



Item 11: Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition RPG Project

Woody Rickerson
Vice Present, Grid Planning and Operations

Board of Directors Meeting

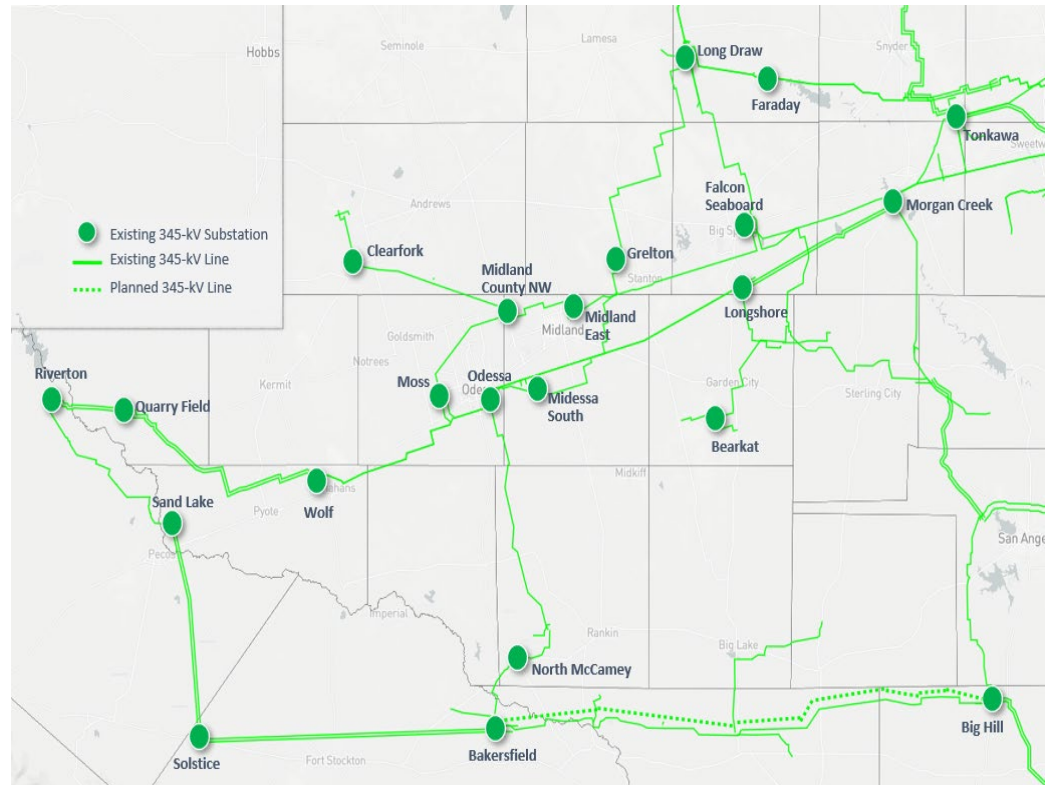
ERCOT Public
August 16, 2022

Action

- At the conclusion of this presentation the Board of Directors will be asked to:
 1. Endorse the Bearkat – North McCamey – Sand Lake 345-kV Transmission Addition Regional Planning Group (RPG) Project based on NERC and ERCOT reliability planning criteria; and
 2. Designate the project as critical to the reliability of the ERCOT System pursuant to PUCT Substantive Rule 25.101(b)(3)(D)

Bearkat – North McCamey – Sand Lake 345-kV Transmission Addition Project

- LCRA Transmission Services Corporation (LCRA TSC), Wind Energy Transmission Texas (WETT), and Oncor jointly submitted the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Project for Regional Planning Group (RPG) review in April 2022
- The purpose of the project is to address reliability needs driven by rapid load growth (oil & gas) in the Delaware Basin area and to improve capability to import power into the Delaware Basin area



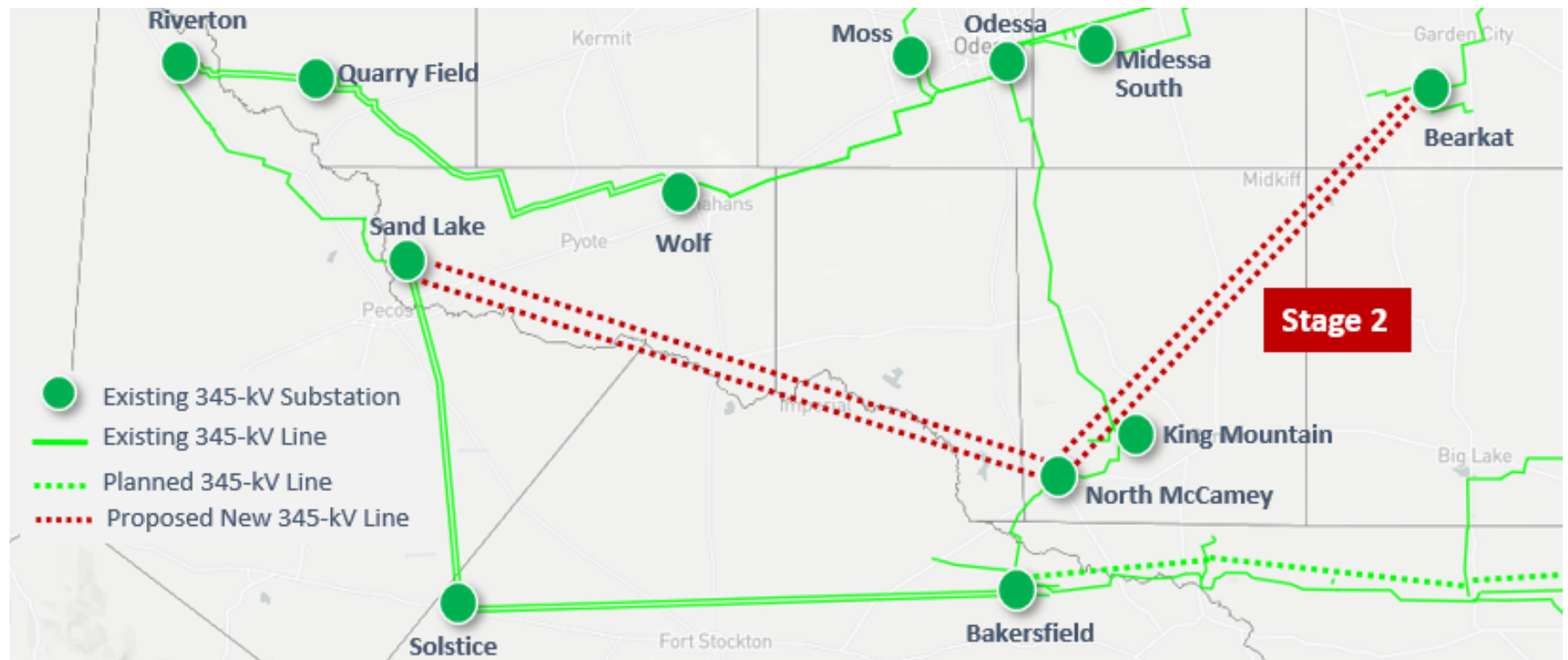
TAC Endorsement

- ERCOT presented the project to the Technical Advisory Committee on July 27, 2022
- TAC voted unanimously to endorse the project (Stage 2)

Request for Board Vote

- ERCOT staff requests and recommends that the Board of Directors vote to endorse the need for the Bearkat – North McCamey – Sand Lake 345-kV Transmission Addition Project (Stage 2) based on NERC and ERCOT reliability planning criteria
- ERCOT staff requests and recommends that Board of Directors designate the Bearkat – North McCamey – Sand Lake 345-kV Transmission Addition Project (Stage 2) as critical to the reliability of the ERCOT System pursuant to PUCT Substantive Rule 25.101(b)(3)(D)

Questions?



