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**PUC DOCKET NO. 56799**

**DIRECT TESTIMONY**
**OF JARED GURLEY, WITNESS FOR**
**ONCOR ELECTRIC DELIVERY COMPANY LLC**


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| Exhibit JG-1 | Resume of Jared Gurley |
| Exhibit JG-2 | ERCOT's Permian Basin Study (December 2021) |
| Exhibit JG-3 | ERCOT RPG Submittal: West Texas Rebuild Project (November 2023) |
| Exhibit JG-4 | ERCOT Independent Review: West Texas Rebuild Project (May 2024) |
| Exhibit JG-5 | ERCOT Board of Directors Endorsement Letter: West Texas Rebuild Project (June 2024) |

# DIRECT TESTIMONY OF JARED GURLEY

## I. POSITION AND QUALIFICATIONS

Q. PLEASE STATE YOUR NAME, TITLE, AND BUSINESS ADDRESS.

A. My name is Jared Gurley. I am employed by Oncor Electric Delivery Company LLC ("Oncor"). I hold the position of Senior Manager in Oncor's Transmission Planning group. My business address is 777 Main Street, Suite 707, Fort Worth, Texas 76102.

Q. PLEASE DESCRIBE YOUR PROFESSIONAL QUALIFICATIONS.

A. I am a licensed professional engineer in the State of Texas (License No. 115694) with over 15 years of experience in transmission planning, system protection, and transmission operations. I graduated with a Bachelor of Science degree in Electrical Engineering from Texas Tech University in 2009 and have worked for Oncor ever since.

My job duties include: leading Oncor's evaluation of long-range transmission projects to resolve grid reliability issues; performing power flow studies and analyses in accordance with North American Electric Reliability Corporation ("NERC") reliability criteria and the Electric Reliability Council of Texas ("ERCOT") Planning Guide; and supporting the development of Oncor's transmission projects through the ERCOT and Public Utility Commission of Texas ("Commission") approval processes. Currently, I am focused on Oncor's West Texas 345 kV Infrastructure Rebuild Project ("West Texas Rebuild Project"), which includes the proposed Reiter Switch-Tesoro Switch 345 kV transmission line project (the "Proposed Transmission Line Project"). My resume is included as Exhibit JG-1 to my direct testimony.

Q. HAVE YOU PREVIOUSLY SUBMITTED TESTIMONY BEFORE THE COMMISSION?

A. No, I have not.

## II. PURPOSE OF TESTIMONY

Q. WHAT IS THE PURPOSE OF YOUR DIRECT TESTIMONY?

A. The purpose of my direct testimony is to address certain aspects of the Proposed Transmission Line Project, including:

- supporting the electrical need for the Proposed Transmission Line Project;
- submissions to and recommendations from ERCOT regarding the Proposed Transmission Line Project;
- the adequacy of existing service;
- the need for additional service;
- how the Proposed Transmission Line Project supports the reliability and adequacy of the interconnected transmission system;
- how the Proposed Transmission Line Project supports robust wholesale competition;
- the probable improvement of service or lowering of cost to consumers in the area if the certificate of convenience and necessity ("CCN") is granted;
- the effect of granting the requested CCN on Oncor and any other electric utility serving the proximate area; and
- presentation and comparison of alternatives to the Proposed Transmission Line Project.

These issues are addressed in Oncor's responses to Question Nos. 14-16 in the Application for a Certificate of Convenience and Necessity for a Proposed Transmission Line Project filed by Oncor in this docket (the "Application"). The facts and statements set forth in Question Nos. 14-16 of the Application and Attachment Nos. 4-9 to the Application, which I sponsor, are true and correct to the best of my knowledge. Oncor will offer the Application, as it may be amended and/or supplemented, into evidence in this proceeding.

## III. PROJECT DESCRIPTION AND DEVELOPMENT

Q. PLEASE GENERALLY DESCRIBE THE EXISTING TRANSMISSION

SYSTEM IN THE PROJECT AREA.

A. The project area is situated in Ector and Midland counties, located within West Texas in a part of the region known as the Permian Basin. Multiple transmission lines and stations are located in the project area, but they are aging and/or of lower capacity. Oncor's transmission facilities in the project area need extensive upgrades and modifications to meet current planning and design standards. These transmission system improvements are also needed to meet surging customer demand resulting from continued expansion of the oil and gas industry. A schematic and map of the transmission system in the area are included as Attachment Nos. 8 and 9 to the Application, respectively.

