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PROJECT NO. 55999

CY 2024 REPORTS OF THE ELECTRIC RELABILITY COUNCIL OF TEXAS	§ § §	**PUBLIC UTILITY COMMISSION OF TEXAS**

ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.'S NOTICE OF ENDORSEMENT OF A TIER 1 TRANSMISSION PROJECT

Pursuant to ERCOT Protocol Section 3.11.4.9(1), Electric Reliability Council of Texas, Inc. (ERCOT) files this Notice of ERCOT's acceptance of a Tier 1 transmission project submitted by Texas-New Mexico Power, as reflected in Attachments A and B. Texas-New Mexico Power is the ERCOT-registered Transmission Service Provider (TSP) responsible for the transmission project. ERCOT is prepared to provide the Commission with any additional information it may request regarding this matter.

Dated: January 9, 2024

Respectfully Submitted,

/s/ Katherine Gross

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Attachment A

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January 9, 2024

Mr. Vincent Roberts
Director of System Engineering
TNMP
2641 E. Hwy 6
Alvin, TX 77511

Mr. Eithar Nashawati
Director, Asset Planning
Oncor Electric Delivery
2233-B Mountain Creek PKWY
Dallas, TX 75211-6716

RE: Silverleaf and Cowpen 345/138-kV Stations Project

Dear Mr. Roberts and Mr. Nashawati:

On December 19, 2023, the Electric Reliability Council of Texas (ERCOT) Board of Directors endorsed the following Tier 1 transmission project in accordance with ERCOT Protocol Section 3.11.4:

Silverleaf and Cowpen 345/138-kV Stations Project:

- Construct a new 345-kV New Substation 1, nearby the existing Cedarvale 138-kV substation. The New Substation 1 will be designed in a breaker-and-a-half configuration and interconnected by cutting the station into the planned North McCamey – Sand Lake 345-kV double-circuit transmission line. The existing Cedarvale substation is currently owned by TNMP. The existing North McCamey substation is currently owned by LCRA TSC. The existing Sand Lake substation is currently owned by Oncor.
- Construct a new Silverleaf 345/138-kV station, nearby the New Substation 1. The Silverleaf 345/138-kV station includes:
  - Three 345/138-kV transformers, each with normal/emergency ratings of at least 668/750 MVA.
  - A high side breaker with breaker disconnect switches for each of the three 345/138-kV transformers. No bus bar connections between the high sides of the three transformers (bus connections between the high sides of the three transformers to be established at the 345-kV New Substation 1).
  - 138-kV switchyard to be designed in a breaker-and-a-half configuration.
- Silverleaf 345/138-kV station to be interconnected as follows:
  - Extend 345-kV tie-lines from the high sides of the three Silverleaf 345/138-kV transformers to positions within the 345-kV New Substation 1 (total of three 345-kV tie lines). The three 345-kV tie-lines will be on separate structures, with a normal and emergency rating of at least 1793 MVA per tie-line.
  - Loop the existing Cedarvale – Pecos 138-kV transmission line #1 into the new Silverleaf 138-kV station. The line extensions are estimated at approximately 0.4 miles each and will require new Rights of Way (ROW). The existing Pecos substation is currently owned by TNMP.

- Loop the existing Cedarvale – Pecos 138-kV transmission line #2 into the new Silverleaf 138-kV station. The line extensions are estimated at approximately 1.2 miles each and will require new ROW.
- Loop the existing Cedarvale – Bone Springs 138-kV transmission line into the new Silverleaf 138-kV station. The line extensions are estimated at approximately 0.6 miles each and will require new ROW. The existing Bone Springs substation is currently owned by TNMP.

- Construct a new 345-kV New Substation 2, approximately 13 miles south of the existing Sand Lake 345/138-kV station. The New Substation 2 will be designed in a breaker-and-a-half configuration and interconnected by cutting the station into the existing Sand Lake – Solstice 345-kV double-circuit transmission line. The existing Solstice substation is currently owned by AEP.
- Construct a new Cowpen 345/138-kV station nearby the New Substation 2. The Cowpen 345/138-kV station includes:
  - Two 345/138-kV transformers, each with normal/emergency ratings of at least 668/750 MVA.
  - A high side breaker with breaker disconnect switches for each of the two 345/138-kV transformers. No bus bar connections between the high sides of the two transformers (bus connections between the high sides of the two transformers to be established at the 345-kV New Substation 2).
  - 138-kV switchyard to be designed in a breaker-and-a-half configuration.
- Cowpen 345/138-kV station to be interconnected as follows:
  - Extend 345-kV tie-lines from the high sides of the two Cowpen 345/138-kV transformers to positions within the 345-kV New Substation 2 (total of two 345-kV tie lines). The two 345-kV tie-lines will be on separate structures, with a normal and emergency rating of at least 1793 MVA per tie-line.
  - Loop the existing IH20 – Salt Draw 138-kV transmission line into the new Cowpen 138-kV station. The line extensions are estimated at approximately 6.8 miles each and will require new ROW. The existing IH20 and Salt Draw substations are currently owned by TNMP.
  - Loop the existing Birds of Prey Tap – Harpoon Tap 138-kV transmission line into the new Cowpen 138-kV station. The line extensions are estimated at approximately 0.3 miles each and will require new ROW. The existing Birds of Prey Tap and Harpoon Tap are currently owned by TNMP.

Should you have any questions please contact me at any time.

Sincerely,

Kristi A Hobbs

Kristi Hobbs
Vice President, System Planning and Weatherization
Electric Reliability Council of Texas

cc:

Pablo Vegas, ERCOT
Woody Rickerson, ERCOT
Prabhu Gnanam, ERCOT
Robert Golen, ERCOT
Brandon Gleason, ERCOT

Silverleaf and Cowpen 345-138 kV Stations Project

June 2023

Table of Contents

1 Executive Summary

TNMP proposes the Silverleaf and Cowpen stations project, which encompasses the following specific system upgrade components. Proposed facility ratings are provided below in Table E-1.

1. 345 kV support nearby TNMP Cedarvale substation.
   a. Oncor to construct a 345 kV switching station nearby TNMP Cedarvale substation. The new Oncor 345 kV switching station will be designed in a breaker-and-a-half configuration and interconnected by cutting the station into the planned North McCamey – Sand Lake 345 kV double circuit transmission line.
   b. TNMP to construct the Silverleaf 345-138 kV station nearby the new Oncor 345 kV switching station. Notable features of the proposed Silverleaf 345-138 kV station include:
      i. Three 345-138 kV transformers, each with a 750 MVA top rating.
      ii. A high side breaker with breaker disconnect switches for each of the three 345-138 kV transformers. No bus bar connections between the high sides of the three transformers (bus connections between the high sides of the three transformers to be established at the new Oncor 345 kV switching station).
      iii. 138 kV switchyard to be designed in a breaker-and-a-half configuration, with the 345-138 kV transformers occupying three positions within the 138 kV bus arrangement.
   c. Silverleaf 345-138 kV station to be interconnected as follows:
      i. Extend 345 kV tie-lines from the high sides of the three Silverleaf 345-138 kV transformers to positions within the new Oncor 345 kV switching station (total of three 345 kV tie-lines). There will be steady state loading issues within the local system associated with concurrent outage of all three tie-lines, so it is critical from a reliability standpoint that the three tie-lines do not share structures.
      ii. Existing Cedarvale – Pecos 138 kV line #1 bisected with both resultant lines extended to occupy two line terminals within the new Silverleaf 138 kV bus.
      iii. Existing Cedarvale – Pecos 138 kV line #2 bisected with both resultant lines extended to occupy two additional line terminals within the new Silverleaf 138 kV bus.
      iv. Existing Cedarvale – Bone Springs 138 kV line bisected with both resultant lines extended to occupy two additional line terminals within the new Silverleaf 138 kV bus.
2. 345 kV support nearby TNMP IH20 substation.
   a. Oncor to construct an additional 345 kV switching station, designed in a breaker-and-a-half configuration and interconnected by cutting the station into the existing Sand Lake – Solstice 345 kV double circuit transmission line.
   b. TNMP to construct the Cowpen 345-138 kV station nearby the additional Oncor 345 kV switching station. Notable features of the proposed Cowpen 345-138 kV station include:
      i. Two 345-138 kV transformers, each with a 750 MVA rating.