ERCOT Recommendation: Stage 2

- Build a new double-circuit 345-kV line from existing Bearkat Substation to existing North McCamey Substation (~71 miles), with normal and emergency ratings of at least 2,564 MVA
- Build a new double-circuit 345-kV line from existing North McCamey Substation to existing Sand Lake Substation (~94 miles), with normal and emergency ratings of at least 2,564 MVA
- Reconfigure each of the existing substations into a breaker-and-a-half substation (as a minimum configuration)



Date: August 9, 2022
To: Board of Directors
From: Woody Rickerson, Vice President, Grid Planning and Operations
Subject: Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition RPG Project

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: August 16, 2022

Item No.: 11

Issue:

Whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should accept the recommendation of ERCOT staff to: (1) endorse the need for the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Regional Planning Group (RPG) Project in order to meet the reliability requirements for the ERCOT System, which ERCOT staff has independently reviewed and which the Technical Advisory Committee (TAC) has voted unanimously to endorse, and (2) designate the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition RPG Project as critical to the reliability of the ERCOT System pursuant to Public Utility Commission of Texas (PUCT) Substantive Rule 25.101(b)(3)(D).

Background/History:

ERCOT submitted a proposed project for RPG review to address potential reliability needs driven by the rapid load growth in the Delaware Basin area and to improve capability to import power into the Delaware Basin area.

ERCOT performed an independent review of the proposed project and confirmed the reliability need for transmission system improvements based on North American Electric Reliability Corporation (NERC) and ERCOT reliability planning criteria. Based on its independent review, ERCOT recommends the following transmission improvements (Stage 2):

- Build a new double-circuit 345-kV line from existing Bearkat Substation to existing North McCamey Substation (~71 miles), with normal and emergency ratings of at least 2,564 MVA
- Build a new double-circuit 345-kV line from existing North McCamey Substation to existing Sand Lake Substation (~94 miles), with normal and emergency ratings of at least 2,564 MVA
- Reconfigure each of the existing substations into a breaker-and-a-half substation (as a minimum configuration)

The estimated cost for these improvements is \$477.6 million.

The load growth in the Delaware Basin area is expected to exceed 4,022 MW by 2026 or earlier, which is the load level triggering the reliability need, based on the ERCOT

2021 Regional Transmission Plan (RTP) and ERCOT October 2021 Steady-State Working Group (SSWG) cases. Therefore, ERCOT recommends the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition RPG Project be designated critical to the reliability of the ERCOT System pursuant to PUCT Substantive Rule 25.101(b)(3)(D). Designating a project requiring a Certificate of Convenience and Necessity (CCN) application (*i.e.*, those requiring a new right-of-way) as critical will reduce the risk of exposure to reliability issues by shortening the time to complete the improvements.

The report describing the ERCOT Independent Review of the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition RPG Project, including ERCOT staff's recommendation for the Stage 2 upgrade, is attached as **Attachment A**.

Key Factors Influencing Issue:

1. Transmission system improvements are needed to meet reliability planning criteria for the Delaware Basin area.
2. The recommended set of improvements was found to be the most efficient solution for meeting the planning reliability criteria.
3. Protocol Section 3.11.4.7 requires Board endorsement of a project with an estimated capital cost of \$100 million or greater.
4. TAC voted unanimously to endorse the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition RPG Project (Stage 2) on July 27, 2022.
5. Since there is reliability need to have the project in place as soon as possible, ERCOT staff has deemed this project critical to reliability.
6. If the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition RPG Project (Stage 2) is designated as critical to the reliability of the ERCOT System, the review process at the PUCT will be expedited pursuant to Substantive Rule 25.101.(b)(3)(D).

Conclusion/Recommendation:

ERCOT staff recommends, and the Reliability and Markets Committee is expected to consider and to likely recommend, that the Board: (1) endorse the need for the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition RPG Project (Stage 2), which ERCOT staff has independently reviewed and which TAC has voted unanimously to endorse, based on NERC and ERCOT reliability planning criteria, and (2) designate the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Upgrades RPG Project (Stage 2) as critical to the reliability of the ERCOT System pursuant to PUCT Substantive Rule 25.101(b)(3)(D).



ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, after due consideration of the alternatives, the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) deems it desirable and in the best interest of ERCOT to accept ERCOT staff's recommendation to (1) endorse the need for Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Regional Planning Group Project (Stage 2), which ERCOT staff has independently reviewed and which the Technical Advisory Committee (TAC) and Reliability and Markets (R&M) Committee have voted unanimously to endorse, based on North American Electric Reliability Corporation (NERC) and ERCOT reliability planning criteria, and (2) designate the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Regional Planning Group Project (Stage 2) as critical to the reliability of the ERCOT System pursuant to Public Utility Commission of Texas (PUCT) Substantive Rule 25.101(b)(3)(D);

THEREFORE, BE IT RESOLVED, that is the Board hereby (1) endorses the need for the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Regional Planning Group Project (Stage 2), which ERCOT staff has independently reviewed and which TAC and the R&M Committee have voted unanimously to endorse, based on NERC and ERCOT reliability planning criteria, and (2) designates Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Regional Planning Group Project (Stage 2) as critical to the reliability of the ERCOT System pursuant to PUCT Substantive Rule 25.101(b)(3)(D).

CORPORATE SECRETARY'S CERTIFICATE

I, Jonathan M. Levine, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its August 16, 2022 meeting, the Board passed a motion approving the above Resolution by _____.

IN WITNESS WHEREOF, I have hereunto set my hand this ____ day of August, 2022.

Jonathan M. Levine
Assistant Corporate Secretary



ERCOT Independent Review of the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Project

Final

Document Revisions

Date	Version	Description	Author(s)
July 13, 2022	1.0	Final	Ying Li
		Reviewed by	Sun Wook Kang, Prabhu Gnanam

Executive Summary

On April 12, 2022, LCRA Transmission Services Corporation (LCRA TSC), Wind Energy Transmission Texas (WETT), and Oncor jointly submitted the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Project to the Regional Planning Group (RPG). This project is designed to meet the growing demand for electricity from increased oil and natural gas extraction activities in the Permian Basin region, specifically in the Delaware Basin.

ERCOT completed the Delaware Basin Load Integration Study¹ in December 2019, following review and input by the affected Transmission Service Providers (TSPs). This study, which identified the reliability needs of the region, provides a long lead time transmission improvement roadmap for the continued oil and gas load growth in the Delaware Basin area. This RPG project, as submitted by LCRA TSC, WETT, and Oncor, aligns with the Stage 2 upgrade identified in the Delaware Basin Load Integration Study. The study found that the addition of a double-circuit 345-kV line from Bearkat to North McCamey to Sand Lake (i.e., Stage 2 upgrade) is the recommended option to reliably serve load once the peak demand level of the Delaware Basin area exceeds 4,022 MW. More details of the Delaware Basin Load Integration Study can be found in Appendix A.

Although ERCOT confirmed the need for the Stage 2 upgrade in the Delaware Basin Load Integration Study, ERCOT also performed additional analysis in the Permian Basin Load Interconnection Study² completed in December 2021 to reconfirm the need for the Stage 2 upgrade using the 2030 study case. More details of the Permian Basin Load Interconnection Study can be found in Appendix B.

The average annual peak demand growth rate of the Far West Weather Zone is about 12% according to the historical load data from 2016 to 2021. Both 2021 Regional Transmission Plan (RTP) and ERCOT October 2021 Steady-State Working Group (SSWG) cases indicated that the load growth in the Delaware Basin area could exceed 4,022 MW by 2026 or earlier. ERCOT also reviewed and assessed the 2021 RTP and confirmed the need for the Stage 2 upgrade to improve the Delaware Basin load serving capability and address a potential voltage instability issue under N-1 condition in 2026.

Based on this independent review, ERCOT recommends the following project as jointly submitted by LCRA TSC, WETT, and Oncor:

- Build a new double-circuit 345-kV line from existing Bearkat Substation to existing North McCamey Substation (~71 miles), with normal and emergency ratings of at least 2,564 MVA
- Build a new double-circuit 345-kV line from existing North McCamey Substation to existing Sand Lake Substation (~94 miles), with normal and emergency ratings of at least 2,564 MVA
- Reconfigure each of the existing substations into a breaker-and-a-half substation (as a minimum configuration)

The recommended project is a Tier 1 project estimated to cost \$477.6 Million. Certificate of Convenience and Necessity (CCN) filings will be required for this new transmission project (approximately 165 miles of new double-circuit 345-kV lines). The project is expected to be in-service by June 2026.

