster and more informed operational decision-making.

In addition to real-time operational benefits, sensor data supports longer-term system analysis by identifying performance trends, recurring issues, and areas of elevated risk, thereby informing maintenance planning, system upgrades, and reliability improvements.

b. SCADA Hardware Upgrades

SCADA hardware upgrades include the modernization and replacement of legacy field and control system components used for system monitoring and operational control. These upgrades improve system reliability, ensure compatibility with current communications and device standards, and support integration with modern field equipment and emerging grid technologies.

This modernization strengthens the District's ability to maintain consistent and reliable visibility and control over critical distribution assets, particularly during high-risk operating conditions or system disturbances.

c. SCADA Software and User Interface Upgrades

SCADA software and user interface (UI) upgrades focus on improving operator situational awareness, system usability, and analytical capabilities. This includes modernization of visualization tools, alarm management, system navigation, and data integration functions.

These improvements enhance real-time operational decision-making by enabling faster interpretation of system conditions and more efficient response to outages or abnormal operating events. They also support data-driven analysis of system performance, contributing to improved planning, maintenance prioritization, and reliability assessment.

d. Field Device Communications

Field device communications represent the "last mile" component of the SCADA and Grid Technology framework, enabling reliable connectivity between field devices and the District's operational systems. This includes communications supporting reclosers, switches, sensors, and other intelligent grid devices deployed throughout the distribution system.

Communications solutions include both District-owned fiber infrastructure (including SRIP where available) and standardized alternative communication technologies where

fiber deployment is not currently feasible. This hybrid approach ensures consistent and reliable connectivity for critical field devices across the system.

Field communications infrastructure is fundamental to enabling real-time monitoring and operational control, while also supporting the expansion of system intelligence through increased data availability from field devices. This capability directly enhances both operational response and long-term system analysis.

Major Projects

a. Glenshire/Truckee Feeder Tie Project

The Glenshire/Truckee Feeder Tie Project is a major capital initiative intended to improve system reliability and strengthen operational independence within a unique portion of the distribution system. The Glenshire area is currently the only segment of the District's system operating at 14.4 kV delta and is supplied via the District's transmission provider through a dedicated distribution line. This arrangement introduces a dependency on external system coordination, limiting the District's ability to independently control switching and restore service under contingency conditions.

This external dependency results in reduced operational flexibility and can contribute to extended restoration times during outage events, particularly when coordination with upstream providers is required for switching or reconfiguration. As a result, the Glenshire area operates with a lower degree of real-time operational control compared to the remainder of the District's distribution system.

The project addresses this constraint by establishing a new primary supply path using an existing District-controlled 12.47 kV distribution feeder. A step-up transformer will be installed to serve the 14.4 kV Glenshire system from this District-operated source, while maintaining the existing 14.4 kV distribution infrastructure. This approach reduces reliance on the external dedicated distribution supply line and transitions primary operational responsibility for the area to District-controlled infrastructure.

In addition, the project includes the development of a feeder tie configuration that provides operational flexibility and supports multiple supply scenarios. An automatic transfer scheme is being evaluated to further enhance continuity of service and improve system response during outage or abnormal operating conditions.

The scope also includes installation of reclosers, sectionalizing devices, and associated protection equipment to improve fault isolation capability within the Glenshire area. These upgrades enhance coordination with the broader distribution system, improve switching flexibility, and reduce customer outage exposure by enabling faster and more targeted restoration actions.

While the primary objective of the project is to reduce dependency on external system operations and improve District control authority, these improvements also provide meaningful reliability benefits, including reduced restoration times, improved fault isolation, and enhanced operational responsiveness during both planned and unplanned system events.

Due to its specialized engineering requirements, integration of custom transformation equipment, and significant impact on system control and reliability, the Glenshire/Truckee

Feeder Tie Project is classified as a major capital improvement project and represents a key initiative in strengthening operational independence and improving service reliability within the District's service territory.

b. Martis Valley Substation Rebuild Project

The Martis Valley Substation Modernization Project is a phased capital improvement program to fully rebuild and modernize one of the District's critical substations and ensure continued reliable operation of a critical node within the electric distribution system. Originally placed into service in 1982, Martis Valley Substation (MV Sub) is the District's only substation directly served by the 120 kV transmission system and provides an important source of supply for both primary load service and contingency support within the broader distribution network.

MV Sub serves a diverse set of critical and community-serving loads. Because of its transmission-level connection and system configuration, MV Sub plays an important role in both normal operations and contingency conditions requiring alternate supply paths and system support.

Over its operating life, MV Sub has received targeted capital investments, including seismic upgrades, protective relay modernization, and ongoing civil infrastructure maintenance. However, consistent with prior District substation modernization efforts, such as Donner Lake Substation (2010), Tahoe Donner Substation (2014), and Truckee Substation (2021), MV Sub has reached the end of its useful service life and requires comprehensive reconstruction to ensure long-term reliability, maintainability, and operational performance. It is also the District's only remaining substation that has not undergone a full modernization and rebuild program.

Since 2021, District engineering staff, in coordination with engineering consultants, have developed a comprehensive modernization scope. The project is designed to transition the substation from legacy outdoor infrastructure to a modern indoor switchgear-based configuration while improving operational resilience, safety, and maintainability.