ii. A high side breaker with breaker disconnect switches for each of the two 345-138 kV transformers. No bus bar connections between the high sides of the two transformers (bus connections between the high sides of the two transformers to be established at the additional Oncor 345 kV switching station).

iii. 138 kV switchyard to be designed in a breaker-and-a-half configuration, with the 345-138 kV transformers occupying two positions within the 138 kV bus arrangement.

c. Cowpen switching station to be interconnected as follows:

   i. Extend 345 kV tie-lines from the high sides of the two Cowpen 345-138 kV transformers to positions within the additional Oncor 345 kV switching station (total of two 345 kV tie-lines).

   ii. Existing IH20 – Salt Draw 138 kV line bisected with both resultant lines extended to occupy two line terminals within the new Cowpen 138 kV bus. The line extensions are estimated at approximately 7 miles each.

   iii. Existing Birds of Prey Tap – Harpoon Tap 138 kV line section bisected with both resultant lines extended on double circuit structures to occupy two additional line terminals within the new Cowpen 138 kV bus. The line extensions are estimated at approximately 0.25 miles each.

Table E-1: Proposed Facility Ratings

Facility	Ratings (MVA)	
	Normal	Emergency
345 kV line terminations for Sand Lake and North McCamey DCKT lines into Oncor-owned station nearby TNMP Cedarvale	2988	2988
Each of the three 345 kV tie-lines between Oncor-owned station nearby TNMP Cedarvale and Silverleaf 345-138 kV station	1793	1793
Each of the three 345-138 kV transformers at Silverleaf 345-138 kV station	668	750
All 138 kV lines to be terminated at Silverleaf station	717	717
345 kV line terminations for Sand Lake and Solstice DCKT lines into Oncor-owned station nearby TNMP IH20	2988	2988
Each of the two 345 kV tie-lines between Oncor-owned station nearby TNMP IH20 and Cowpen 345-138 kV station	1793	1793
Each of the two 345-138 kV transformers at Cowpen 345-138 kV station	668	750
All existing 138 kV lines to be bisected and terminated at Cowpen station	409 (New terminations will be 717 MVA, existing lines to be cut in will remain at 409 MVA)	409 (New terminations will be 717 MVA, existing lines to be cut in will remain at 409 MVA)

The Silverleaf and Cowpen stations project will address numerous steady state system performance deficiencies within a specific area of TNMP's Far West Texas transmission system driven by recent commitments to serve a significant amount of new load.

TNMP's studies indicate the project resolves the targeted steady state system performance issues without introducing stability-related system performance deficiencies. Moreover, the stability study results generally indicate incremental improvements in stability performance where change case results differ from benchmark results.

The short circuit study results indicate the project will not result in any fault interrupt rating exceedances for transmission breakers located within the study area.

TNMP's topology check indicates the proposed Silverleaf and Cowpen station projects do not result in any new or shorter paths between existing generation resources and series capacitors. For any existing paths between resources and series capacitors that would be altered by construction of the 345-138 kV ties proposed herein, the path alterations would be limited to lengthening of the affected path. Therefore, no further SSR analysis is needed for the proposed 345-138 kV projects.

This will be a Tier 1 project with an estimated capital cost of $299 million. CCNs will be required for portions of the project. The estimated in-service date is June 2027.

Pursuant to PUCT rule 25.101.(b).(3).(D), *Projects deemed critical to reliability*, TNMP is requesting ERCOT designate the facilities proposed herein as critical to the reliability of the system to provide for expedited processing of associated transmission line applications by the commission.

2 *Introduction*

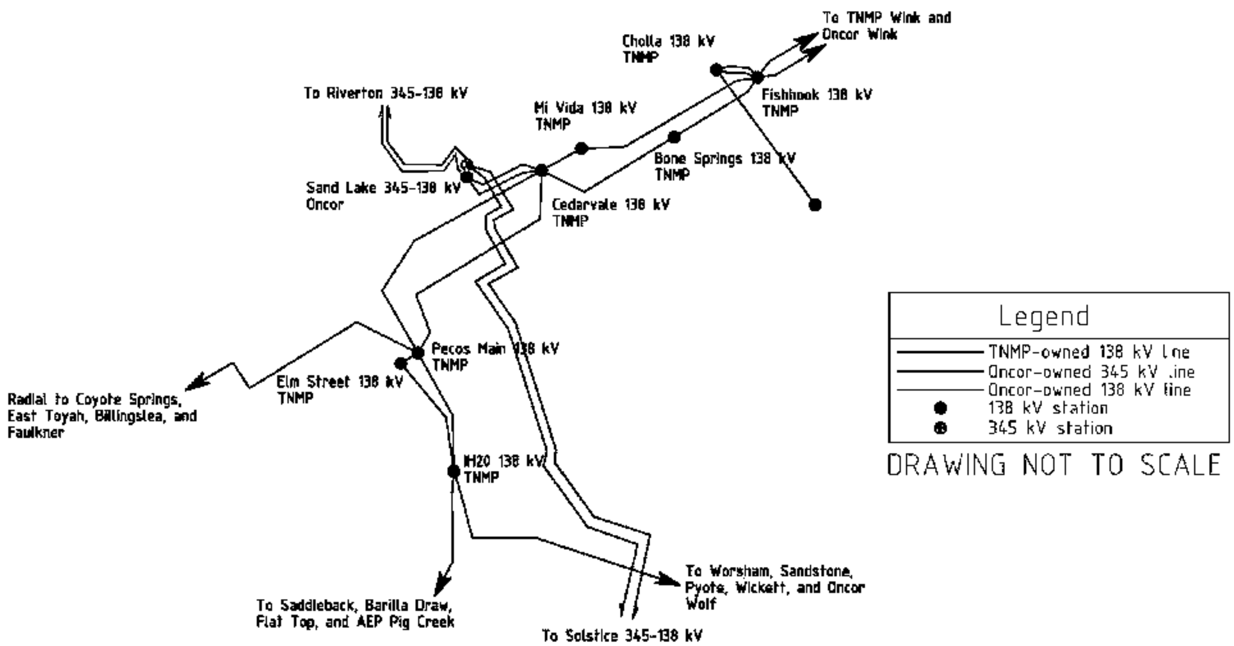
TNMP serves a considerable amount of load concentrated within its service territories located in Winkler, Ward, Reeves, and Pecos counties. The current peak load forecast for this area for year 2023 sits at about 2.6 GW. This load is composed of approximately 54% datacenter/crypto mining, 41% oil field-related, and 4% residential/commercial.