LCRA TSC, Oncor, and WETT have requested ERCOT designate the recommended project “critical” to the reliability of the system per PUCT Substantive Rule 25.101(b)(3)(D). Since there is a reliability need to have the project in place and significant uncertainty associated with predicting the timing of the need for the proposed project (see Section 8 for more details), ERCOT deems the project critical

¹ <https://www.ercot.com/gridinfo/planning> >> ERCOT Delaware Basin Load Integration Study Report

² <https://www.ercot.com/gridinfo/planning> >> ERCOT Permian Basin Load Interconnection Study Report

to reliability. LCRA TSC, Oncor, and WETT also indicated in the RPG submittal that they will work with ERCOT to implement Constraint Management Plans (CMPs) based on operational conditions as required. In addition, Oncor indicated in its response to the RPG comment that Oncor will work with the neighboring TSP in order to effectively and efficiently address other potential transmission system concerns that may arise from the recent influx of customer loads in the Far West region beyond those identified in the scope of the original Delaware Basin area review.

Table of Contents

Executive Summary	ii
1. Introduction	1
2. Study Assumptions and Methodology	5
2.1. Study Assumptions and Methodologies	5
2.1.1. Steady-State Study Base Case	5
2.1.2. Economic Study Base Case	6
2.2. Study Tool.....	7
3. Project Need	8
3.1. Review of the 2021 Regional Transmission Plan (RTP) Cases	8
3.2. Review of Delaware Basin Load Integration Study Results.....	8
3.3. Review of Permian Basin Load Interconnection Study Results.....	8
4. Project Alternatives and Recommended Project.....	10
4.1. Review of Delaware Basin Load Integration Study Results.....	10
4.2. Additional Alternatives Evaluation.....	10
4.3. Recommended Project.....	11
5. Impact of Stage 2 Upgrade on Dynamic Stability Analysis	12
6. Sub-synchronous resonance (SSR) Assessment and Other Sensitivity Studies	13
6.1. SSR Assessment.....	13
6.2. Planning Guide Section 3.1.3(4) Sensitivities	13
6.2.1. Generation Addition Sensitivity Analysis	13
6.2.2. Load Scaling Sensitivity Analysis.....	14
7. Congestion Analysis	15
8. Load Growth Consideration	16
9. Conclusion	18
10. Appendix	19
10.1. Appendix A: Delaware Basin Load Integration Study Report	19
10.2. Appendix B: Permian Basin Load Interconnection Study Report	19

1. Introduction

The Far West Weather Zone, which includes the Delaware Basin area, has experienced an average annual peak demand growth rate of approximately 12% from 2016 to 2021 due to significant growth in oil and natural gas industry demand. This growth rate is the highest of any weather zone in the ERCOT region. Figure 1.1 shows the primary oil basin resources in the Permian area.

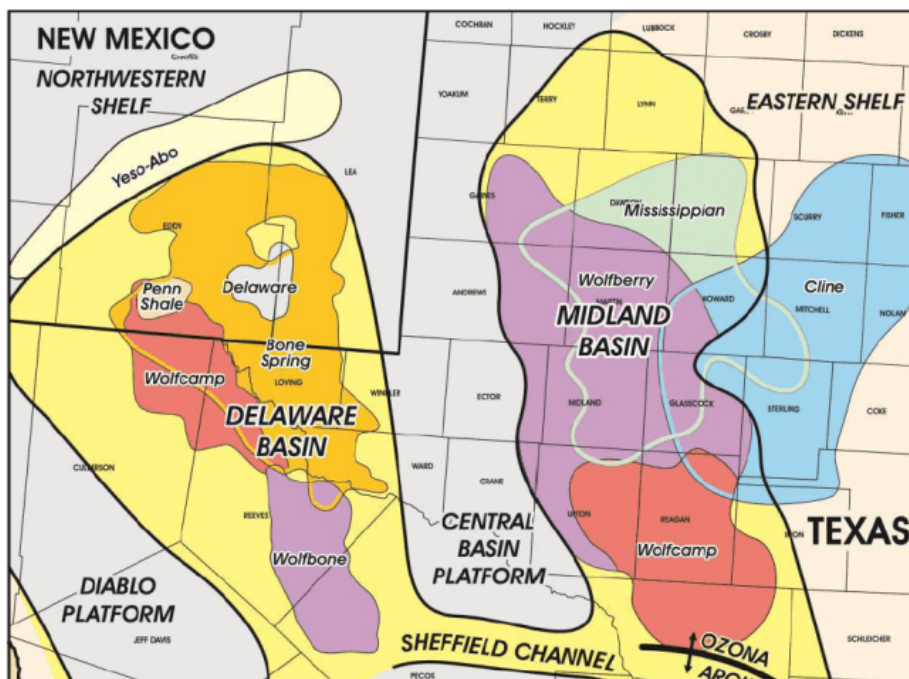


Figure 1.1 Map of Tectonic Subdivision of the Delaware Basin³

Several transmission upgrades, including the Far West Texas Project (FWTP), the Far West Texas Dynamic Reactive Devices (DRD) Project, and the Far West Texas Project 2 (FWTP2) have been completed in recent years to accommodate the significant and rapid load growth and to address the transmission needs in the area. Figure 1.2 shows the existing 345-kV transmission system map of the study area.

The rapid oil and gas development in the area has been and will continue to be a significant challenge for both transmission planning and system operations. The challenge originates from fundamental difference in planning horizons between major transmission improvements and oil and gas development. The oil and gas industry typically maintains a one or two year planning horizon, while transmission improvements, which include planning studies, routing analysis, regulatory approvals, route acquisition, design, and construction, can take on the order of four to six years. Because of the short planning horizon for oil and gas customers and resulting lack of long-term load commitments, transmission planning studies are able to accurately identify system needs only for one to two years in advance, which is not sufficient to plan and construct new transmission improvements to meet the rapid and significant load growth in the Permian Basin area.

³ <https://www.oilandgas360.com/ngl-energy-partners-adds-water-sources-for-oil-gas-operators-in-the-permian/>