Q. PLEASE GENERALLY DESCRIBE THE NEED FOR THE PROPOSED TRANSMISSION LINE PROJECT.

A. In December 2021, ERCOT completed the Permian Basin Load Interconnection Study Report ("Permian Basin Study"), identifying transmission upgrades needed for reliable service in the area. The Permian Basin Study includes the Proposed Transmission Line to address potential thermal overloads. ERCOT endorsed Oncor's West Texas Rebuild Project, endorsed by ERCOT in June 2024, including the Proposed Transmission Line Project. The overall West Texas Rebuild Project includes a series of transmission rebuilds, upgrades, and new transmission construction that will address reliability issues, increase load-serving capability, and provide operational flexibility in the West Texas area, including the Permian Basin region.

Q. WHAT IS THE STATUS OF THE WEST TEXAS REBUILD PROJECT?

A. As part of the West Texas Rebuild Project, Oncor will seek Commission approval for multiple projects in separate CCN proceedings. This proceeding is the second of such CCN proceedings, with the first being the Ranger Camp Switch 345 kV transmission tap line project in Mitchell County. The application for that first project, which can be found in Docket

No. 56597, is currently awaiting an order on final disposition from the Commission.

Q. PLEASE DESCRIBE THE PROPOSED TRANSMISSION LINE PROJECT.

A. The Proposed Transmission Line Project includes constructing a new 4.0- to 5.5-mile, double-circuit 345 kV transmission line connecting Oncor's planned Reiter Switch station in Ector County to Oncor's existing Tesoro Switch station in Midland County. The transmission line is proposed to be built on double-circuit lattice steel towers. Details of the structures, conductor, and stations are provided in the direct testimony of Oncor witness Kaleb Roberts.

## IV. NEED FOR THE PROPOSED TRANSMISSION LINE PROJECT

Q. PLEASE PROVIDE AN OVERVIEW OF THE NEED FOR THE PROPOSED TRANSMISSION LINE PROJECT.

A. The Proposed Transmission Line Project is a component of the West Texas Rebuild Project and is needed to expand and upgrade Oncor's transmission system to address reliability issues in West Texas. Load growth, load integration requests, and the age of existing facilities all contribute to the Proposed Transmission Line Project's need. The Proposed Transmission Line Project will result in a more stable, reliable, and interconnected transmission system.

Q. PLEASE ELABORATE ON THE IDENTIFIED RELIABILITY ISSUES.

A. The historical and forecasted rapidly growing loads cause transmission reliability issues in the area of the project. The following table shows the historical and forecasted loads in the project area:

| YEAR | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 |
|---|---|---|---|---|---|---|---|
| LOAD (MW) | 5,824 | 6,476 | 8,480 | 10,139 | 11,119 | 11,595 | 11,993 |

Oncor's steady-state contingency analysis shows thermal overloads by summer 2028 under certain NERC post-contingency conditions. Oncor's analysis was based on ERCOT's October 10, 2022, Steady State Working Group (SSWG) case. Oncor identified thermal overloads on numerous 345

kV transmission lines and 345/138 kV autotransformers in the West Texas portion of Oncor's transmission grid under: (i) NERC Category P7 contingency conditions; or (ii) the loss of any two adjacent (vertically or horizontally) circuits on a common structure. Oncor's response to Question No. 14 of the Application further details these thermal overloads under Oncor's steady-state contingency analysis.

Q. HAS ERCOT REVIEWED THE NEED FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. Yes. In December 2021, ERCOT completed the Permian Basin Study, included as Attachment No. 4 to the Application and Exhibit JG-2 to my direct testimony. The Permian Basin Study identifies transmission upgrades necessary to reliably serve the existing and projected oil and gas loads in the Permian Basin area. The Permian Basin Study includes the Proposed Transmission Line Project to resolve an overload condition on the Odessa EHV 345/138 kV autotransformer #2 identified in the 2025 and 2030 cases that were studied by ERCOT.