A recent significant surge in the datacenter/crypto mining portion of this load has consumed all available transmission capacity that, up until early 2022, was in excess of minimum capacity required to maintain transmission reliability as set forth in the NERC TPL-001 Reliability Standard and Section 4 of the ERCOT Planning Guide. Furthermore, TNMP has contractual commitments in place to serve an additional 1.477 GW datacenter/crypto mining load, which will obviously require system upgrades to serve the additional load reliably.

TNMP's steady state analyses have revealed significant transfer limitations attributed to 713 MW of the additional 1.477 GW datacenter/crypto mining load, within a specific area of the system starting from Oncor's Sand Lake station, through TNMP's 138 kV transmission network in Reeves and Ward counties, and to loads directly served by those facilities. A diagram of the transmission system relevant to this RPG submittal is included below in figure 2-1.

This report presents a preferred solution along with consideration of alternatives to address the identified system performance issues. This report also outlines the methodology and study results supporting TNMP's system improvement recommendations.

Figure 2-1: TNMP and Adjoining Transmission System Relevant to this RPG Submittal



3 System Performance Issues

3.1 Load Increases Driving the System Performance Issues

TNMP has conducted numerous FAC-002 studies over the last year-and-a-half in response to requests to serve new datacenter/crypto mining load within the far West Texas region. Through its FAC-002 study processes, TNMP ascertained a significant portion of the requested load could be accommodated upon implementation of (a) numerous Tier 4 system upgrades within TNMP's transmission systems and (b) system improvement projects external to TNMP transmission systems which recently have been endorsed by the RPG or are currently being reviewed by the RPG. Nonetheless, significant system upgrades not previously submitted and reviewed by the RPG are required to reliably accommodate all the requested load.

There is approximately 713 MW contracted new load associated with the system improvements presented in Section 4 of this report. Table 3-1 provides detail on the locations of the new loads in terms of station points of delivery/PSSE bus numbers, what portions of each load can be accommodated upon completion of Tier 4 projects/recently endorsed/currently under review RPG projects, and the remaining portions of load requiring the system upgrades presented in Section 4 of this report.

Table 3-1: New Load Locations Relevant to this RPG Submittal and Integration Outlook

Point of Delivery (Station Name)	PSSE Bus #	Total Load Requested (MW)	Amount of Load Which can be Accommodated Either Immediately or Upon Completion of Committed System Improvement Projects[a] (MW)	Remaining Amount of Load Requiring Completion of RPG Projects as Set Forth in Section 4 (MW)
Pyote	38001	300	50	0[b]
Worsham	38021	10	10	0
Collie Field	38038	150	0	150
County Road	38047	15	15	0
Saddleback	38058	35	35	0
Flat Top	38069	17	17	0
Coyote Springs	38113	5	5	0
Faulkner	38124	300	42	0[c]
Cedarvale	38145	700	397	303
Lone Star	38190	300	300	0
Cholla	38195	300	23	0[d]
Tarbush	38295	300	40	260
	Total	**2432**	**934**[1]	**713**

a. The meaning of committed system improvement projects is (a) Tier 4 projects and (b) RPG projects that recently have been endorsed or are currently under review.
b. The requestor has revised the load request from the original 300 MW down to 50 MW.
c. The requestor has revised the load request from the original 300 MW down to 42 MW.
d. The requestor has revised the load request from the original 300 MW down to 23 MW.

3.2 Planning Criteria Violations

The planning criteria violations presented herein are based on the year 2027 summer peak and 2024 minimum load cases available in the ERCOT 2021[2] RTP case set with the datacenter/crypto mining loads listed in the last two columns of Table 3-1 added to the cases. Please refer to Section 5.1 for details on the steady state models and methodology utilized in the development of this RPG submittal.

The planning criteria violation/contingency pairs TNMP proposes to address via the recommended system upgrades detailed in Section 4.1 are listed below in Tables 3-2, 3-3, and 3-4.

[1] The 934 MW number provided above may vary depending on the case one uses to derive the quantity. The number provided above was ascertained using the 2025 summer peak case from the SSWG case set dated February 2022, modified during FAC-002 study processes to include various system improvement projects that have now become committed. Considering the significant variability of load modeled from one SSWG data set to the next, using any other case with consideration of case load limited only to the load information provided above could yield results that do not align with the result documented above.

[2] TNMP utilized the finalized 2021 RTP cases for the analyses as opposed to the 2022 RTP cases due to the timing of starting the analyses, which was prior to the 12/22/22 finalization date of the 2022 RTP cases. Nonetheless, TNMP performed a comparison of the study area loads and network models between the cases TNMP conditioned for the analyses and the relevant 2022 RTP cases to ensure accurate, up-to-date modeling of the study area. The results of the comparison indicate there are no differences that would invalidate the study findings herein. The only significant modeling differences between the study areas is appearance of new projects within the 2022 RTP cases (e.g., the Cholla 345 kV interconnection). However, differences such as these are not an issue as TNMP would have removed the subject new projects anyway from the 2022 RTP cases had those cases been used for the analyses considering one of the primary points of the analyses was to determine optimized solutions in view of the load forecast being revised lower after the 2022 RTP study had already started.

Table 3-2: Planning Criteria Violation/Single Element Contingency Pairs Relevant to This RPG Submittal

Case	Category	Contingency	Criteria Violation
Peak	P1.2	Cedarvale – Sand Lake 138 kV line #2	Cedarvale – Sand Lake 138 kV line #1 loads to 106% of 614 MVA rating
Off-Peak	P1.2	Cedarvale – Sand Lake 138 kV line #2	Cedarvale – Sand Lake 138 kV line #1 loads to 142% of 614 MVA rating
Peak	P1.2	Cedarvale – Sand Lake 138 kV line #1	Cedarvale – Sand Lake 138 kV line #2 loads to 107% of 614 MVA rating
Off-Peak	P1.2	Cedarvale – Sand Lake 138 kV line #1	Cedarvale – Sand Lake 138 kV line #2 loads to 143% of 614 MVA rating
Peak	P1.3	Sand Lake 345-138 kV transformer #2	Sand Lake 345-138 kV transformer #1 loads to 111% of 750 MVA rating
Off-Peak	P1.3	Sand Lake 345-138 kV transformer #2	Sand Lake 345-138 kV transformer #1 loads to 102% of 750 MVA rating
Peak	P1.3	Sand Lake 345-138 kV transformer #1	Sand Lake 345-138 kV transformer #2 loads to 111% of 750 MVA rating
Off-Peak	P1.3	Sand Lake 345-138 kV transformer #1	Sand Lake 345-138 kV transformer #2 loads to 103% of 750 MVA rating

Table 3-3: Unique[a] Planning Criteria Violation/Multiple Element Contingency Pairs Relevant to This RPG Submittal

Case	Category[b]	Contingency	Criteria Violation
Off-Peak	ERCOT PG4 PGRR098	**Redacted**	**Redacted**
Off-Peak	ERCOT PG4 PGRR098	Staghorn – Sandstone 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Flat Top – Foxtail loads to 129% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Sandstone – Reward Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Flat Top – Foxtail loads to 121% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Worsham – Reward Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Flat Top – Foxtail loads to 116% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Worsham – Harpoon Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Flat Top – Foxtail loads to 108% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Harpoon Tap – Birds of Prey Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Flat Top – Foxtail loads to 106% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Birds of Prey Tap – Collie Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Flat Top – Foxtail loads to 100% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Staghorn – Sandstone 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Barilla Draw – Flat Top loads to 120% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Sandstone – Reward Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Barilla Draw – Flat Top loads to 112% of 409 MVA rating