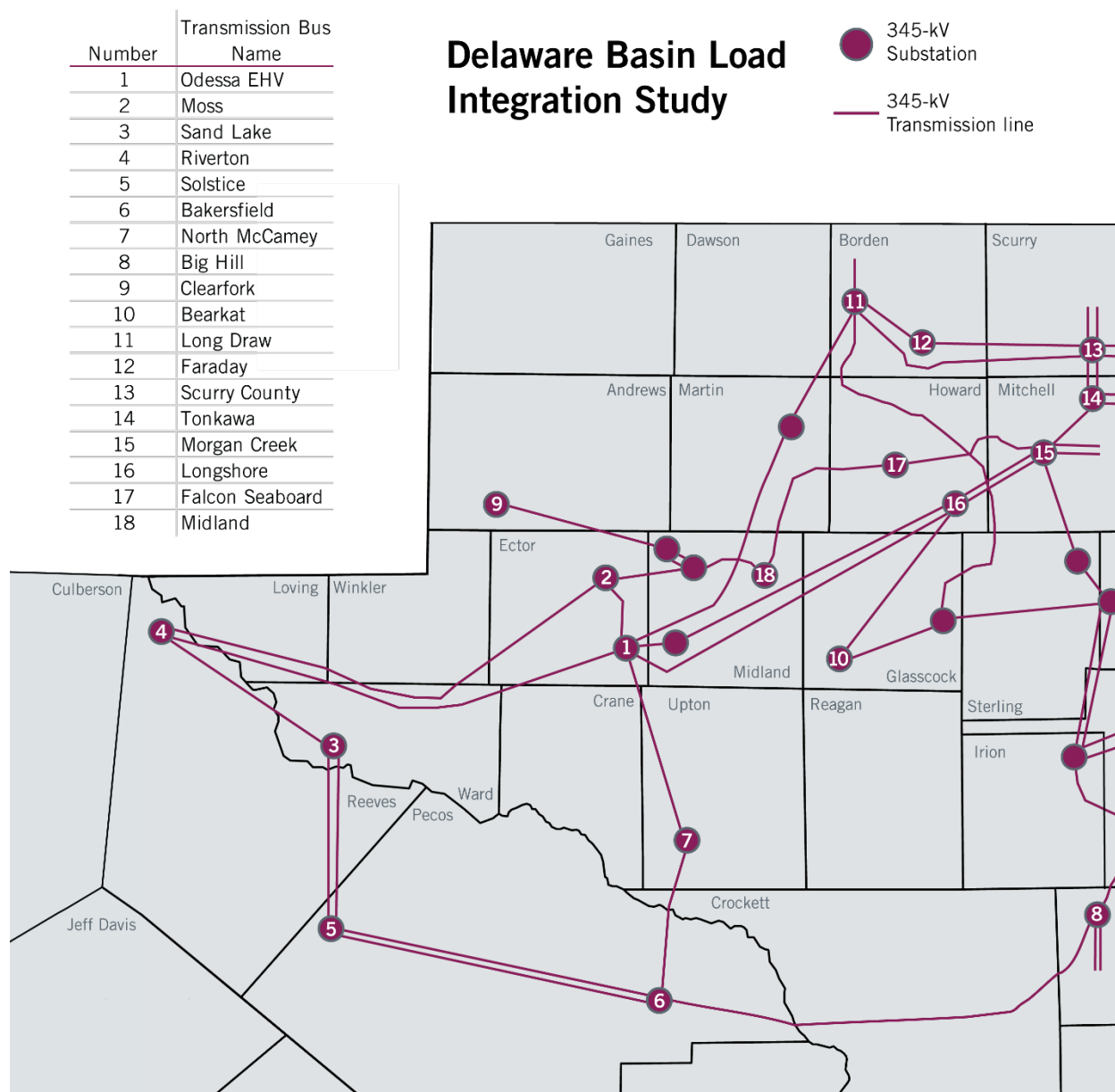


Figure 1.2 345-kV Transmission System Map of Study Area

As part of the continuing efforts to address the challenge, ERCOT completed the Delaware Basin Load Integration Study¹ in December 2019 and Permian Basin Load Interconnection Study² in December 2021 through extensive review and input by TSPs and stakeholders.

The Delaware Basin Load Integration Study identified potential long lead time transmission improvements (i.e., new 345-kV transmission lines) to accommodate the rapid oil and gas development. The study developed a roadmap of preferred system upgrades involving major new 345-kV lines to improve the capability to import power into the Delaware Basin area using a higher-than-forecasted (i.e., conceptual plus planned) load growth in the Delaware Basin area. The conceptual load growth assumed in the Delaware Basin Load Integration Study was provided by the TSPs in the area based on the surveys of their high-use oil and gas customers. Table 1.1 and Figure 1.3 show the

roadmap of the five stages of transmission upgrades identified from the study. Among the upgrades in the roadmap, the Stage 1 upgrade was endorsed in June 2021 and is expected to be complete in 2023.

Table 1.1 Delaware Basin Transmission Upgrade Roadmap

Stage	Estimated Delaware Basin Load Level (MW)	Upgrade Element	Trigger
1	3,052	Add a second circuit on the existing Big Hill – Bakersfield 345-kV line	Import Needs
2	4,022	A new Bearkat – North McCamey – Sand Lake double-circuit 345-kV line	Import Needs
3	4,582	A new Riverton – Owl Hills single-circuit 345-kV line	Culberson Loop Needs
4	5,032	Riverton – Sand Lake 138-kV to 345-kV conversion and a new Riverton – Sand Lake 138-kV line	Culberson Loop Needs
5	5,422	A new Faraday – Lamesa – Clearfork – Riverton double-circuit 345-kV line	Import Needs

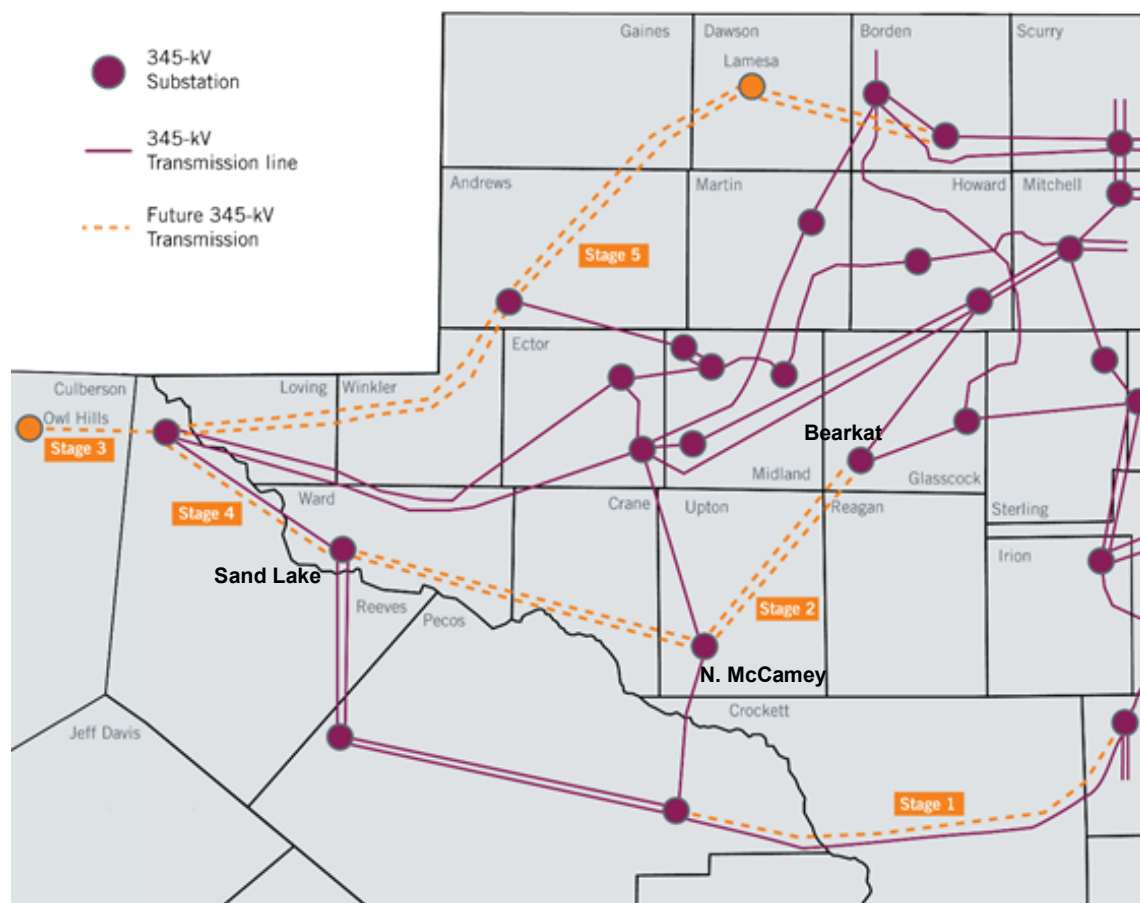


Figure 1.3 345-kV Transmission System Map of Study Area with Stage 1 – Stage 5 Upgrades

The Permian Basin Load Interconnection Study identified the reliability challenges and a set of transmission upgrades, especially long lead time transmission upgrades, to connect and reliably serve the existing and projected oil and gas loads in the Permian Basin area utilizing the demand forecast from the IHS Markit study⁴. The IHS Markit study is a customer demand study performed by IHS Markit, which provides an in-depth analysis of the oil and gas industry and provides an electricity demand forecast in the Permian area through 2030. According to the IHS Markit study report, the demand forecast was based on geology and resource assessment, industry intelligence, oil and gas expertise, commercial considerations, translations of historical and forecasted oil and gas activities into electric load demands in every single square mile in the Permian Basin area.