Key scope elements include relocation of the 12.5 kV distribution bus into an indoor switchgear control enclosure, replacement of legacy SF6 high-voltage switching equipment with modern vacuum circuit breaker technology, and upgrades to substation protection and control systems. Additional improvements include relocation of DC battery systems into protected indoor enclosures, addition of redundant station service power supply, replacement of outdated bus tie switching with modern switchgear configurations, and conversion of porcelain insulation systems to polymer-based components to improve reliability and reduce maintenance exposure.

The project also includes structural and civil rehabilitation of the substation site, addressing aging foundations, drainage, grading, and site security improvements, while incorporating provisions for future expansion, including additional distribution feeders and potential integration of energy storage and other emerging technologies.

To manage construction risk and maintain system reliability, the project has been implemented in phases. Phase 1 civil improvements within the existing substation footprint were completed in 2025, enabling installation readiness for major electrical equipment. Long-lead equipment, including the switchgear control enclosure and breaker,

was procured in advance and delivered following completion of enabling civil work. Subsequent phases will complete electrical installation, equipment integration, and final commissioning of the modernized substation.

Upon completion, the Martis Valley Substation will provide a fully modernized, resilient, and maintainable transmission-connected supply point that enhances system reliability, strengthens contingency operations, and ensures continued service to key load areas within the District's service territory.

c. Battery Energy Storage System (BESS)

The Battery Energy Storage System (BESS) initiative is an evaluation-level effort to assess the potential role of energy storage within the District's electric system. The study will examine whether energy storage can provide operational and economic benefits, including improved system flexibility, enhanced reliability, and potential cost management opportunities.

A key area of interest is the potential for energy storage to support energy arbitrage, including charging during lower-cost off-peak periods and discharging during higher-cost peak periods when system energy prices and demand are elevated. Additional potential applications may include peak load management and operational support during contingency or high-stress system conditions.

The evaluation will also consider how BESS could integrate with other distributed energy resources, including the potential for co-located local photovoltaic (PV) generation where technically and economically feasible. These configurations would be assessed as part of the broader feasibility and system impact analysis.

The study will further evaluate how energy storage could complement existing and planned system improvements, including distribution automation and SCADA-enabled infrastructure.

No specific project scope, locations, technologies, or implementation timeline have been established. Any future advancement would be subject to the results of feasibility and economic analysis, followed by appropriate District review and approval.

d. Freeway, River, Railroad Crossing Rebuilds

Freeway, river, and railroad crossing rebuild projects address critical distribution system crossings where overhead infrastructure spans constrained rights-of-way, environmentally sensitive areas, or third-party controlled corridors. These structures include aging infrastructure components that require periodic maintenance, replacement, or hardening to maintain system reliability, safety, and long-term serviceability.

A key component of these projects is the replacement of existing wood pole crossing structures with self-supporting steel structures, improving structural strength, reducing maintenance requirements, and enhancing long-term resilience at these high-consequence system interfaces.

Where feasible, crossing improvements also include relocation of structures out of third-party controlled rights-of-way, such as transportation or railroad corridors, to District-controlled or more accessible locations. This improves long-term operational flexibility

by reducing dependency on external access coordination and simplifying future maintenance, inspection, and emergency response activities.

In addition to structural and location improvements, these projects are designed to support system resilience along primary evacuation routes and major transportation corridors, where outages could impact public safety and emergency response access. Crossing upgrades are therefore intended to improve reliability at critical infrastructure intersections within the distribution system.

Where applicable, designs also incorporate future capacity considerations, including the potential for multi-circuit crossings or expanded conductor configurations to support future feeder growth and system reconfiguration needs without requiring full reconstruction of crossing infrastructure.

Because of their location within regulated corridors, these projects require coordination with external agencies, including transportation authorities, environmental permitting agencies, and railroad operators. Permitting, environmental review, and right-of-way constraints remain significant factors in project sequencing and delivery timelines.

These projects represent an important component of the District's capital improvement program, balancing aging infrastructure renewal, structural hardening, operational accessibility, future capacity needs, and regulatory constraints at key distribution system interface points.

e. Transmission Rebuild

The District operates a limited transmission segment consisting of approximately 0.5 miles of 60 kV infrastructure constructed on wood pole structures with bare conductor configuration. This segment functions as part of the broader transmission supply arrangement supporting the District's distribution system operations.

While this transmission asset remains in service and continues to perform its intended function, its configuration and construction type represent a legacy design relative to modern transmission construction standards. As such, it is recognized as a long-term candidate for future upgrade consideration within the District's system planning framework.

No specific transmission rebuilding projects were identified for near-term execution within the current capital planning horizon. However, transmission-level infrastructure considerations will continue to be tracked as part of long-range planning, particularly with respect to system resilience, maintainability, and alignment with evolving transmission construction standards.

Future evaluation of this segment may include consideration of hardening strategies such as structural upgrades, conductor insulation enhancements, or other design improvements to increase resilience and reduce exposure to environmental and operational risks, depending on system needs and feasibility at the time of project development.

f. Undergrounding Projects

Undergrounding projects consist of the conversion of existing overhead distribution facilities to underground infrastructure, typically initiated through coordination with local

jurisdictions, community initiatives, or planned infrastructure improvement efforts. These projects are commonly associated with jurisdiction-led underground utility districts, where civil improvements such as conduit systems, vaults, and related infrastructure are constructed in advance by third parties.

The District's role generally includes the removal of existing overhead facilities and the transition of electrical distribution infrastructure into the newly constructed underground system, including system reconnection and integration with the existing distribution network.