Table 3-3: Unique[a] Planning Criteria Violation/Multiple Element Contingency Pairs Relevant to This RPG Submittal

Case	Category[b]	Contingency	Criteria Violation
Off-Peak	ERCOT PG4 PGRR098	Worsham – Reward Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Barilla Draw – Flat Top loads to 107% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Staghorn – Sandstone 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Saddleback – Barilla Draw loads to 114% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Sandstone – Reward Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Saddleback – Barilla Draw loads to 106% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Worsham – Reward Tap 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Saddleback – Barilla Draw loads to 101% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Flat Top - Foxtail 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Staghorn – Sandstone 138 kV loads to 131% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Barilla Draw – Flat Top 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Staghorn – Sandstone 138 kV loads to 117% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Saddleback – Barilla Draw 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Staghorn – Sandstone 138 kV loads to 111% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Flat Top - Foxtail 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Sandstone – Reward Tap 138 kV loads to 124% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Barilla Draw – Flat Top 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Sandstone – Reward Tap 138 kV loads to 111% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Saddleback – Barilla Draw 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Sandstone – Reward Tap 138 kV loads to 105% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Flat Top - Foxtail 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Worsham – Reward Tap 138 kV loads to 121% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Barilla Draw – Flat Top 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Worsham – Reward Tap 138 kV loads to 108% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Saddleback – Barilla Draw 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Worsham – Reward Tap 138 kV loads to 101% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Flat Top - Foxtail 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Worsham – Harpoon Tap 138 kV loads to 116% of 409 MVA rating

Table 3-3: Unique[a] Planning Criteria Violation/Multiple Element Contingency Pairs Relevant to This RPG Submittal

Case	Category[b]	Contingency	Criteria Violation
Off-Peak	ERCOT PG4 PGRR098	Barilla Draw – Flat Top 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Worsham – Harpoon Tap 138 kV loads to 103% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Flat Top - Foxtail 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Harpoon Tap – Birds of Prey Tap 138 kV loads to 115% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Barilla Draw – Flat Top 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Harpoon Tap – Birds of Prey Tap 138 kV loads to 102% of 409 MVA rating
Off-Peak	ERCOT PG4 PGRR098	Flat Top - Foxtail 138 kV in combination with DCKT loss of IH20 – Pecos 138 kV and IH20 – Elm Street 138 kV	Birds of Prey Tap – Collie Tap 138 kV loads to 111% of 409 MVA rating

a The intended meaning of unique planning criteria violation/multiple element contingency pairs is one in which the planning criteria violation is unique to the multiple element contingency to the extent that the planning criteria violation does not appear under single loss of any element comprising the multiple element contingency definition.

b Because it is generally not possible, or difficult at best, to justify investment in RPG-level projects based on those planning events for which non-consequential load loss is allowed pursuant to the NERC TPL-001 Reliability Standard and all extreme events, the multiple-element contingencies included in this table are limited only to those planning events for which non-consequential load loss is not allowed and all ERCOT Planning Guide Section 4 events that result in unique planning criteria violations as a result of addition of the 713 MW load discussed in Section 3.1. This in no way is an indication that the transmission improvement solutions presented herein fall short of mitigating all planning event system performance deficiencies resulting from the load addition, including those planning events where non-consequential load loss is permitted.

Table 3-4: Reiterative[c] Planning Criteria Violation/Multiple Element Contingency Pairs Relevant to This RPG Submittal

Case	Category	Contingency	Criteria Violation
Peak	ERCOT PG4	Sand Lake 345-138 kV transformer #2 in combination with Sand Lake – Riverton 345 kV	Sand Lake 345-138 kV transformer #1 loads to 120% of 750 MVA rating
Off-Peak	ERCOT PG4	Sand Lake 345-138 kV transformer #2 in combination with Sand Lake – Riverton 345 kV	Sand Lake 345-138 kV transformer #1 loads to 91% of 750 MVA rating
Peak	ERCOT PG4	Sand Lake 345-138 kV transformer #1 in combination with Sand Lake – Riverton 345 kV	Sand Lake 345-138 kV transformer #2 loads to 120% of 750 MVA rating
Off-Peak	ERCOT PG4	Sand Lake 345-138 kV transformer #1 in combination with Sand Lake – Riverton 345 kV	Sand Lake 345-138 kV transformer #2 loads to 91% of 750 MVA rating

c The intended meaning of reiterative planning criteria violation/multiple element contingency pair is one in which the planning criteria is not unique to the multiple element contingency to the extent that the planning criteria violation also appears under single loss of one or more single elements comprising the multiple element contingency definition. Table 3-4 does not contain an exhaustive list of reiterative planning criteria violation/multiple element contingency pairs, only those specified per stakeholder request.

4 Solution Discussion

Through steady state system performance testing, TNMP has confirmed the preferred solution and the alternative presented in this section yield sufficient system performance characteristics across all TPL-001 planning events and ERCOT Planning Guide Section 5 events (without the need for non-consequential load loss for those planning events where non-consequential load loss is permitted).

4.1 Preferred Solution

TNMP's preferred solution to address the system performance issues listed in Section 3.2 consists of the following elements.

1. 345 kV support nearby TNMP Cedarvale substation.
   a. Oncor to construct a 345 kV switching station nearby TNMP Cedarvale substation. The new Oncor 345 kV switching station will be designed in a breaker-and-a-half configuration and interconnected by cutting the station into the planned North McCamey – Sand Lake 345 kV double circuit transmission line.
   b. TNMP to construct the Silverleaf 345-138 kV station nearby the new Oncor 345 kV switching station. Notable features of the proposed Silverleaf 345-138 kV station include:
      i. Three 345-138 kV transformers, each with a 750 MVA top rating.
      ii. A high side breaker with breaker disconnect switches for each of the three 345-138 kV transformers. No bus bar connections between the high sides of the three transformers (bus connections between the high sides of the three transformers to be established at the new Oncor 345 kV switching station).
      iii. 138 kV switchyard to be designed in a breaker-and-a-half configuration, with the 345-138 kV transformers occupying three positions within the 138 kV bus arrangement.
   c. Silverleaf 345-138 kV station to be interconnected as follows:
      i. Extend 345 kV tie-lines from the high sides of the three Silverleaf 345-138 kV transformers to positions within the new Oncor 345 kV switching station (total of three 345 kV tie-lines). There will be steady state loading issues within the local system associated with concurrent outage of all three tie-lines, so it is critical from a reliability standpoint that the three tie-lines do not share structures.
      ii. Existing Cedarvale – Pecos 138 kV line #1 bisected with both resultant lines extended to occupy two line terminals within the new Silverleaf 138 kV bus.
      iii. Existing Cedarvale – Pecos 138 kV line #2 bisected with both resultant lines extended to occupy two additional line terminals within the new Silverleaf 138 kV bus.
      iv. Existing Cedarvale – Bone Springs 138 kV line bisected with both resultant lines extended to occupy two additional line terminals within the new Silverleaf 138 kV bus.
2. 345 kV support nearby TNMP IH20 substation.
   a. Oncor to construct an additional 345 kV switching station, designed in a breaker-and-a-half configuration and interconnected by cutting the station into the existing Sand Lake – Solstice 345 kV double circuit transmission line.
   b. TNMP to construct the Cowpen 345-138 kV station nearby the additional Oncor 345 kV switching station. Notable features of the proposed Cowpen 345-138 kV station include:
      i. Two 345-138 kV transformers, each with a 750 MVA rating.