As shown in Appendix B, the Permian Basin Load Interconnection Study identified the preferred transmission upgrades. Among the preferred transmission upgrades, the Stage 2 upgrade was identified to maintain grid reliability under multiple P7 contingencies (i.e., N-1 conditions) in the 2030 study case. More details of the need for the Stage 2 upgrade are described in Section 3.

LCRA TSC, Oncor, and WETT jointly submitted the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Project for RPG review to provide a new transmission import path into the Delaware Basin area that is necessary to accommodate significant and rapid load growth associated with oil and gas development and to address reliability needs in the Delaware Basin area. With the demand in the Delaware Basin area forecasted to exceed the Stage 2 trigger point (4,022 MW) in both the 2021 RTP (year 2026) and October 2021 SSWG cases (year 2024), LCRA TSC, Oncor, and WETT propose to implement the Stage 2 upgrade. This RPG project has an estimated cost of \$477.6 Million and is classified as a Tier 1 project pursuant to Protocol Section 3.11.4.3. Certificate of Convenience and Necessity filings would be required for this project.

Since the Stage 2 upgrade has already been evaluated and proposed as part of the Delaware Basin Load Integration Study and Permian Basin Load Interconnection Study, ERCOT conducted the independent review of this RPG project by reviewing these study results and assumptions to check if any recent system changes would potentially alter or modify the projects recommended in these studies. In addition, ERCOT reviewed and compared the recent trends of demand growth in the Delaware Basin area. The subsequent sections describe the details of the study assumptions, methodology, and the results of the ERCOT Independent Review.

⁴ https://www.ercot.com/files/docs/2020/11/27/27706_ERCOT_Letter_to_Commissioners_-_Follow-up_Status_Update_on_Permian....pdf

2. Study Assumptions and Methodology

ERCOT reviewed the RPG project jointly submitted by LCRA TSC, Oncor, and WETT and confirmed the submitted project aligns with the Stage 2 upgrade identified in the Delaware Basin Load Integration Study. As such, for this independent review, ERCOT utilized the study results from the Delaware Basin Load Integration Study and the 2021 Permian Basin Load Interconnection Study. Furthermore, ERCOT reviewed the 2021 RTP final reliability case to confirm the project need.

2.1. Study Assumptions and Methodologies

ERCOT conducted the Delaware Basin Load Integration Study in 2019 based on criteria contained in NERC reliability standard TPL-001-4 and the ERCOT Planning Guide.

Oil and gas loads in the Delaware Basin area were assumed to be constant throughout the year based on operational data. As such, potential high impact maintenance outages (including major 345-kV circuits) were included in the study in order to ensure adequate operational flexibility and reliability in the study area.

Due to the relatively constant demand from oil and gas customers in the Delaware Basin region, solar generation in the area was assumed to be offline to represent a stressed system condition. This solar dispatch assumption was extended to the entire Far West Weather Zone during the review of the 2021 RTP final reliability case.

The following sections describe the study assumptions of the review using the 2021 RTP final case.

2.1.1. Steady-State Study Base Case

The study area for this review included transmission facilities in the Far West Weather Zone.

2.1.1.1. Base Case

The steady-state study base case was constructed from the following final 2021 RTP case⁵ posted on the MIS on December 23, 2022:

- 2021RTP_2026_SUM_WFW_12232021

2.1.1.2. Transmission Topology

All RPG-approved Tier 1, Tier 2, and Tier 3 transmission projects within the study area as well as the Tier 4 projects within the Delaware Basin area expected to be in-service by 2026 that were not in the base case were added to the study base case. Based on the ERCOT Transmission Project Information and Tracking (TPIT) report posted on October 1, 2021, the TPIT projects in Table 2.1 were added to the study base case.

Table 2.1 Transmission Projects Added to Study Base Case

TPIT Number	Project Name	County	Projected In-service Date	Planning Charter Tier
7124	Flat Iron – Barr Ranch – Pegasus South 138 kV Line Project	Midland	Dec-2023	Tier 2
63429	Adds TNMP Alamo Street Substation	Pecos	May-2022	Tier 4
63431	Adds TNMP Holiday Switching Station	Pecos	May-2022	Tier 4
63427	Adds TNMP Girvin Switching Station	Pecos	Jun-2022	Tier 4

⁵ <https://mis.ercot.com/secure/data-products/grid/regional-planning?id=PG3-2178-M>

63433	Rebuilds AEP Creosote - TNMP Coyanosa138-kV line as double circuit	Reeves	Dec-2022	Tier 4
62728	Wink - Shifting Sands 69-kV Line Conversion to 138-kV	Winkler	Dec-2022	Tier 4

The Stage 2 upgrade was already modeled in the 2021 RTP 2026 reliability case to address the reliability violations. In this ERCOT Independent Review, the Stage 2 upgrade was removed from the 2021 RTP reliability case.

2.1.1.3. Generation

Based on the January 2022 Generator Interconnection Status (GIS) report posted on the ERCOT website in February 2021, generator additions planned to connect to the study area and meeting Planning Guide Section 6.9(1) for inclusion in the planning models that were not in the base case were added to the study base case. These generator additions are listed in Table 2.2. All the new battery generation units added to the case were dispatched consistent with the 2021 RTP methodology.

Table 2.2 Generation Units Added to Study Case

GINR Number	Project Name	County	Capacity (MW)	Fuel	Projected Commercial Operation Date
20INR0280	High Lonesome BESS	Crockett	51.06	Battery	06/01/2022
20INR0281	Queen BESS	Upton	51.06	Battery	05/31/2022
22INR0372	BRP Hydra BESS	Pecos	202.31	Battery	10/30/2022
22INR0384	BRP Pavo BESS	Pecos	176.85	Battery	07/11/2022

The status of the units either mothballed or retired were reviewed at the time of this study, and the following unit was removed from the study case:

- RAY OLINGER STG U1

2.1.1.4. Loads

The load level of the Far West Weather Zone remains the same as in the 2021 RTP case. The loads outside of the study weather zone, excluding the West and Far West Weather Zones, were adjusted necessary for power balance consistent with the 2021 RTP assumptions.

2.1.2. Economic Study Base Case

2.1.2.1. Base Case

The 2026 economic final case from the 2021 RTP was used to develop a study base case for congestion analysis.

2.1.2.2. Transmission Topology

All RPG-approved Tier 1, 2, and 3 transmission projects in the study area as well as the Tier 4 projects in the Delaware Basin area expected to be in-service by 2026 were added to the study base case. The ERCOT TPIT report posted on October 1, 2021, was used as reference. The added TPIT projects are listed in Table 2.1.

2.1.2.3. Generation

Planned generators in the ERCOT system that met Planning Guide Section 6.9(1) conditions for inclusion in the base cases (based on the 2022 January GIS report) were added to the study base case. The added generators are listed in Table 2.2.

The status of the units either mothballed or retired were reviewed at the time of this study and the following unit was removed from the study case:

- RAY OLINGER STG U1

2.1.2.4. Loads

Loads were maintained consistent with the 2021 RTP economic model for the year 2026.

2.2. Study Tool

ERCOT utilized the following software tools to perform this independent review:

- PowerWorld Simulator version 22 was used for security constrained optimal power flow (SCOPF) and steady state contingency analysis
- UPLAN version 11.4.0.27191 was used to perform the congestion analysis

3. Project Need

ERCOT conducted the review of the Delaware Basin Load Integration Study, Permian Basin Load Interconnection Study, and the 2021 RTP summer peak final reliability case based on the study assumptions and methodologies described in Section 2.

3.1. Review of the 2021 Regional Transmission Plan (RTP) Cases

ERCOT evaluated the 2021 RTP 2026 case based on the study assumptions and methodologies described in Section 2. The study results showed potential voltage instability under certain NERC Category P7 contingency (i.e., N-1 condition) and confirmed the reliability need of the Stage 2 upgrade.