Undergrounding projects vary significantly in scope, timing, and implementation approach depending on external drivers, coordination requirements, and readiness of supporting civil infrastructure. As a result, they are generally planned and executed as distinct efforts separate from internally initiated reliability, capacity, or system hardening programs.

From a planning perspective, undergrounding represents a high-cost but high-impact infrastructure solution that may provide long-term benefits related to system reliability, environmental exposure reduction, and alignment with community development objectives. Given the substantially higher capital cost relative to equivalent overhead reconstruction or system hardening initiatives, undergrounding projects are evaluated in the context of overall system planning to ensure the most cost-effective solution is selected for achieving reliability, resilience, and community objectives.

Joint Agency & Coordinated Infrastructure Projects

This category includes capital improvements implemented in coordination with external agencies, municipalities, or third-party infrastructure programs. These projects are typically initiated by non-District entities and involve shared planning, design coordination, and construction sequencing to align electric utility infrastructure with broader public works or development initiatives.

Examples include joint trench undergrounding projects, roadway or corridor reconstruction projects, and coordinated utility relocations associated with transportation, rail, or public infrastructure improvements.

The District's role generally includes engineering review, system integration, relocation or replacement of existing facilities, and ensuring continued service reliability during and after construction. Participation in these projects is evaluated based on system benefit, operational efficiency, long-term maintainability, and overall cost effectiveness relative to alternative standalone solutions.

Where joint coordination is feasible, these projects may provide opportunities to reduce long-term maintenance exposure, improve access, and align infrastructure with future system planning objectives.

A. APPENDIX A – TDPUD ONE LINE

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B. APPENDIX B – Forecasted Spot Loads

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Project Name	Address	Est. Load Size(kW)	Proposed Feeder	Est. Date
Crestwood Construction Industrial Building	10980 Industrial Way	176	TR-6	2026
Soaring Ranch Phase III	10701 Soaring Way	683	MV-2	
Skislope Way Townhomes	16665 Ski Slope Way	16	DL-3	
Zurich Place Offices	12885 Zurich Place	171	TD-2	
Waltman/Elements Mountain Company	10414 Panamint Place	57	DL-3	
Rocker Memorial Skate Park	Truckee River Regional Park	5	MV-2	
Tesla - Jibboom St.	10640 East Jibboom St.	2300	TR-6	
Tesla - Deerfield	12353 Deerfield Dr.	2500	MV-3	
Amtrak Station Upgrade Truckee	10065 Donner Pass Rd.	215	TR-3	
Village at Gray's Crossing Lots D&E - Live/Work	10151 & 10105 Edwin Wy.	172	TR-6	
Village at Gray's Crossing - Studio Lofts	10222, 10202, & 10204 Edwin Wy.	189	TR-6	
Pacific Crest Commons	10077 State Highway 89	668	TR-4	
Edmund's Lofts	11860 Edmunds Dr.	200	TR-4	
Tahoe Forest Hospital District Gateway Center	11046 Donner Pass Rd.	216	TR-4	
Town of Truckee Mobility Hub	11010 Church St.	1145	TR-2	
Friends of Tahoe Truckee Waldorf School	12640 Union Mills Road	121	TR-6	
West River Street Park	10257 West River Street	5	MV-3	2028
Coldstream commercial Development	12848 Deerfield Drive	354	MV-3	
Tahoe Donner Downhill Ski Lodge	11585 Snowpeak Way:	245	DL-3	
Estates Meadows	10020 Estates Drive	156	MV-2	
Joerger Ranch Parcel 2	10110 Soaring Way	79	MV-2	
Trailside Townhomes	12800 Zurich Place	24	TD-2	
Village at Gray's Crossing Car Wash	10012 Edwin Way	32	TR-6	
Silver Creek Estates	Winter Creek Loop	196	MV-1	
Town of Truckee Corp Yard EV Charging	10961 Stevens Ln.	2080	TR-6	
Town of Truckee Town Center EV Charging	10181 Truckee Airport Rd.	440	MV-2	
Truckee Tahoe School District - EV Charging	12485 Joerger Dr.	500	MV-4	
Truckee Library - Relocation	10500 Brockway Rd.	1766	MV-3	
Kidzone - Sierra Nevada Childrens Library	10010 Estates Dr.	175	MV-1	
The Crossing Phase 2	10198 Church St.	600	TR-2	
Mountain Brew	11260 Donner Pass Road	24	MV-3	
Old Trestle Restaurant	10331 West River Street	87	MV-3	
Industrial Heritage District	11158 Church Street	1142	TR-2	
Trout Creek District	11158 Church Street	204	TR-2	2029
Railyard Hotel	10108 Truckee Way	364	TR-2	
The Residences at Jibboom	10090 Jibboom St	305	TR-3	
Soaring Ranch Phase II	10501 Soaring Way	896	MV-2	
10400 Pioneer Trail	10400 Pioneer Trail	2061	TR-6	
Gray's Crossing Hotel	10162 Edwin Way	509	TR-6	
Gray's Crossing Lot F	Prosser Dam Rd	144	TR-5	