   ii. A high side breaker with breaker disconnect switches for each of the two 345-138 kV transformers. No bus bar connections between the high sides of the two transformers (bus connections between the high sides of the two transformers to be established at the additional Oncor 345 kV switching station).
   iii. 138 kV switchyard to be designed in a breaker-and-a-half configuration, with the 345-138 kV transformers occupying two positions within the 138 kV bus arrangement.

c. Cowpen switching station to be interconnected as follows:
   i. Extend 345 kV tie-lines from the high sides of the two Cowpen 345-138 kV transformers to positions within the additional Oncor 345 kV switching station (total of two 345 kV tie-lines).
   ii. Existing IH20 – Salt Draw 138 kV line bisected with both resultant lines extended to occupy two line terminals within the new Cowpen 138 kV bus. The line extensions are estimated at approximately 7 miles each.
   iii. Existing Birds of Prey Tap – Harpoon Tap 138 kV line section bisected with both resultant lines extended on double circuit structures to occupy two additional line terminals within the new Cowpen 138 kV bus. The line extensions are estimated at approximately 0.25 miles each.

A drawing of the preferred solution is provided below in Figure 4-1. Estimated costs for the preferred solution are included below in Table 4-1.

Figure 4-1: Preferred Solution Illustration

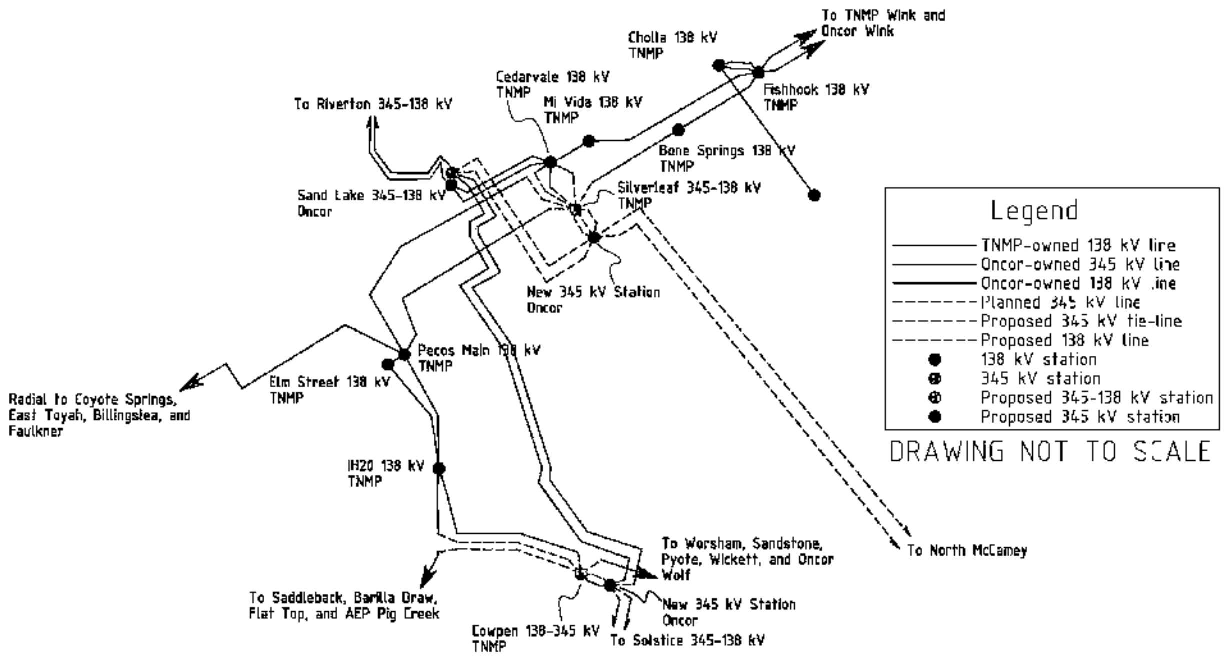


Table 4-1: Preferred Solution Estimated Cost

Item	Estimated Cost
Oncor costs for 345 kV station nearby Cedarvale, 345 kV cut-in, three 345 kV tie-lines to TNMP Silverleaf	$52,150,000[3]
TNMP costs for new Silverleaf 345-138 kV station with three 345-138 kV transformers, terminate three 345 kV tie-lines from new Oncor station, and 138 kV line cut-ins to Silverleaf	$115,033,000
Oncor costs for 345 kV station nearby IH20, 345 kV cut-in, two 345 kV tie-lines to TNMP Cowpen	$46,738,000
TNMP costs for new Cowpen 345-138 kV station with two 345-138 kV transformers, terminate two 345 kV tie-lines from new Oncor station, and 138 kV line cut-ins to Cowpen	$84,777,000
Preferred Solution Total	**$298,698,000**

4.2 Alternative

The following alternative is a strong contender to the preferred solution.

1. Same upgrades for Cedarvale area as proposed in the Preferred Solution.
2. 345 kV support nearby TNMP IH20 substation.
    a. Oncor to construct an additional 345 kV switching station, designed in a breaker-and-a-half configuration and interconnected by cutting the station into the existing Sand Lake – Solstice 345 kV double circuit transmission line.

[3] Estimated by TNMP. Cost figure shown subject to change after Oncor's review and comment.

b. TNMP to construct the Cowpen 345-138 kV station nearby the additional Oncor 345 kV switching station. Notable features of the proposed Cowpen 345-138 kV station include:

   i. Two 345-138 kV transformers, each with a 750 MVA rating.

   ii. A high side breaker with breaker disconnect switches for each of the two 345-138 kV transformers. No bus bar connections between the high sides of the two transformers (bus connections between the high sides of the two transformers to be established at the additional Oncor 345 kV switching station).

   iii. 138 kV switchyard to be designed in a breaker-and-a-half configuration, with the 345-138 kV transformers occupying two positions within the 138 kV bus arrangement.

c. Cowpen switching station to be interconnected as follows:

   i. Extend 345 kV tie-lines from the high sides of the two Cowpen 345-138 kV transformers to positions within the additional Oncor 345 kV switching station (total of two 345 kV tie-lines).

   ii. Existing IH20 – Salt Draw 138 kV line bisected with both resultant lines extended to occupy two line terminals within the new Cowpen 138 kV bus. The line extensions are estimated at approximately 6 miles each.

   iii. Existing IH20 - Collie 138 kV line bisected with both resultant lines extended to occupy two additional line terminals within the new Cowpen 138 kV bus. The line extensions are estimated at approximately 6 miles each.

A drawing of the alternative is provided below in Figure 4-2. Estimated costs for the alternative are included in Table 4-2.