Voltage instability was observed under the following NERC Category P7 contingency condition in 2026 case:

■ REDACTED

The Stage 2 upgrade will address the potential voltage instability issue that may occur under N-1 condition of certain NERC Category P7 contingency.

Table 3.1 Delaware Basin Area Load Forecast in the 2021 RTP Cases

Year	MW
2026	4,347
2027	4,545

The trigger point of the Stage 2 upgrade (4,022 MW) was compared to the Delaware Basin area load in the 2021 RTP WFW 2026 and 2027 summer peak cases as shown in Table 3.1. The Delaware Basin area load in the 2021 RTP 2026 case exceeds the trigger point of the Stage 2 upgrade, indicating that the Stage 2 upgrade (i.e., a new Bearkat – North McCamey – Sand Lake double-circuit 345-kV line) is needed by summer 2026 or earlier.

3.2. Review of Delaware Basin Load Integration Study Results

The Delaware Basin Load Integration Study identified the addition of a new Bearkat – North McCamey – Sand Lake double-circuit 345-kV line as the Stage 2 upgrade to address the overload of the Longshore to Midessa South 345-kV line under certain critical N-1 contingency that may occur during the planned maintenance outage of the Odessa combined cycle train 1 when the Delaware Basin area load level exceeds 4,022 MW.

More details of the Delaware Basin Load Integration Study can be found in Appendix A.

3.3. Review of Permian Basin Load Interconnection Study Results

The Permian Basin Load Interconnection Study identified a set of transmission upgrades, especially long lead time local transmission upgrades, to connect and reliably serve the existing and projected oil and gas loads in the Permian Basin area utilizing the demand forecast from the IHS Markit study, which provides an in-depth analysis of the oil and gas industry and provides an electricity demand forecast in the Permian Basin area through 2030. Table 3.2 shows the 2025 and 2030 load levels in the Delaware Basin area studied in the Permian Basin Load Interconnection Study.

Table 3.2 Delaware Basin Area Load Forecast in the Permian Basin Load Interconnection Study

Year	MW
2025	3,789
2030	4,898

The results of the Permian Basin Load Interconnection Study reconfirmed the need of the Stage 2 upgrade to maintain grid reliability under multiple P7 contingencies (i.e., N-1 conditions) in the 2030 study case in which the Delaware Basin area load is 4,898 MW.

More details of the Permian Basin Load Interconnection Study can be found in Appendix B.

4. Project Alternatives and Recommended Project

4.1. Review of Delaware Basin Load Integration Study Results

ERCOT evaluated a number of options (as part of the Delaware Basin Study) to improve the capability to import power into the Delaware Basin area to resolve the identified reliability issues, including adding a second circuit on the existing Big Hill – Bakersfield 345-kV line (Stage 1 upgrade), a new Bearkat – North McCamey – Sand Lake double-circuit 345-kV line (Stage 2 upgrade, estimated cost: \$371 Million in 2019 dollar and \$477.6 Million in 2022 dollar, estimated new rights-of-way: 165 miles), and a new Faraday – Lamesa – Clearfork – Riverton double-circuit 345-kV line (Stage 5 upgrade, estimated cost: \$444 Million in 2019 dollar, estimated new rights-of-way: 193 miles). The Stage 1 upgrade was endorsed by ERCOT in June 2021 and is expected to be implemented in 2023.

The estimated load serving capabilities are similar for the Stage 2 and Stage 5 upgrades as described in Sections 4 and 6 of the Delaware Basin Load Integration Study. The Stage 2 upgrade requires relatively less amount of new rights-of-way and is projected to cost less than the Stage 5 upgrade. As such, ERCOT proposed the new Bearkat – North McCamey – Sand Lake double-circuit 345-kV line as the Stage 2 upgrade in the Delaware Basin Load Integration Study.

4.2. Additional Alternatives Evaluation

ERCOT considered additional alternatives submitted by Garland Power and Light (GP&L) and Texas-New Mexico Power (TNMP) during the comments period of this RPG review. The alternatives are slightly different from the Stage 2 upgrade as shown in Figure 4.1.

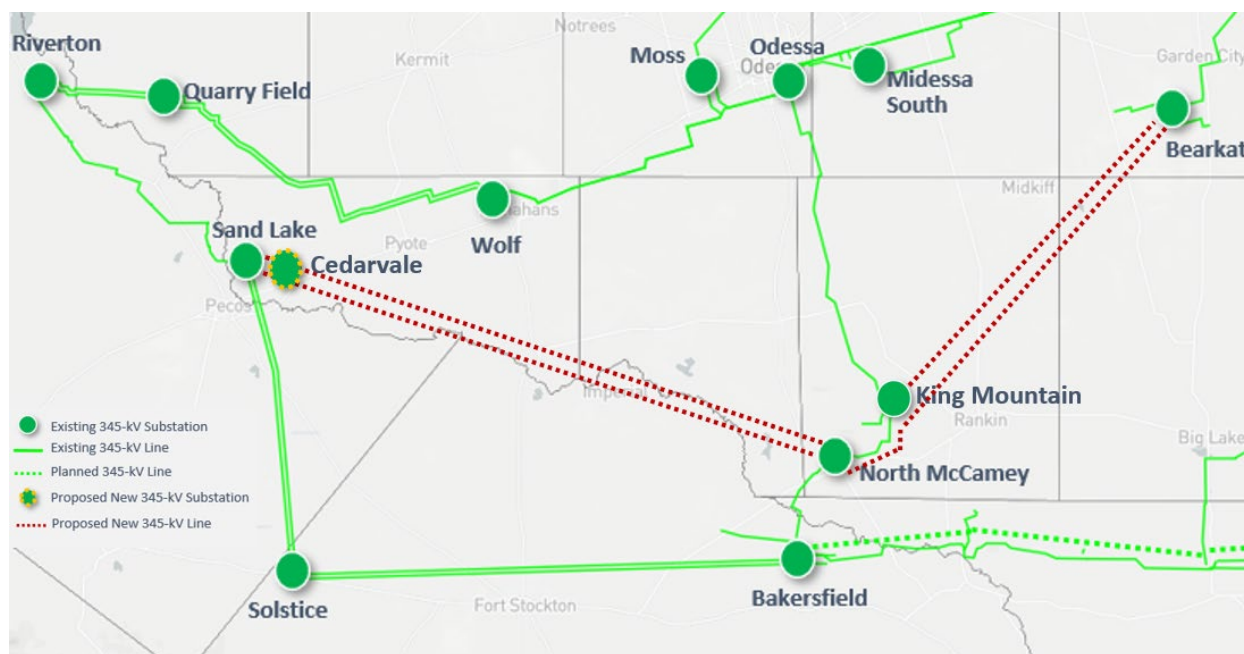


Figure 4.1 Additional Alternatives

GP&L's alternative slightly modifies the Stage 2 upgrade by terminating one of the new 345-kV circuits from Bearkat at King Mountain and making portion of the new Bearkat – North McCamey circuit share the same towers with the existing King Mountain to North McCamey circuit as shown in Figure 4.1.

ERCOT evaluated GP&L's alternative and determined that the proposed Stage 2 upgrade is more reliable than GP&L's alternative based on the following reasons:

- The Stage 2 upgrade provides one more outlet to North McCamey where two 800 MVA 345/138 kV transformers are located to serve the load and generation on the 138-kV system in the McCamey area, compared to GP&L's alternative.
- GP&L's alternative will leave only one circuit from Bearkat to North McCamey under the maintenance outage of the existing North McCamey to King Mountain circuit. ERCOT's steady-state analysis with the maintenance outage condition showed thermal overloads on some of the 138-kV lines in the McCamey area.
- Under GP&L's alternative, a NERC Category P7 contingency will remove both the existing North McCamey – King Mountain 345-kV line and the new North McCamey – Bearkat 345-kV line. ERCOT conducted a high-level stability study for GP&L's alternative, and the study indicated negative impact on the McCamey GTC limit under the prior outage of Noelke – Schneeman Draw or Cedar Canyon – Noelke 345-kV double circuits when compared to the Stage 2 upgrade.
- Extended construction outages or higher energized construction costs may be needed to add a second 345-kV circuit on the existing towers in GP&L's alternative.