C. APPENDIX C – Analysis Violation Details

C. APPENDIX C – Analysis Violation Details

Donner Lake Substation – Summary of Primary Low Voltage Violation

Scenarios	Primary Low Voltage Violation							
	Base Case		1-Year		3-Year		5-Year	
	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)
DL1 Normal	0.0	-	0.0	-	0.0	-	0.0	-
DL1 to MV3	12.6	110.1	13.7	102.8	13.7	101.0	14.7	99.6
DL1 to DL2	0.0	-	0.0	-	0.0	-	0.0	0.0
DL2 Normal	0.0	-	0.0	-	0.0	-	0.0	-
DL2 to DL1	0.0	-	0.0	-	0.0	-	0.3	117.9
DL3 Normal	21.5	109.7	22.8	109.1	23.1	106.8	22.8	107.8
DL3 to TD1	28.5	102.2	29.0	101.1	31.2	100.0	31.4	98.6
DL3 to TD2	35.7	92.4	35.7	90.8	35.8	88.2	35.8	86.6
DL3 to TD3	32.9	104.8	33.1	103.8	34.4	101.9	34.6	101.7

Donner Lake Substation – Summary of Primary Conductor Overload Violation

Scenarios	Length of Primary Conductor Overload Violation (miles)			
	Base Case	1-Year	3-Year	5-Year
DL1 Normal	0.0	0.0	0.0	0.0
DL1 to MV3	0.0	2.2	2.3	2.3
DL1 to DL2	0.0	0.0	0.0	0.0
DL2 Normal	0.0	0.0	0.0	0.0
DL2 to DL1	0.0	0.0	0.0	0.0
DL3 Normal	0.0	0.0	0.6	0.7
DL3 to TD1	2.1	2.2	2.7	2.7
DL3 to TD2	1.4	1.5	2.7	2.9
DL3 to TD3	1.1	1.4	1.9	1.9

Donner Lake Substation – Summary of Service Transformer Overload Violation

Scenarios	QTY of Service TXs Violation (>150% KVA Rating)			
	Base Case	1-Year	3-Year	5-Year
DL1 Normal	0	0	0	0
DL1 to MV3	0	1	1	2
DL1 to DL2	0	0	0	0
DL2 Normal	0	0	0	0
DL2 to DL1	0	0	0	0
DL3 Normal	2	2	5	5
DL3 to TD1	2	3	5	5
DL3 to TD2	2	2	5	5
DL3 to TD3	2	2	5	5

Donner Lake Substation – Summary of Protective Device Overload Violation

Scenarios	QTY of Protective Device Overload Violation (>100% Rating)			
	Base Case	1-Year	3-Year	5-Year
DL1 Normal	0	0	0	0
DL1 to MV3	14	21	21	21
DL1 to DL2	0	0	0	0
DL2 Normal	0	0	0	0
DL2 to DL1	0	0	0	0
DL3 Normal	11	12	13	14
DL3 to TD1	10	12	13	14
DL3 to TD2	16	17	19	20
DL3 to TD3	15	16	18	18

Donner Lake Substation – Summary of Phase Imbalance Violation

Scenarios	Percentage of Phase Imbalance			
	Base Case	1-Year	3-Year	5-Year
DL1 Normal	50.3%	50.3%	50.3%	50.3%
DL1 to MV3	16.0%	10.5%	-	-
DL1 to DL2	-	-	-	-
DL2 Normal	35.8%	35.8%	35.9%	35.9%
DL2 to DL1	-	-	-	-
DL3 Normal	45.1%	45.1%	43.2%	43.4%
DL3 to TD1	31.2%	31.5%	30.8%	31.0%
DL3 to TD2	27.9%	29.6%	30.1%	31.1%
DL3 to TD3	22.9%	23.2%	22.9%	23.1%

Donner Lake Substation – Summary of Secondary Low Voltage Violation

Scenarios	Qty of Secondary Low Voltage (<114V)			
	Base Case	1-Year	3-Year	5-Year
DL1 Normal	0	0	0	0
DL1 to MV3	1137	1281	1309	1345
DL1 to DL2	18	19	27	40
DL2 Normal	15	15	15	16
DL2 to DL1	27	35	23	52
DL3 Normal	1475	1530	1611	1650
DL3 to TD1	2008	2034	2154	2162
DL3 to TD2	2394	2438	2521	2644
DL3 to TD3	1908	1937	2066	2141

Tahoe Donner Substation – Summary of Primary Low Voltage Violation

Scenarios	Primary Low Voltage Violation							
	Base Case		1-Year		3-Year		5-Year	
	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)
TD1 Normal	0.0	-	0.0	-	0.0	-	0.0	-
TD1 to TD2	0.0	-	0.0	-	0.0	-	0.0	-
TD1 to DL3	28.0	107.8	28.0	107.1	28.0	106.5	28.0	105.6
TD2 Normal	0.0	-	0.0	-	0.0	-	0.0	-
TD2 to TD1	0.0	-	0.0	-	0.0	-	0.0	-
TD2 to DL3	42.0	100.1	42.0	98.9	42.0	97.1	42.0	96.1
TD2 to TD3_1	28.5	103.5	29.6	102.2	29.8	101.9	29.9	100.5
TD2 to TD3_2	11.9	115.4	16.1	115.1	10.5	115.5	14.4	115.2
TD3 Normal	2.5	117.6	3.1	117.5	2.3	117.2	5.4	117.0
TD3 to TD2	15.6	113.3	36.4	110.8	18.6	113.0	20.0	112.6
TD3 to TR5	49.9	111.5	51.8	111.2	49.8	111.4	53.1	110.5
TD3 to TR4_1	31.9	108.7	32.0	107.9	32.3	107.1	32.1	106.2
TD3 to TR4_2	31.9	108.9	32.1	107.8	32.3	107.0	32.2	106.2
TD3 to DL3	44.1	104.9	44.6	105.6	45.3	103.9	46.2	103.8