Figure 4-2: Alternative Illustration

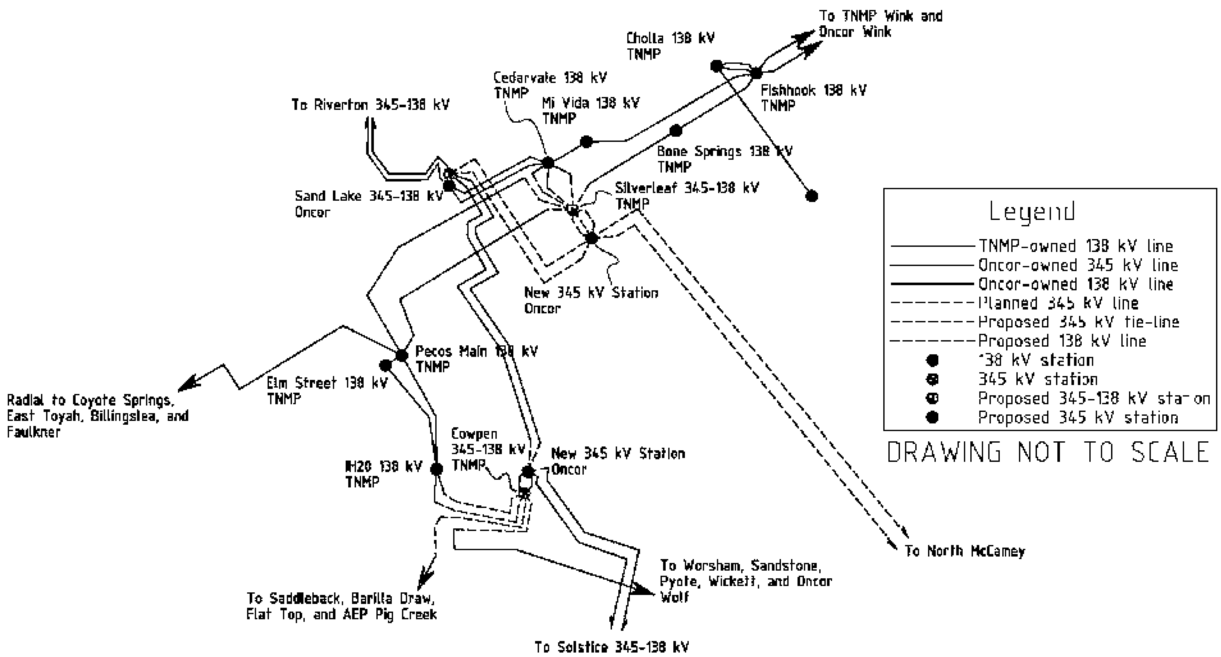


Table 4-2: Alternative Estimated Cost

Item	Estimated Cost
Oncor costs for 345 kV station nearby Cedarvale, 345 kV cut-in, three 345 kV tie-lines to TNMP Silverleaf	$52,150,000
TNMP costs for new Silverleaf 345-138 kV station with three 345-138 kV transformers, terminate three 345 kV tie-lines from new Oncor station, and 138 kV line cut-ins to Silverleaf	$115,033,000
Oncor costs for 345 kV station nearby IH20, 345 kV cut-in, two 345 kV tie-lines to TNMP Cowpen	$46,738,000
TNMP costs for new Cowpen 345-138 kV station with two 345-138 kV transformers, terminate two 345 kV tie-lines from new Oncor station, and 138 kV line cut-ins to Cowpen	$97,444,000
Alternative Total	**$311,365,000**

4.3 Consideration of Other Alternatives

4.3.1 Silverleaf Alternatives

Viable alternatives to the Silverleaf part of the preferred solution are limited due to the large size of the new load being integrated and the portion of that new load that is located at or nearby TNMP Cedarvale station. Subsequently, one feature any feasible solution must necessarily incorporate is a new 345 kV interconnection at or close by to TNMP's Cedarvale 138 kV bus. In the absence of such feature, it would be necessary to (a) substantially increase the 345-138 kV transformation capacity at Oncor's Sand Lake station by adding 345-138 kV transformers at Sand Lake and (b) construct numerous new 138 kV lines between Oncor Sand Lake and TNMP Cedarvale stations to allow for reliable transfers from Sand Lake to Cedarvale and other nearby TNMP load-serving points. At least three additional 345-138 kV transformers would be needed at Sand Lake station for this approach, bringing the total number of Sand Lake transformers to five, which perhaps renders the approach impractical.

One seemingly viable alternative to the system upgrades proposed at Silverleaf, the fundamental difference from the preferred solution being the 345 kV delivery method to Silverleaf, consists of the following features:

1. New Silverleaf 345-138 kV station similar to the Preferred Solution but with a 345 kV bus configured in a breaker-and-a-half arrangement suitable to terminate three incoming 345 kV transmission lines.
2. In lieu of sourcing the 345 kV side of Silverleaf from tapping the planned Sand Lake – North McCamey 345 kV double circuit, source the 345 kV side of Silverleaf from three transmission lines originating from the Sand Lake 345 kV bus and terminating at the Silverleaf 345 kV bus.
3. 138 kV line cut-ins at Silverleaf identical to that proposed in the Preferred Solution.

Although it is estimated the alternative described above would be comparable to the Preferred Solution from an economic perspective, TNMP's studies indicate the alternative would be inferior from the system performance perspective and would not offer the best level of available capacity for future load growth, which likely would turn out to be a significant flaw considering the aggressive load growth forecasted within the ERCOT far West Texas system. For instance, the following key system performance observations were made corresponding to the Silverleaf upgrades proposed in the Preferred Solution versus the alternative described above.

1. Incrementally best resolution of the system performance issues stated in Tables 3-2 and 3-3 affecting the two Sand Lake autos and the two Sand Lake – Cedarvale 138 kV lines.
2. Higher available capacity across each Silverleaf auto for future load growth.
   a. About 83 MW more in available capacity for loss of one Silverleaf auto
   b. About 60 MW more in available capacity for loss of the new source at IH20
3. Higher available capacity across the 138 kV network interfacing Silverleaf with the surrounding system.
   a. Two additional 138 kV circuits within the interface.
   b. Interface circuits lighter loaded, about 1300 MW more in available capacity for P0.
4. Significant less reliance on the adjacent Oncor 138 kV system via the two Cedarvale 138 kV tie-lines
   a. Tie lines are about 10% lighter loaded for P0.
   b. About 17% lower tie-line loading for post-contingency loss of one tie-line.

Additionally, a potential limitation with the Silverleaf alternative described above is constructability. Two likely hurdles in this area are (1) identifying and making available the required three 345 kV line terminals at Sand Lake and (2) routing of the three 345 kV lines between Sand Lake and Silverleaf in an area already congested with 345 and 138 kV transmission line rights-of-way.

4.3.2 Cowpen Alternatives

TNMP considered several alternatives to the Cowpen part of the preferred solution, which includes the following.

1. Cowpen option 1 – A variation of Cowpen described for the Alternative introduced in Section 4.2, with the key difference being relocation of the Cowpen 345-138 kV station closer to the existing TNMP IH20 station. This alternative, although potentially offering even better system performance than the Preferred Solution and the Alternative, would be substantially more

expensive due to significant lengthening of the two 345 kV tie-lines between the new Oncor 345 kV station and Cowpen.

2. Cowpen option 2 – This is the 138 kV-only option for Cowpen with the following key characteristics:
   a. No new Oncor 345 kV station required for boosting system support at IH20.
   b. New Cowpen 138 kV station constructed nearby TNMP IH20.
   c. New Silverleaf – Cowpen[4] 138 kV line (line length estimated at 15 miles).