TNMP's alternative slightly modifies the Stage 2 upgrade by looping the new North McCamey to Sand Lake double-circuit 345-kV line into a new Cedarvale 345-kV substation (~ 3.7 miles southeast of the existing Sand Lake substation) in order to accommodate potential large flexible loads in the area. According to the response to the TNMP comment, Oncor and TNMP agreed that the LCRA TSC, Oncor, and WETT Bearkat – North McCamey – Sand Lake 345kV Transmission Line Addition Project should move forward without delay as originally submitted. The response from the TSPs also indicated that "both Oncor and TNMP will remain committed to effectively and efficiently address transmission system concerns that arise from the recent influx of customer loads in the Far West region beyond that which was identified in the scope of the original Delaware Basin area review."

Since such loads are currently under review by Large Flexible Load Task Force, ERCOT also recommends moving forward with the proposed Stage 2 upgrade.

4.3. Recommended Project

Based on this independent review, the Delaware Basin Load Integration Study and Permian Basin Load Interconnection Study, ERCOT recommends the following project (Stage 2 upgrade):

- Build a new double-circuit 345-kV line from existing Bearkat Substation to existing North McCamey Substation (~71 miles), with normal and emergency ratings of at least 2,564 MVA
- Build a new double-circuit 345-kV line from existing North McCamey Substation to existing Sand Lake Substation (~94 miles), with normal and emergency ratings of at least 2,564 MVA
- Reconfigure each of the existing substations into a breaker-and-a-half substation (as a minimum configuration)

5. Impact of Stage 2 Upgrade on Dynamic Stability Analysis

ERCOT assessed the potential impact of the recommended project (Stage 2 upgrade) on the existing McCamey Generic Transmission Constraint (GTC). As the Stage 2 upgrade provides additional new 345-kV transmission outlets to the McCamey area, it is expected to improve system strength by reducing overall system impedances and reactive losses. Therefore, the Stage 2 upgrade is expected to improve the dynamic stability of the existing system in the McCamey area.

The Stage 2 upgrade, a new Bearkat – North McCamey – Sand Lake double-circuit 345-kV line, is not expected to require any extended transmission outages during construction. The McCamey GTC will continue to be reviewed and updated in the future Quarterly Stability Assessments (QSAs).

6. Sub-synchronous resonance (SSR) Assessment and Other Sensitivity Studies

A sub-synchronous-resonance (SSR) assessment was performed for the Stage 2 upgrade to identify any adverse impacts to the system in the study area. In addition, sensitivity studies were performed to identify the Stage 2 upgrade performance under certain sensitivity scenarios.

6.1. SSR Assessment

Pursuant to Nodal Protocol Section 3.22.1.3, ERCOT conducted an SSR screening for the Stage 2 upgrade and found no need to require further assessment per Nodal Protocol Section 3.22.

6.2. Planning Guide Section 3.1.3(4) Sensitivities

The Stage 2 upgrade is categorized as a Tier 1 project, pursuant to ERCOT Protocol 3.11.4.3. As required by Planning Guide Section 3.1.3(4), ERCOT performed generation and load sensitivity studies.

6.2.1. Generation Addition Sensitivity Analysis

ERCOT performed a generation addition sensitivity analysis based on Planning Guide Section 3.1.3(4)(a).

Based on a review of the January 2022 GIS report, the following generators in the study area shown in Table 6.1 have a signed interconnection agreement (IA) but have not met all the conditions for inclusion in the case pursuant to Section 6.9(1) of the Planning Guide.

Table 6.1 Generation Units with Signed IA

GINR	Project Name	County	Projected Commercial Operation Date	Fuel	Capacity (MW)
20INR0143	Soda Lake Solar 2	Crane	05/31/2023	Solar	202.99
20INR0249	Appaloosa Run Wind	Upton	03/01/2023	Wind	175
21INR0005	Hutt Wind	Midland	04/05/2023	Wind	336
21INR0021	Green Holly Solar	Dawson	03/31/2023	Solar	413.6
21INR0022	Red Holly Solar	Dawson	08/01/2023	Solar	260
21INR0029	Green Holly Storage	Dawson	08/01/2023	Battery	50
21INR0033	Red Holly Storage	Dawson	08/01/2023	Battery	50
21INR0268	Greyhound Solar	Ector	06/30/2023	Solar	608.7
22INR0363	Hayhurst Texas Solar	Culberson	02/15/2023	Solar	46.2
22INR0485	House Mountain 2 Batt	Brewster	02/01/2023	Battery	61.62
22INR0495	TIMBERWOLF BESS 2	Upton	02/17/2023	Battery	150

These potential renewable resources are located in the Far West Weather Zone. As discussed in Section 2, due to the relatively constant demand from oil and gas customers in the Delaware Basin area, solar generation in the Far West region was assumed to be offline to represent a stressed system condition. Therefore, inclusion of the potential solar resources in Table 6.1 will not change the reliability need.

Although inclusion of the potential wind and battery resources may slightly improve the load serving capability in the study area under normal system conditions if these renewable resources become materialized, it is not expected to be enough to address the reliability need in the study area. As shown in Table 6.1, there are 511 MW of potential new wind generation capacity in the Far West Weather

Zone. With the assumption of 9.55% wind generation dispatch inside the study region per 2021 RTP methodology, the potential new wind generation addition will be about 49 MW. The battery generation is assumed online to provide reactive power support only, i.e., zero MW output, based on the 2021 RTP methodology.

As such, these future renewable resources are not expected to have a material impact on the need of the Stage 2 upgrade.

6.2.2. Load Scaling Sensitivity Analysis

Planning Guide Section 3.1.3(4)(b) requires evaluation of the potential impact of load scaling on the criteria violations seen in this ERCOT independent review. ERCOT concluded that the load scaling would not have a material impact on the project need because of the following reasons:

- The Delaware Basin area is remotely located at the western most part of the ERCOT system relying on two major 345-kV import paths (i.e., Odessa/Moss – Wolf – Riverton and Bakersfield – Solstice).
- Significant and rapid oil and gas load additions were observed and projected in the Delaware Basin area. The load scaling outside the Delaware Basin area is not expected to have a material impact on the need of the Stage 2 upgrade.

7. Congestion Analysis

ERCOT conducted a congestion analysis to identify any potential impact on system congestion related to the addition of the Bearkat – North McCamey – Sand Lake double-circuit 345-kV line, using the 2021 RTP 2026 economic study case.

The results of the congestion analysis indicated no additional congestion in the area with the addition of the Stage 2 upgrade.

8. Load Growth Consideration

ERCOT compared the load forecasts related to the Delaware Basin area assumed in the 2021 RTP cases, the Permian Basin Load Interconnection Study completed in 2021, and the October 2021 ERCOT SSWG cases as shown in Table 8.1. The load forecasts assumed in the 2021 RTP cases and the Permian Basin Load Interconnection Study are based on the load forecast from the IHS Markit Study published in April 2020. The 2021 RTP cases indicate that the Delaware Basin area load is expected to exceed the trigger point of 4,022 MW for the Stage 2 upgrade prior to summer 2026. The 2021 SSWG cases indicate that the Delaware Basin area load will exceed the trigger point of the Stage 2 upgrade a few years earlier.

These discrepancies indicate the current uncertainty associated with predicting the timing of the need for the proposed project.

Table 8.1 Delaware Basin Area Load Forecasts Comparison

Year	2021 RTP (MW)	2021 Permian Basin Load Interconnection Study (MW)	October 2021 SSWG (MW)
2025	n/a*	3,789	4,515
2026	4,347	n/a**	4,543
2027	4,545	n/a**	4,556

Note:

* 2021 RTP study didn't include the case for year 2025.

** 2021 Permian Basin Load Interconnection Study included the cases for year 2025 and 2030. The load levels are 3,789 MW and 4,898 MW for 2025 and 2030 respectively.