Oncor provided its West Texas 345 kV Infrastructure Rebuild Project submittal, including the Proposed Transmission Line Project, to the ERCOT Regional Planning Group ("RPG") in November 2023. ERCOT conducted an independent review of the West Texas Rebuild Project and published its report, recommending the Proposed Transmission Line Project as a component, in May 2024. A copy of Oncor's submittal to the ERCOT RPG is attached to my testimony as Exhibit JG-3 and included in the Application as Attachment No. 5. ERCOT's independent review of the West Texas Rebuild Project is attached to my testimony as JG-4 and included as Attachment No. 6 to the Application. At a meeting held on June 18, 2024, ERCOT's Board of Directors endorsed the West Texas Rebuild Project as a Tier 1 project. The signed endorsement letter memorializing this approval is included as Exhibit JG-5 to my direct testimony and Attachment No. 7 to the Application.

Q. HOW WILL THE PROPOSED TRANSMISSION LINE PROJECT IMPROVE RELIABILITY IN THE STUDY AREA?

A. The system in West Texas currently lacks the transmission facilities needed to address the load growth it is experiencing, raising concerns for transmission reliability in the area. In conducting its underlying Permian Basin Study, ERCOT performed reliability assessments based on NERC Reliability Standard TPL-001-5.1, ERCOT Protocols, and ERCOT Planning Criteria. ERCOT's steady-state contingency analysis observed potential thermal overload violations during N-1 failure or outage conditions relating to NERC Category P7 contingencies.

As a component of the West Texas Rebuild Project, the Proposed Transmission Line Project will address these potential NERC reliability standard violations by adding a new double-circuit 345 kV line in the area and expanding existing stations through the addition of 345 kV switchyards. Additionally, the West Texas Rebuild Project will provide the following system improvements: (1) providing increased operational flexibility during emergency conditions; (2) enhancing voltage support in the Permian Basin by creating a more-integrated 345 kV transmission system; (3) providing transformer redundancy in the area; and (4) allowing for future expansion in the project area.

Q. WHAT WERE THE RESULTS OF ERCOT'S INDEPENDENT REVIEW FOR THE PROPOSED TRANSMISSION LINE PROJECT?

A. ERCOT endorsed the West Texas Rebuild Project, including the Proposed Transmission Line Project, pursuant to 16 Texas Administrative Code ("TAC") § 25.101(b)(3)(D). It is my understanding that 16 TAC § 25.101(b)(3)(A) requires the Commission to give great weight to ERCOT's endorsement of the Proposed Transmission Line Project.

Q. DOES THE PROPOSED TRANSMISSION LINE PROJECT FACILITATE ROBUST WHOLESALE COMPETITION?

A. Yes. The West Texas Rebuild Project, including the Proposed Transmission Line Project, will facilitate robust wholesale competition by facilitating the delivery of electric power at 345 kV from existing and future generation resources to existing and future electric customers in the area.

Q. DOES THE PROPOSED TRANSMISSION LINE PROJECT FOSTER COMPETITION IN THE RETAIL MARKET?

A. Yes. The Proposed Transmission Line Project will foster competition in the retail market by improving transmission service through an area where retail competition is available.

Q. WILL THE PROPOSED TRANSMISSION LINE PROJECT AFFECT ANY OTHER ELECTRIC UTILITIES IN THE AREA?

A. The Proposed Transmission Line Project will not serve or connect into another electric utility. However, all utilities operating in the area will benefit from the increased system reliability resulting from the West Texas Rebuild Project.

## V. ALTERNATIVES CONSIDERED

Q. WHAT ALTERNATIVES TO THE PROPOSED TRANSMISSION LINE PROJECT WERE STUDIED?

A. Because ERCOT recommended the Proposed Transmission Line Project as part of ERCOT's Permian Basin Study, neither ERCOT nor Oncor conducted an additional assessment of alternatives for the West Texas Rebuild Project. The Permian Basin Study, attached as Exhibit JG-2 to my direct testimony, did evaluate three alternatives to the Proposed Transmission Line Project. These alternatives included: (1) building a new Midessa South – Moss 345 kV single-circuit line; (2) establishing the Reiter Switch and a 345/138 kV Tesoro Switch, looping the existing Odessa EHV – Moss/Wolf 345 kV line through the Reiter Switch, and building a new Reiter – Tesoro 345 kV double-circuit line; and (3) establishing the Reiter Switch, looping the existing Odessa EHV – Moss/Wolf 345 kV line through

the Reiter Switch, and building a new Reiter – Midessa South 345 kV double-circuit line.