Tahoe Donner Substation – Summary of Primary Conductor Overload Violation

Scenarios	Length of Primary Conductor Overload Violation (miles)			
	Base Case	1-Year	3-Year	5-Year
TD1 Normal	0.0	0.0	0.0	0.0
TD1 to TD2	0.0	0.0	0.0	0.0
TD1 to DL3	0.0	0.0	0.7	0.8
TD2 Normal	0.0	0.0	0.0	0.0
TD2 to TD1	0.0	0.0	0.0	0.0
TD2 to DL3	1.5	1.5	1.5	1.5
TD2 to TD3_1	2.4	2.4	2.4	2.4
TD2 to TD3_2	0.0	0.0	0.0	0.0
TD3 Normal	0.0	0.0	0.0	0.0
TD3 to TD2	0.4	0.4	0.4	0.4
TD3 to TR5	0.1	0.1	0.1	0.1
TD3 to TR4_1	0.0	0.0	0.5	0.5

TD3 to TR4_2	0.0	0.0	0.5	0.5
TD3 to DL3	0.0	0.3	0.8	0.8

Tahoe Donner Substation – Summary of Service Transformer Overload Violation

Scenarios	QTY of Service TXs Violation (>150% KVA Rating)			
	Base Case	1-Year	3-Year	5-Year
TD1 Normal	0	0	0	0
TD1 to TD2	0	0	0	0
TD1 to DL3	2	2	5	5
TD2 Normal	0	0	0	0
TD2 to TD1	0	0	0	0
TD2 to DL3	2	3	5	5
TD2 to TD3_1	0	0	0	1
TD2 to TD3_2	0	0	0	0
TD3 Normal	0	0	0	0
TD3 to TD2	0	0	0	1
TD3 to TR5	0	0	1	2
TD3 to TR4_1	1	1	1	2
TD3 to TR4_2	1	1	1	2
TD3 to DL3	2	2	5	6

Tahoe Donner Substation – Summary of Protective Device Overload Violation

Scenarios	QTY of Protective Device Violation (>100% KVA Rating)			
	Base Case	1-Year	3-Year	5-Year
TD1 Normal	2	2	2	2
TD1 to TD2	8	8	8	8
TD1 to DL3	14	15	15	17
TD2 Normal	4	4	4	4
TD2 to TD1	8	8	8	8
TD2 to DL3	18	21	23	24
TD2 to TD3_1	15	15	17	18
TD2 to TD3_2	12	12	12	13
TD3 Normal	4	4	4	4
TD3 to TD2	11	11	11	13
TD3 to TR5	18	18	20	21
TD3 to TR4_1	20	22	25	25
TD3 to TR4_2	20	22	24	24
TD3 to DL3	17	19	22	23

Tahoe Donner Substation – Summary of Phase Imbalance Violation

Scenarios	Percentage of Phase Imbalance			
	Base Case	1-Year	3-Year	5-Year
TD1 Normal	43.0%	43.0%	43.1%	43.1%
TD1 to TD2	19.9%	19.2%	19.1%	19.0%
TD1 to DL3	29.9%	29.9%	29.2%	29.4%
TD2 Normal	16.9%	16.0%	15.9%	15.9%
TD2 to TD1	19.9%	19.2%	19.1%	19.0%
TD2 to DL3	23.2%	23.1%	22.8%	23.2%
TD2 to TD3_1	18.6%	18.3%	18.2%	18.7%
TD2 to TD3_2	15.5%	15.1%	15.0%	15.0%
TD3 Normal	23.4%	23.4%	23.4%	23.4%
TD3 to TD2	15.8%	15.5%	15.4%	15.5%
TD3 to TR5	21.0%	21.0%	21.0%	20.7%
TD3 to TR4_1	14.1%	14.2%	14.3%	14.4%
TD3 to TR4_2	14.1%	14.2%	14.3%	14.3%
TD3 to DL3	23.1%	23.1%	22.8%	23.0%

Tahoe Donner Substation –Summary of Secondary Low Voltage Violation

Scenarios	Qty of Secondary Low Voltage (<114V)			
	Base Case	1-Year	3-Year	5-Year
TD1 Normal	0	0	0	0
TD1 to TD2	0	1	2	2
TD1 to DL3	42	56	66	66
TD2 Normal	0	0	0	0
TD2 to TD1	10	11	15	24
TD2 to DL3	42	56	65	66
TD2 to TD3_1	3690	3697	3737	3733
TD2 to TD3_2	2676	2716	2743	2753
TD3 Normal	0	0	0	0
TD3 to TD2	88	103	108	130
TD3 to TR5	875	2017	951	1018
TD3 to TR4_1	2015	2070	2172	2195
TD3 to TR4_2	1831	1958	2060	2074
TD3 to DL3	1790	1944	2044	2117