In addition, ERCOT reviewed the historical oil and gas activities and load growth in the Far West region. As shown in Figure 8.1, oil and gas drilling activities in the Far West Texas region declined in early 2020 due economic factors and international oil markets but have been increasing since July 2020. As shown in Figure 8.2, historical peak demand in the Far West Weather Zone continues to grow.

Based on this review of the historical and forecasted demand in the area, recent oil and gas drilling trends, and the evaluation of the 2021 RTP cases described in Section 3.3, ERCOT believes that this project will be needed prior to summer 2026. As such, ERCOT concurs with the schedule proposed by LCRA TSC, Oncor, and WETT, specifically that the project be completed prior to summer 2026.

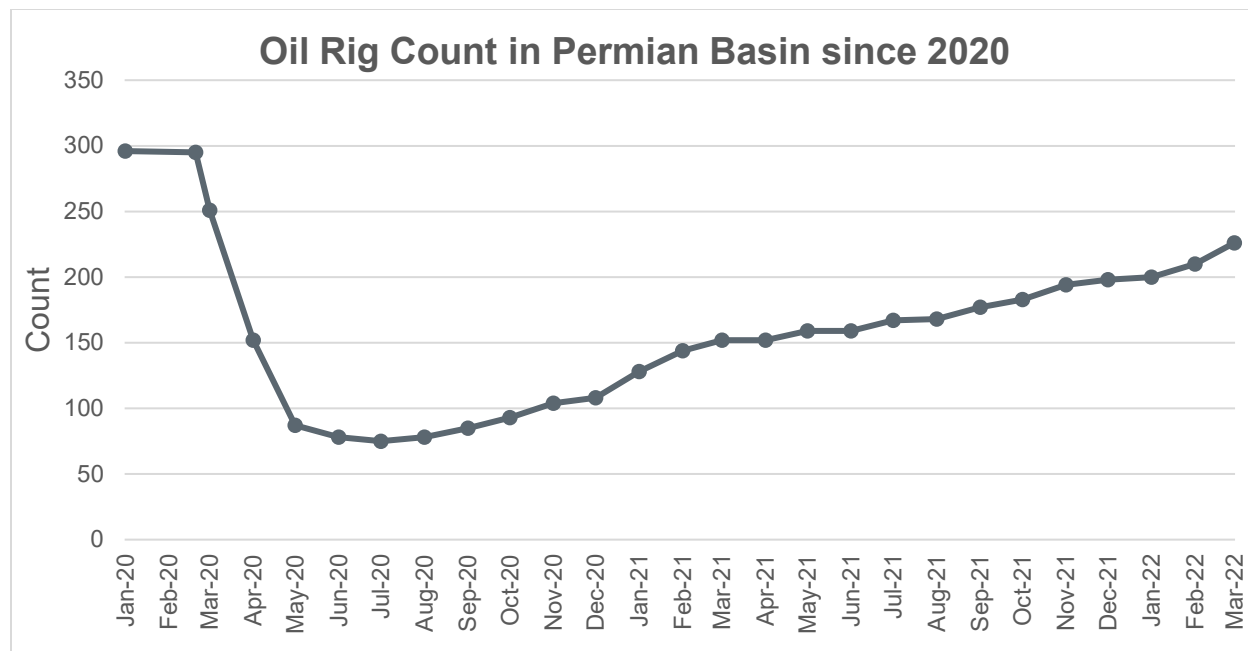


Figure 8.1 Oil Rig Counts in Permian Basin

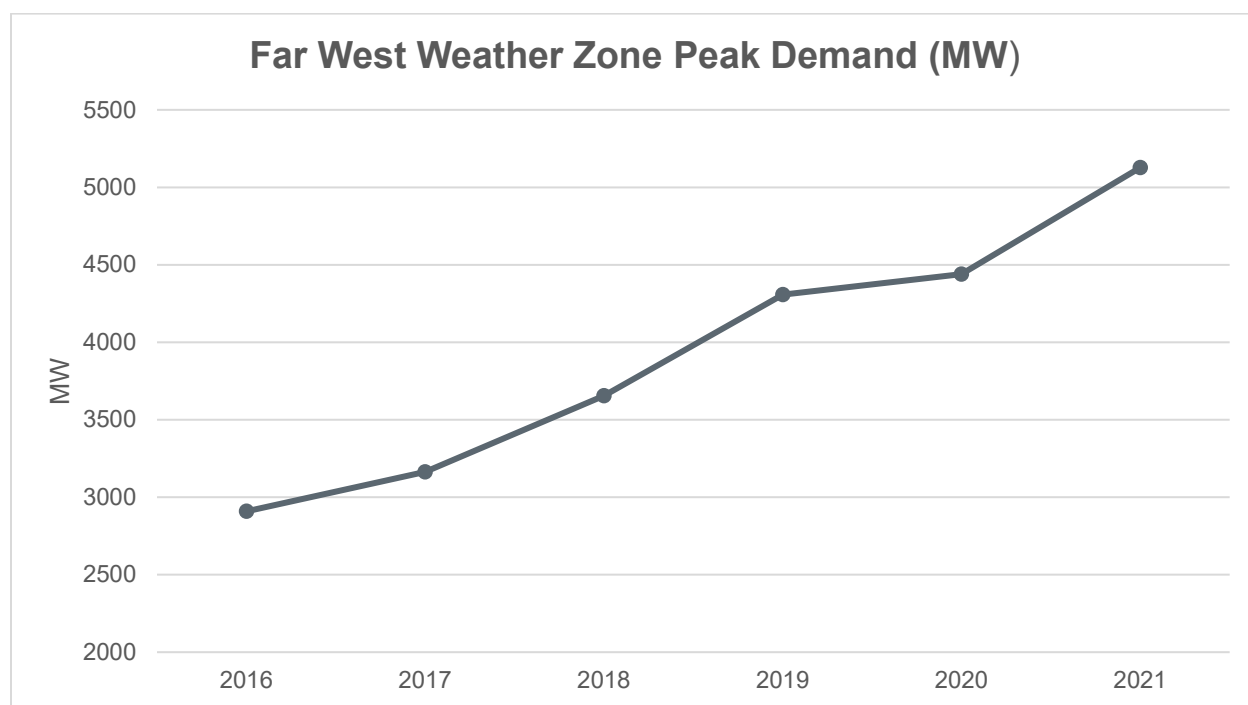


Figure 8.2 Far West Weather Zone Historical Peak Demand

9. Conclusion



This report describes the ERCOT evaluation of the Bearkat – North McCamey – Sand Lake 345-kV Transmission Line Addition Project jointly submitted by LCRA TSC, WETT, and Oncor. Based on the results of this independent review, ERCOT recommends this RPG project to address the reliability need to accommodate the significant and rapid load growth in the Delaware Basin area. The Bearkat – North McCamey – Sand Lake double-circuit 345-kV line addition Project is estimated to cost \$477.6 Million and consists of the following upgrades:

- Build a new double-circuit 345-kV line from existing Bearkat Substation to existing North McCamey Substation (~71 miles), with normal and emergency ratings of at least 2,564 MVA
- Build a new double-circuit 345-kV line from existing North McCamey Substation to existing Sand Lake Substation (~94 miles), with normal and emergency ratings of at least 2,564 MVA
- Reconfigure each of the existing substations into a breaker-and-a-half substation (as a minimum configuration)

It is also recommended that this project be in-service by summer 2026.

LCRA TSC, Oncor, and WETT have requested ERCOT designate the recommended project “critical” to the reliability of the system per PUCT Substantive Rule 25.101(b)(3)(D). Since there is a reliability need to have the project in place and significant uncertainty associated with predicting the timing of the need for the proposed project (see Section 8 for more details), ERCOT deems the project critical to reliability.

10. Appendix

10.1. Appendix A: Delaware Basin Load Integration Study Report	 ERCOT_Delaware_B asin_Load_Integrati
10.2. Appendix B: Permian Basin Load Interconnection Study Report	 ERCOT_Permian_Ba sin_Load_Interconne