ERCOT selected the Proposed Transmission Line Project as the preferred option because two of the alternatives were found not to perform as well as the Proposed Transmission Line Project and the other alternative would be more costly with the addition of a 138 kV switchyard at Tesoro.

Q. WOULD A DISTRIBUTION ALTERNATIVE TO THE PROPOSED TRANSMISSION LINE PROJECT BE FEASIBLE?

A. No. Upgrading voltage, bundling of conductors of existing facilities, and adding transformers would not address the identified reliability issues. These alternatives would also fail to provide the necessary level of service to meet electric demand in the area, including all of the increasing oil and gas loads.

## VI. CONCLUSION

Q. ARE THE PROPOSED FACILITIES NECESSARY FOR THE SERVICE, ACCOMMODATION, CONVENIENCE, OR SAFETY OF THE PUBLIC WITHIN THE MEANING OF PURA § 37.056(A), TAKING INTO ACCOUNT THE FACTORS SET OUT IN PURA § 37.056(C)?

A. Yes. Existing transmission service in the project area is inadequate. The additional service provided by the Proposed Transmission Line Project is needed to support the reliability and adequacy of the interconnected transmission system.

Q. PLEASE SUMMARIZE YOUR TESTIMONY.

A. The Proposed Transmission Line Project is needed to address reliability issues, including thermal overloads. The Proposed Transmission Line Project will strengthen reliability, improve service, and support current and future load by creating a more networked transmission grid in an area where customer demand is continuously growing.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.

## AFFIDAVIT

**STATE OF TEXAS** §
§
**COUNTY OF TARRANT** §

**BEFORE ME,** the undersigned authority, on this day personally appeared Jared Gurley who, having been placed under oath by me, did depose as follows:

My name is Jared Gurley. I am of legal age and a resident of the State of Texas. The foregoing testimony and exhibits offered by me are true and correct, and the opinions stated therein are, to the best of my knowledge and belief, accurate, true and correct.

Jared Gurley

**SUBSCRIBED AND SWORN TO BEFORE ME** on this 24th day of July, 2024.

Terri Watts
Notary Public, State of Texas

My Commission Expires

07-07-2028

TERRI WATTS
Notary Public, State of Texas
Comm. Expires 07-07-2028
Notary ID 1129360-0

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Hudson Oaks, TX 76087
Phone (817) 694-7915
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# Jared Gurley

**Education**

**Texas Tech University** — **Lubbock, TX**
Graduated in May 2009
Bachelor of Science in Electrical Engineering

**Work Experience**

**June 2009 – Present Oncor Electric Delivery** — **Fort Worth, TX**

**Sr. Manager Transmission Planning**

June 2023 – Present

- Manage a team of transmission planning engineers that cover west Texas
- Guide planning team to solve transmission system reliability deficiencies and develop Regional Planning Group submittals
- Manage west Texas planning input for Integrated Scoping team
- Collaborate with the Compliance team to meet NERC and ERCOT requirements.
- Aided in developing Operational Solution process to serve customers sooner
- Engaged in ERCOT PLWG and RPG stakeholder groups
- Assisted in coordinating transmission providers and ERCOT in early stages of Permian Basin Reliability Study
- Facilitate a high-performance team culture including hiring high-potential job candidates, providing mentoring to professionally develop team members, and demonstrating continuous improvement practices.
- Perform performance reviews, salary administration, and other management administrative tasks

**Manager Transmission II – Relay Settings**

June 2019 – June 2023

- Assist in managing the Relay Setting group and manage relay setting contractors
- Manage project assignments for all relay setting engineers
- Assist in maintaining compliance with ERCOT and NERC standards
- Led a team to develop and implement a new relay setting process with new software to assist relay setting engineers by automating tasks and reducing human error
- Assisted in the development of Relay Setting Application Guide and other job aids
- Experience in providing technical support to other groups and organizations