   Although this alternative would be the most attractive from an economical standpoint, the option would be a poor choice from a system performance standpoint, offering inferior available capacity for future load growth in an area of the system forecasted to experience significant further load growth.

5 Model Data Used for the Analyses

5.1 Steady State Model Data

5.1.1 Starting Cases

TNMP used the 2021 RTP steady state cases[5] as a starting point for all steady state simulations conducted for this study. The specific 2021 RTP cases used include:

1. 2024 minimum load case dated 12/23/21.
2. 2027 summer peak case dated 12/23/21.

5.1.2 Benchmark Cases

To ensure accurate, up-to-date modeling of study area and to establish a valid benchmark comparison for the analysis, TNMP made numerous notable revisions to the starting cases to develop the benchmark cases, as noted below.

Transmission projects common to both the 2024 minimum load and 2027 peak load cases not related to new load referenced in Section 3.1 of this report:

1. Added new Holiday station, TPIT # 63431.
2. Added new Alamo Street station, TPIT # 63429.
3. Added new Girvin station, TPIT # 63427.

[4] It would not be feasible to route the new 138 kV line from Silverleaf directly into IH20 due to (a) the IH20 138 kV bus would have to be expanded, which there is no physical space available for and (b) congestion around the area of IH20 including the town of Pecos and several existing 138 kV lines emanating from IH20 station.

[5] TNMP utilized the finalized 2021 RTP cases for the analyses as opposed to the 2022 RTP cases due to the timing of starting the analyses, which was prior to the 12/22/22 finalization date of the 2022 RTP cases. Nonetheless, TNMP performed a comparison of the study area loads and network models between the cases TNMP conditioned for the analyses and the relevant 2022 RTP cases to ensure accurate, up-to-date modeling of the study area. The results of the comparison indicate there are no differences that would invalidate the study findings herein. The only significant modeling differences between the study areas is appearance of new projects within the 2022 RTP cases (e.g., the Cholla 345 kV interconnection). However, differences such as these are not an issue as TNMP would have removed the subject new projects anyway from the 2022 RTP cases had those cases been used for the analyses considering one of the primary points of the analyses was to determine optimized solutions in view of the load forecast being revised lower after the 2022 RTP study had already started.

4. Added second 138 kV circuit between AEP Creosote and TNMP Coyanosa stations, TPIT # 63433.

Other changes common to both the 2024 minimum load and 2027 peak load cases:

1. Updated Sand Lake – Cedarvale 138 kV lines #1 and #2 parameters (as-built info).
2. Updated Wickett – Wolf 138 kV line #2 parameters (as-built info), TPIT # 51216F.
3. Updated Leon Creek – AEP Fort Stockton 138 kV line parameters (as-built info).
4. Updated load forecast (resulted in minor changes to TNMP West Texas native load not related to new load referenced in Section 3.1 of this report).

The load referenced in Section 3.1 of this report was modeled in the benchmark cases as outlined below in Table 5-1.

Table 5-1: Details on Modeling Change Case New Loads as Applied to 2024 Min Load and 2027 Peak Load Cases

Bus Number	Bus Name	Load ID	MW	MVAR	TPIT
38001	TNPYOTE___1 138.00	DC	54.0	17.749	
38021	TNWORSHAM_1 138.00	DC	10.0	3.287	
38034	TNBCJETTA_1 138.00	X1	150.0	49.303	
38047	TNCNTYRD__1 138.00	DC	15.0	4.93	
38058	TNSADDLEBK1 138.00	DC	35.0	11.504	
38069	TNFLATTOP_1 138.00	DC	17.0	5.588	
38097*	TNBCCASTLE1 138.00	X1*	300.0	98.605	TPIT # 63663
38113	TNCOYOTSPG1 138.00	DC	5.0	1.643	
38125	TNBCHERMSA1 138.00	X1	42.0	13.805	
38146	TNBCTRESTL1 138.00	X1	700.0	230.079	TPIT # 63661
38191	TNBCGWRWNK1 138.00	X1	300.0	98.605	TPIT # 63665
38195	TNCHOLLA__1 138.00	DC	23.0	7.56	
38296	TNBCATOKA_1 138.00	X1	300.0	98.605	TPIT # 63661
38341*	TNBCLNCIUM1 138.00	X1	300.0	98.605	TPIT # 63665
38356*	TNBCLNCRK_1 138.00	X1	200.0	65.737	TPIT # 63661
38382*	TNBCCANYON1 138.00	X1	300.0	98.605	TPIT # 63665
131452*	KEO_1_8 138.00	X1	130.0	42.729	

* The indicated load has an insignificant shift factor related to the system performance deficiencies presented in Section 3.2, thus is not relevant to the preferred solution and alternatives presented herein. Included in this table only for completeness.

Lastly, the following Tier 4 transmission projects (all are common to both the 2024 minimum load and 2027 peak load cases) required to help accommodate new load referenced in Section 3.1 of this report were added to the benchmark cases:

1. Fishhook station cut-in on the two Wink – Cedarvale 138 kV lines, TPIT # 65659.
2. Upgrade Wink – Fishhook 138 kV lines #1 and #2 to 3000 Ampere, TPIT # 73452 *Partial.
3. Foxtail station cut-in on the Flat Top – Pig Creek and Tarbush – Pig Creek 138 kV lines, TPIT # 68671.
4. Second 138 kV circuit between Soaptree and Holiday stations, TPIT # 66074.
5. Second 138 kV circuit between Holiday and Alamo Street stations, TPIT # 66074.
6. Upgrade Cedarvale – Pecos 138 kV lines #1 and #2 to 614 MVA, TPIT # 66077.
7. Upgrade TNMP Wink – Oncor Wink 138 kV line #2 to 614 MVA, TPIT # 68673.

5.1.3 Change Cases

TNMP created numerous steady state change cases as needed to develop optimized solutions for addressing the system performance deficiencies identified in Section 3.2.

5.2 Dynamic Stability Model Data

5.2.1 Starting Cases

TNMP used the ERCOT DWG 2022 flat start cases as a starting point for all stability simulations conducted for this study. The specific 2022 flat start cases used include:

1. 2025 HWLL case dated 1/28/22.
2. 2028 summer peak case dated 1/28/22.

5.2.2 Benchmark Cases

The same network model and load changes applied to the steady state change cases as described in Section 5.1.2 were applied to the stability starting cases to develop the stability benchmark cases. The following additional changes were applied in the process of conditioning the stability benchmark cases.

1. Added IHS loads within the study area as modeled in the RTP steady state starting cases.
2. Added the planned Bearkat – North McCamey – Sand Lake 345 kV double circuit line[6].

5.2.3 Change Cases

TNMP modeled the preferred solution, as presented in Section 4.1, within the benchmark flat start cases to create the change flat start cases.

5.3 Short Circuit Model Data

5.3.1 Starting Case

TNMP used the ERCOT SPWG 2027 future year short circuit case, dated 6/30/22, as a starting point for the short circuit solutions conducted for this study.

5.3.2 Benchmark Case

The same network model and load changes applied to the steady state change cases as described in Section 5.1.2 were applied to the short circuit starting case to develop the short circuit benchmark case. The only other change applied in the process of conditioning the short circuit benchmark case was addition of the planned Bearkat – North McCamey – Sand Lake 345 kV double circuit line.