Truckee Substation – Summary of Primary Low Voltage Violation

Scenarios	Primary Low Voltage Violation							
	Base Case		1-Year		3-Year		5-Year	
	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage(V)
TR1 Normal	0.0	-	0.0	-	0.0	-	0.0	-
TR1 to TR2	4.3	117.3	3.4	117.4	13.4	116.0	13.6	115.7
TR1 to MV4	1.5	117.8	2.4	117.7	15.1	116.0	13.8	116.4
TR1 to TR6	16.1	117.0	12.5	117.5	20.4	114.3	21.0	113.4
TR2 Normal	0.0	-	0.0	-	0.0	-	0.0	-
TR2 to TR1	0.2	118.0	0.0	0.0	12.2	116.8	14.2	116.4
TR2 to MV3	4.9	115.6	7.0	108.5	7.9	106.7	12.4	105.1
TR2 to TR3	0.0	-	0.0	-	0.0	-	0.0	-
TR3 Normal	0.0	-	0.0	-	0.0	-	0.0	-
TR3 to TR2	0.0	-	0.0	-	0.0	-	0.0	-
TR3 to TR4	5.0	116.5	15.1	114.4	15.0	114.6	15.1	113.8
TR3 to MV3	7.7	114.7	12.6	107.4	13.4	105.8	13.7	105.1
TR4 Normal	0.0	-	1.0	117.7	1.4	117.4	3.0	117.1
TR4 to TR3	11.4	115.7	15.4	113.5	15.6	113.0	15.4	113.1
TR4 to TD3_1	13.6	115.4	21.3	114.7	22.1	114.2	22.9	113.7
TR4 to TD3_2	13.8	115.4	22.3	114.6	23.2	114.2	23.5	113.7
TR4 to MV3	20.0	104.5	22.0	89.0	22.6	84.3	22.6	83.0
TR5 Normal	3.9	117.1	4.2	116.8	5.5	116.3	5.6	116.2
TR5 to TR6_1	8.0	115.9	11.3	115.4	12.9	115.0	14.8	114.3
TR5 to TR6_2	45.8	98.0	45.8	97.9	45.8	94.8	45.8	90.9
TR5 to TR6_3	8.2	115.9	11.4	115.3	12.9	114.9	15.1	114.3
TR5 to TR6_4	27.9	113.5	28.9	113.5	32.5	112.7	45.5	111.3
TR5 to TD3	55.8	103.5	55.8	102.7	55.9	100.9	55.9	99.5
TR6 Normal	0.0	-	0.0	-	0.0	-	0.0	-
TR6 to TR1	19.6	115.8	27.0	105.5	29.3	93.7	29.7	76.9
TR6 to TR5_1	9.9	115.6	15.0	114.8	20.3	114.1	39.0	113.0
TR6 to TR5_2	29.1	110.0	46.4	85.8	NA*	NA*	NA*	NA*
TR6 to TR5_3	10.5	115.5	16.0	114.6	25.1	113.9	45.9	112.7
TR6 to TR5_4	12.3	115.3	45.9	112.7	46.6	108.0	53.5	103.7

*NISC model analysis failed due to significant voltage drop

Truckee Substation – Summary of Primary Conductor Overload Violation

Scenarios	Length of Primary Conductor Overload Violation (miles)			
	Base Case	1-Year	3-Year	5-Year
TR1 Normal	0.0	0.0	0.0	0.0
TR1 to TR2	0.0	0.0	0.1	0.1
TR1 to MV4	0.0	0.0	0.0	0.0
TR1 to TR6	0.0	0.0	0.1	0.1
TR2 Normal	0.0	0.0	0.0	0.0
TR2 to TR1	0.0	0.0	0.0	0.4
TR2 to MV3	0.0	0.5	0.5	1.7
TR2 to TR3	0.0	0.0	0.0	0.2
TR3 Normal	0.0	0.0	0.0	0.0
TR3 to TR2	0.0	0.0	0.0	0.0
TR3 to TR4	0.0	0.0	0.0	0.2
TR3 to MV3	0.0	0.7	1.2	1.2
TR4 Normal	0.0	0.0	0.0	0.0
TR4 to TR3	0.1	0.4	0.7	1.0
TR4 to TD3_1	0.0	0.0	0.0	0.0
TR4 to TD3_2	0.0	0.0	0.0	0.0
TR4 to MV3	2.0	4.6	4.9	4.9
TR5 Normal	0.0	0.0	0.0	0.0
TR5 to TR6_1	0.0	0.0	0.1	0.1
TR5 to TR6_2	1.2	1.3	1.5	2.3
TR5 to TR6_3	0.0	0.0	0.1	0.1
TR5 to TR6_4	0.0	0.0	0.1	0.1
TR5 to TD3	1.3	1.3	1.3	1.3
TR6 Normal	0.0	0.0	0.0	0.1
TR6 to TR1	0.0	0.0	3.1	6.1
TR6 to TR5_1	0.0	0.0	0.7	0.7
TR6 to TR5_2	0.0	3.6	NA*	NA*
TR6 to TR5_3	0.0	0.0	0.8	0.9
TR6 to TR5_4	0.0	0.4	1.8	2.3

*NISC model analysis failed due to significant voltage drop

Truckee Substation – Summary of Service Transformer Overload Violation

Scenarios	QTY of Service TXs Violation (>150% KVA Rating)			
	Base Case	1-Year	3-Year	5-Year
TR1 Normal	2	2	1	2
TR1 to TR2	2	2	2	2
TR1 to MV4	2	2	2	2
TR1 to TR6	2	2	2	2
TR2 Normal	0	0	0	0
TR2 to TR1	2	2	1	2
TR2 to MV3	0	1	1	2
TR2 to TR3	2	2	2	2
TR3 Normal	2	2	2	2
TR3 to TR2	2	2	2	2
TR3 to TR4	3	3	3	3
TR3 to MV3	2	3	3	4
TR4 Normal	1	1	1	1
TR4 to TR3	3	3	3	3
TR4 to TD3_1	1	1	1	1
TR4 to TD3_2	1	1	1	1
TR4 to MV3	1	2	2	3
TR5 Normal	0	0	1	1
TR5 to TR6_1	0	0	1	1
TR5 to TR6_2	0	0	1	2
TR5 to TR6_3	0	0	1	1
TR5 to TR6_4	0	0	1	1
TR5 to TD3	0	0	1	3
TR6 Normal	0	0	0	0
TR6 to TR1	2	1	2	2
TR6 to TR5_1	0	0	1	1
TR6 to TR5_2	0	0	NA*	NA*
TR6 to TR5_3	0	0	1	1
TR6 to TR5_4	0	0	1	1