**P&C Manager, Fort Worth Transmission**

November 2015 – June 2019

- Directed the Protection and Control organization
- Coordinated the analysis, review and communications of critical events
- Actively participated in task force assignments, planning sessions
- Ensured that District NERC/ERCOT required Maintenance is performed correct and on time

**Senior Engineer, System Protection – Relay Settings**

June 2009 – November 2015

**Professional License**

Professional Engineer – State of Texas

**Leadership Programs**

APEX 2017 Graduate

# ERCOT Permian Basin Load Interconnection Study

**Final**

**December 2021**

# Document Revisions

| Date | Version | Description | Author(s) |
|---|---|---|---|
| December 8, 2021 | 1.0 | Final | Ying Li |
| | | Reviewed by | Sun Wook Kang, Shun Hsien (Fred) Huang |

# Executive Summary

ERCOT, with extensive review and input by the affected Transmission Service Providers (TSPs) and stakeholders, performed the Permian Basin Load Interconnection Study and identified transmission upgrades, especially long lead time transmission upgrades, necessary to reliably serve the existing and projected oil and gas loads in the Permian Basin area. This report describes the identified potential reliability needs and details of the transmission upgrades to meet the electric demand driven by the oil and natural gas industry and the associated economic expansion in the Permian Basin area. The Permian Basin area includes the Delaware Basin, Midland Basin, and Central Basin Platforms which covers most of the counties in the Far West Weather Zone plus five adjacent counties in the West Weather Zone.

The Far West Weather Zone 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. Due to the short-term planning horizons of the oil and gas industry resulting in lack of long-term load commitments, ensuring that necessary transmission improvements are in place in time to accommodate the rapid oil and gas development continues to be a challenge. As part of the efforts to address the challenge, 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. In addition, ERCOT completed the Delaware Basin Load Integration Study[1] in December 2019 and developed the roadmap involving major new 345-kV lines to improve load serving capability to import power into the Delaware Basin area. The Stage 1 upgrade in the roadmap was endorsed in June 2021 and is expected to be complete in 2023.

Given the challenges associated with the rapid load growth in the Permian Basin area, TSPs serving the Permian Basin area have also made significant efforts to better understand the underlying dynamics of oil and gas development throughout the region. This effort led to the completion of a customer demand study by IHS Markit, which provides an in-depth analysis of the oil and gas industry and provides more granular and detailed electricity demand forecast in the Permian Basin area through 2030. According to the IHS Markit study report[2] published in April 2020, the electricity needs of the Permian Basin is projected to be nearly double by 2030 compared to 2019, based on a detailed examination of the key drivers underlying power demand associated with recent and ongoing growth of oil and gas activities in the Midland Basin, Delaware Basin, Central Basin Platform, and Fringe regions of the Permian Basin. ERCOT and the TSPs relevant to the area reviewed the demand forecast from the IHS Markit study and deemed that the forecast is reasonable and appropriate to be used for the local transmission/load interconnection study of the Permian Basin area.

As a result, ERCOT with significant support from the relevant TSPs performed steady state analyses utilizing the demand forecast through 2030 (8,450 MW in 2025 and 9,970 MW in 2030) and identified a set of transmission improvements to connect and reliably serve the projected oil and gas loads in the Permian Basin area. As summarized in Section 5 of this report, ERCOT identified both preferred and placeholder transmission upgrades. If the preferred upgrades identified in this study are submitted to Regional Planning Group (RPG) for review, ERCOT may use this study report as part of ERCOT Independent Review. The placeholder projects may require further review. Table E.1 lists the details of the preferred upgrades identified in this study. The total cost of the preferred transmission upgrades is estimated to be approximately $1.5 Billion. Capital cost estimates of each transmission upgrade

[1] https://www.ercot.com/gridinfo/planning
[2] https://www.ercot.com/files/docs/2020/11/27/27706_ERCOT_Letter_to_Commissioners_-_Follow-up_Status_Update_on_Permian....pdf

were provided by the TSPs relevant to each upgrade. ERCOT used the cost estimates provided by the TSPs to calculate total project cost estimates for various projects.