[6] It is recognized the estimated in-service date of the planned Bearkat – North McCamey – Sand Lake 345 kV DCKT line is beyond the timeframe represented by the 2025 HWLL flat start case. Nonetheless, the project was included in the 2025 HWLL flat start case for the specific purpose of gauging system performance of the preferred solution, as presented in this report, in an off-peak scenario in the timeframe of the ISD for the preferred solution presented herein. Based on a comparison of the study area network models between TNMP's conditioned 2025 HWLL case and 2028 summer peak case, TNMP confirms its conditioned 2025 HWLL case accurately achieves that specific purpose.

5.3.3 Change Case

TNMP modeled the preferred solution, as presented in Section 4.1, within the benchmark short circuit case to create the change short circuit case.

5.4 Data Used for SSR Screening

TNMP used two network models for its SSR screening work herein:

1. The 2027 benchmark network model described above in Section 5.2.2.
2. The 2027 change network model with the Silverleaf and Cowpen 345-138 kV interconnections modeled (preferred solution).

6 Study Methodology

TNMP conducted steady state simulations using the benchmark steady state cases described in Section 5.1.2 to demonstrate the need for system improvements. These simulations include P0, all credible P1-P7 planning events, as defined in Table 1 of the NERC TPL-001-4 Reliability Standard, and ERCOT Planning Guide Section 4 contingencies (including PGRR098-related contingencies) within and adjacent to TNMP's far West Texas transmission systems.

TNMP developed steady state change cases as needed to develop a preferred solution as well as two alternative solutions for correcting the deficiencies identified from the steady state benchmark cases. These simulations include P0, all credible P1-P7 planning events, as defined in Table 1 of the NERC TPL-001-4 Reliability Standard, and ERCOT Planning Guide Section 4 contingencies (including PGRR098-related contingencies). The preferred solution and the two alternative solutions are discussed in Section 4.

TNMP conducted dynamic stability simulations using the stability data sets described in Section 5.2 to evaluate what incremental impacts, if any, the preferred solution has on the stability of the power system for events within the study area. Numerous more severe planning events as well as extreme events were selected and simulated for the stability study.

TNMP conducted short circuit solutions using the short circuit cases described in Section 5.3 to evaluate what the incremental increases in available fault currents will be at selected transmission buses within the study area resulting from construction of the preferred solution.

All steady state, dynamic stability, and short circuit simulations were conducted pursuant to:

1. The steady state transmission system planning performance requirements documented in Table 1 of the NERC TPL-001-4 Reliability Standard.
2. Section 4 of the ERCOT Planning Guide.
3. TNMP transmission planning criteria.

TNMP conducted topology screening analyses for SSR risk assessment using the network models described in Section 5.4. The analyses consisted of (a) identification of shortest paths between resource POIs determined to be nearby to the proposed Silverleaf and Cowpen 345-138 kV interconnections and series reactors utilized within the ERCOT interconnection and (b) comparison of those identified shortest paths between benchmark and change network models. The resource POIs determined to be near the proposed Silverleaf and Cowpen 345-138 kV interconnections are listed below in Table 6-1. All 19 series capacitors located within the ERCOT interconnection were considered in the analysis.

Table 6-1: Resource POIs Determined to be Near the Proposed Silverleaf and Cowpen 345-138 kV Interconnections

Resource Name	Resource Type	POI Bus Number	POI Station Name	POI Nominal kV
Flower Valley II	Storage	38069	Flat Top	138
Swoose II	Storage	38001	Pyote	138
West of Pecos	Solar	11083	Riverton	138

7 Applicable TNMP Transmission Planning Criteria

7.1 Steady State Planning Criteria

The TNMP planning criteria provides the acceptable loading and voltage levels applicable to the different NERC TPL-001-4 planning events as well as ERCOT Planning Guide Section 4 events, which are summarized below in Table 7-1

Table 7-1: Steady State Planning Criteria for 138 kV, 69 kV, and Facilities Operated at 66 kV

NERC or ERCOT Defined Event	Circuit Loading Limit	Bus Voltages (per-unit of nominal operating voltage)			Non-Consequential Load Loss Allowed
		Min	Max	Max Post-Contingency Deviation[7]	
P0	Rate A	0.95	1.05 (138 and 69 kV) 1.1 (66 kV)	N/A	No
P1	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	10%	No
P2.1	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	10%	No
P2.2 – P2.4	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	N/A	Yes
P3	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	10%	No
P4	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	N/A	Yes
P5	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	N/A	Yes
P6	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	N/A	Yes
ERCOT-1	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	10%	No
All PG4 events except ERCOT-1	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	N/A	No
P7.1	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	10%	No
P7.2	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	N/A	Yes
Extreme Events	Rate B	0.9	1.05 (138 and 69 kV) 1.1 (66 kV)	N/A	Yes

[7] For 138 kV, 69 kV, and station buses operated at 66 kV, TNMP's post-contingency voltage deviation limits are applied only to those transmission buses (a) supplying transmission end-user points of interconnection and/or (b) with one or more interconnected power transformers serving distribution level facilities.

7.2 Stability Planning Criteria

TNMP's planning criteria applicable to dynamic performance, which is consistent with Table 1 of the NERC TPL-001-4 Reliability Standard, is detailed in below in Table 7-2.

Table 7-2: Stability Planning Criteria

NERC or ERCOT Defined Event	System Stable	Non-Consequential Load Loss Allowed	Transient Voltage Response	Power Oscillation Damping
P1	Yes	No	Bus voltages should recover to at least 90% of pre-disturbance voltage within five (5) seconds after clearing the fault	Power oscillations should decay with a minimum of 3% damping ratio
P7.1/ERCOT-1 and all events defined in ERCOT PG Section 4	Yes	No		
Extreme Events	Evaluate Risks and Consequences	Yes	Evaluate Risks and Consequences	Evaluate Risks and Consequences

7.3 Short Circuit Planning Criteria

Calculated available symmetrical fault current should not exceed 99% of the transmission breaker nameplate fault interrupt capability for buses where the X/R ratio is less than or equal to 15. For locations where the X/R ratio exceeds 15, the maximum expected asymmetrical fault current that the transmission breakers at those locations would be subjected to interrupt shall not exceed 99% of the transmission breaker nameplate fault interrupt capability.

8 Conclusion

The Silverleaf and Cowpen station project will address numerous steady state system performance deficiencies within a specific area of TNMP's Far West Texas transmission system driven by recent commitments to serve a significant amount of new load.

TNMP's studies indicate the project resolves the targeted steady state system performance issues without introducing stability-related system performance deficiencies. Moreover, the stability study results generally indicate incremental improvements in stability performance where change case results differ from benchmark results.

The short circuit study results indicate the project will not result in any fault interrupt rating exceedances for transmission breakers located within the study area.

TNMP's topology check indicates the proposed Silverleaf and Cowpen station projects do not result in any new or shorter paths between existing generation resources and series capacitors. For any existing paths between resources and series capacitors that would be altered by construction of the 345-138 kV ties proposed herein, the path alterations would be limited to lengthening of the affected path. Therefore, no further SSR analysis is needed for the proposed 345-138 kV projects.

This will be a Tier 1 project with an estimated capital cost of $299 million. CCNs will be required for portions of the project. The estimated in-service date is June 2027.