*NISC model analysis failed due to significant voltage drop

Truckee Substation – Summary of Protective Device Overload Violation

Scenarios	QTY of Protective Device Violation (>150% KVA Rating)			
	Base Case	1-Year	3-Year	5-Year
TR1 Normal	3	3	2	2
TR1 to TR2	4	8	7	8
TR1 to MV4	11	11	11	11
TR1 to TR6	3	9	18	20
TR2 Normal	0	0	0	3
TR2 to TR1	3	7	7	10
TR2 to MV3	7	20	20	22
TR2 to TR3	2	6	7	11
TR3 Normal	1	2	3	3
TR3 to TR2	2	6	7	10
TR3 to TR4	6	15	15	15
TR3 to MV3	9	23	23	23
TR4 Normal	1	11	11	11
TR4 to TR3	18	27	27	27
TR4 to TD3_1	11	14	14	14
TR4 to TD3_2	13	15	15	15
TR4 to MV3	24	33	40	40
TR5 Normal	7	7	7	9
TR5 to TR6_1	13	15	18	26
TR5 to TR6_2	21	23	28	31
TR5 to TR6_3	13	15	18	26
TR5 to TR6_4	15	17	21	25
TR5 to TD3	14	14	15	15
TR6 Normal	0	2	5	15
TR6 to TR1	3	21	34	36
TR6 to TR5_1	7	15	23	30
TR6 to TR5_2	11	29	NA*	NA*
TR6 to TR5_3	7	15	23	30
TR6 to TR5_4	9	18	32	32

*NISC model analysis failed due to significant voltage drop

Truckee Substation – Summary of Phase Imbalance Violation

Scenarios	Percentage of Phase Imbalance			
	Base Case	1-Year	3-Year	5-Year
TR1 Normal	24.6%	24.8%	14.8%	15.0%
TR1 to TR2	18.7%	13.9%	-	-
TR1 to MV4	12.4%	12.4%	-	-
TR1 to TR6	-	-	-	-
TR2 Normal	12.1%	-	-	-
TR2 to TR1	18.5%	13.6%	-	-
TR2 to MV3	-	-	-	-
TR2 to TR3	10.0%	16.5%	12.9%	-
TR3 Normal	-	25.7%	25.7%	23.2%
TR3 to TR2	10.0%	16.6%	12.9%	-
TR3 to TR4	-	19.2%	19.3%	18.7%
TR3 to MV3	-	-	-	-
TR4 Normal	-	15.1%	15.1%	15.1%
TR4 to TR3	-	18.5%	18.6%	18.0%
TR4 to TD3_1	13.0%	13.1%	13.2%	13.2%
TR4 to TD3_2	13.1%	13.2%	13.3%	13.3%
TR4 to MV3	-	-	-	-
TR5 Normal	19.9%	19.9%	20.0%	19.3%
TR5 to TR6_1	10.5%	-	-	-
TR5 to TR6_2	16.6%	-	-	-
TR5 to TR6_3	10.5%	-	-	-
TR5 to TR6_4	10.9%	-	-	-
TR5 to TD3	21.8%	21.9%	22.1%	21.8%
TR6 Normal	12.9%	-	-	-
TR6 to TR1	-	-	-	-
TR6 to TR5_1	10.5%	-	-	-
TR6 to TR5_2	-	-	NA*	NA*
TR6 to TR5_3	10.5%	-	-	-
TR6 to TR5_4	10.3%	-	-	-

*NISC model analysis failed due to significant voltage drop

Truckee Substation – Summary of Secondary Low Voltage Violation

Scenarios	Qty of Secondary Low Voltage (<114V)			
	Base Case	1-Year	3-Year	5-Year
TR1 Normal	4	4	4	4
TR1 to TR2	4	4	10	17
TR1 to MV4	5	4	10	9
TR1 to TR6	9	9	77	255
TR2 Normal	0	0	0	0
TR2 to TR1	4	4	5	7
TR2 to MV3	65	569	583	679
TR2 to TR3	2	2	28	33
TR3 Normal	2	2	2	2
TR3 to TR2	2	2	31	33
TR3 to TR4	125	343	333	419
TR3 to MV3	250	659	686	772
TR4 Normal	16	47	61	62
TR4 to TR3	196	453	544	522
TR4 to TD3_1	452	713	850	923
TR4 to TD3_2	464	797	955	1051
TR4 to MV3	1456	1562	1593	1593
TR5 Normal	74	87	136	173
TR5 to TR6_1	171	244	326	482
TR5 to TR6_2	1641	1654	1663	1682
TR5 to TR6_3	175	254	338	506
TR5 to TR6_4	498	607	697	921
TR5 to TD3	2550	2588	2667	2689
TR6 Normal	0	0	0	1
TR6 to TR1	41	592	676	839
TR6 to TR5_1	203	365	526	684
TR6 to TR5_2	1067	1274	NA*	NA*
TR6 to TR5_3	209	423	560	752
TR6 to TR5_4	266	1047	1512	1675