**Table E.1 Preferred Reliability Upgrades**

| Project ID | Preferred Transmission Upgrades (Note: Assumed ratings can be found in Section 6) | Year of Study Case with Reliability Need Starting to Appear | Approximate Cost Estimate ($M) |
|---|---|---|---|
| 1 | Rebuild existing Morgan Creek – Tonkawa 345-kV line using double-circuit capable structures and add a 2nd circuit | 2025 | 100.58 |
| 2 | Rebuild existing Midland East – Falcon Seaboard 345-kV line using double-circuit capable structures and add a 2nd circuit | 2025 | 196.47 |
| 2 | Rebuild existing Morgan Creek – Falcon Seaboard 345-kV line using double-circuit capable structures and add a 2nd circuit | 2030 | |
| 2 | Rebuild existing Midland East – Midland County NW 345-kV line using double-circuit capable structures and add a 2nd circuit | 2025 | |
| 3 | Upgrade existing Morgan Creek – Longshore 345-kV line | 2030 | 393.88 |
| 3 | Upgrade existing Morgan Creek – Longshore Fly 345-kV line | 2025 | |
| 3 | Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers;<br>Loop existing Longshore – Midessa South 345-kV line into Consavvy and upgrade Longshore – Consavvy 345-kV line;<br>Loop existing South Midland – Pronghorn 138-kV line and Midland East – Spraberry 138-kV line into Consavvy | 2025 | |
| 3 | Upgrade Consavvy – Midessa South 345-kV line | 2025 | |
| 3 | Upgrade existing Longshore Fly – Quail 345-kV line | 2025 | |
| 3 | Loop existing Grelton – Odessa EHV 345-kV line into Consavvy | 2025 | |
| 3 | Upgrade existing Midessa South – Odessa EHV 345-kV line | 2025 | |
| 3 | Upgrade existing Quail – Odessa EHV 345-kV line | 2025 | |
| 3 | Upgrade existing Midessa South 345/138-kV transformer and add a 2nd Midessa South 345/138-kV transformer | 2025 | |
| 18 | Add Verhalen – New Load 90108 138-kV line | 2025 | 6.60 |
| 24 | Establish a new IH20 345-kV Substation and install two new 345/138-kV transformers | 2030 | 65.55 |
| 24 | Loop existing Solstice – Sand Lake 345-kV double-circuit line at the new IH20 345-kV Substation | 2030 | |
| 25 | Establish a new 345/138-kV Reiter Substation with two new 345/138-kV transformers;<br>Establish a new 345-kV Quail East Substation;<br>Add a new Quail East – Reiter 345-kV double-circuit line | 2025 | 104.65 |
| 31 | Add Quarry Field – New Load 90004 138-kV line | 2025 | 80.23 |
| 31 | Add New Load 90004 – New Load 90007 – New Load 90015 – New Load 90066 – Keystone 138-kV line | 2025 | |
| 31 | Add capacitor bank (90 Mvar) at new load bus 90004 | 2025 | |
| 33 | Add ONC90005_TAP – New Load 90005 138-kV line | 2025 | 67.25 |
| 33 | Add New Load 90005 – New Load 90111 – New Load 90023 - New Load 90012 138-kV line | 2025 | |

| | | | |
|---|---|---|---|
| 33 | Add capacitor bank (90 Mvar) at new load bus 90012 | 2025 | |
| 34 | Add New Load 90012 – New Load 90021 138-kV line | 2030 | 29.6 |
| 35 | Add Faulkner – New Load 90038 – New Load 90021 138-kV line | 2025 | 33.8 |
| 35 | Add capacitor bank (90 Mvar) at new load bus 90021 | 2030 | |
| 36 | Add Faulkner – New Load 90108 138-kV line | 2030 | 17.55 |
| 42 | Add Bearkat – North McCamey 345-kV double-circuit line (Stage 2 upgrade) | 2030 | 392.41 |
| 42 | Add North McCamey – Sand Lake 345-kV double-circuit line (Stage 2 upgrade) | 2030 | |