*NISC model analysis failed due to significant voltage drop

Martis Valley Substation – Summary of Primary Low Voltage Violation

Scenarios	Primary Low Voltage Violation							
	Base Case		1-Year		3-Year		5-Year	
	Length of Mainline (miles)	The Lowest Voltage(V)	Length of Mainline (miles)	The Lowest Voltage	Length of Mainline (miles)	The Lowest Voltage	Length of Mainline (miles)	The Lowest Voltage
MV1 Normal	0.0	-	0.0	-	0.0	-	0.0	-
MV1 to MV2	1.3	117.9	0.9	117.5	6.5	116.4	7.5	115.3
MV1 to MV3	5.0	115.3	6.8	109.0	8.2	106.4	9.5	106.2
MV2 Normal	0.0	-	0.0	-	0.0	-	1.1	117.1
MV2 to MV1	0.8	117.9	0.9	117.5	6.5	116.4	7.5	115.2
MV3 Normal	2.4	117.0	5.9	110.8	6.3	108.5	6.7	107.6
MV3 to MV1	5.8	115.1	7.0	108.5	13.6	105.5	11.0	105.3
MV3 to DL1	12.0	113.6	14.7	108.7	14.8	106.0	14.8	105.6
MV3 to TR2	2.3	117.1	5.9	111.0	6.2	109.1	6.3	108.2
MV3 to TR3	4.4	116.6	6.2	110.2	6.2	108.7	6.2	108.4
MV3 to TR4	19.0	111.9	21.6	105.2	21.6	103.2	21.7	101.6
MV3 to MV4	10.3	112.0	10.7	101.2	10.5	99.6	11.4	96.3
MV4 Normal	0.0	-	0.0	-	0.0	-	0.0	-
MV4 to TR1	5.7	117.3	1.4	117.8	20.0	116.0	17.9	116.3

Martis Valley Substation – Summary of Primary Conductor Overload Violation

Scenarios	Length of Primary Conductor Overload Violation (miles)			
	Base Case	1-Year	3-Year	5-Year
MV1 Normal	0.0	0.0	0.0	0.0
MV1 to MV2	0.0	0.0	0.0	0.4
MV1 to MV3	0.0	0.5	0.5	0.5
MV2 Normal	0.0	0.0	0.0	0.0
MV2 to MV1	0.0	0.0	0.0	0.4
MV3 Normal	0.0	0.1	0.5	0.5
MV3 to MV1	0.0	0.5	0.9	0.9
MV3 to DL1	0.0	0.6	0.6	0.6
MV3 to TR2	0.0	0.1	0.6	0.6
MV3 to TR3	0.0	0.3	1.3	1.3
MV3 to TR4	0.8	2.5	2.8	2.8

MV3 to MV4	0.5	1.6	1.6	3.4
MV4 Normal	0.0	0.0	0.0	0.0
MV4 to TR1	0.0	0.0	0.0	0.0

Martis Valley Substation – Summary of Service Transformer Violation

Scenarios	QTY of Service TXs Violation (>150% KVA Rating)			
	Base Case	1-Year	3-Year	5-Year
MV1 Normal	0	0	0	0
MV1 to MV2	1	1	2	2
MV1 to MV3	0	1	1	2
MV2 Normal	1	1	2	2
MV2 to MV1	1	1	2	2
MV3 Normal	0	1	1	2
MV3 to MV1	0	1	1	2
MV3 to DL1	0	1	1	2
MV3 to TR2	0	1	1	2
MV3 to TR3	2	3	3	4
MV3 to TR4	1	2	2	3
MV3 to MV4	0	1	1	2
MV4 Normal	0	0	0	0
MV4 to TR1	2	2	2	2

Martis Valley Substation – Summary of Protective Device Overload Violation

Scenarios	QTY of Protective Device Overload Violation (>100% Rating)			
	Base Case	1-Year	3-Year	5-Year
MV1 Normal	0	0	1	1
MV1 to MV2	6	8	12	27
MV1 to MV3	5	20	21	21
MV2 Normal	6	8	10	25
MV2 to MV1	7	9	13	28
MV3 Normal	4	19	19	19
MV3 to MV1	7	23	25	25
MV3 to DL1	13	17	18	19
MV3 to TR2	7	23	23	23
MV3 to TR3	12	28	29	29
MV3 to TR4	22	28	29	30
MV3 to MV4	9	25	25	29

MV4 Normal	0	0	1	1
MV4 to TR1	12	12	12	12

Martis Valley Substation – Summary of Phase Imbalance Violation

Scenarios	Percentage of Phase Imbalance			
	Base Case	1-Year	3-Year	5-Year
MV1 Normal	14.4%	14.5%	-	-
MV1 to MV2	16.0%	14.0%	-	-
MV1 to MV3	-	-	-	-
MV2 Normal	20.0%	16.9%	14.7%	12.6%
MV2 to MV1	16.0%	14.0%	-	-
MV3 Normal	-	-	-	-
MV3 to MV1	-	-	-	-
MV3 to DL1	14.1%	-	-	-
MV3 to TR2	-	-	-	-
MV3 to TR3	-	-	-	-
MV3 to TR4	-	-	-	-
MV3 to MV4	-	-	-	-
MV4 Normal	-	-	-	-
MV4 to TR1	12.5%	12.4%	-	-