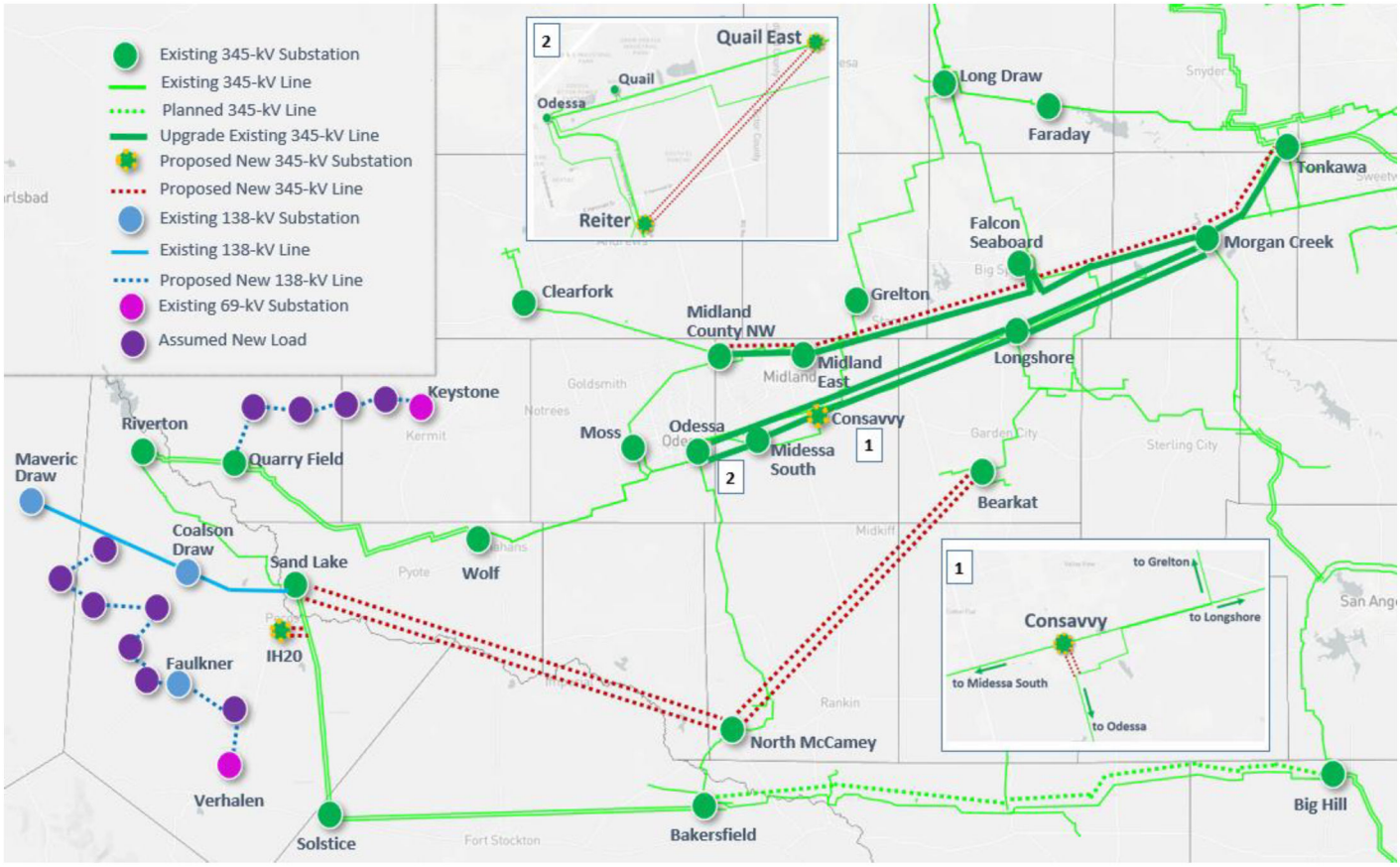


Figure E.1 Preferred Reliability Upgrades for 2030

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# 1. Introduction

Over the past several years, the Far West Weather Zone, which includes the Delaware Basin, Midland Basin, and Central Basin Platform, 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. Figure 1.1 shows the primary oil basin resources in the Permian area.

Ensuring that necessary transmission improvements are in place in time to accommodate the rapid oil and gas development in the Permian Basin 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 improvement and oil and gas development. Due to the nature of the oil and gas industry, it is extremely difficult to accurately forecast their electricity demand more than one to two years. On the other hand, transmission improvements, which include planning studies, routing analysis, regulatory approvals, route acquisition, design, and construction, generally can take up to six years. Because of lack of long-term load commitments from the oil and gas industry, 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 for the rapid and significant load growth in the Permian Basin area.

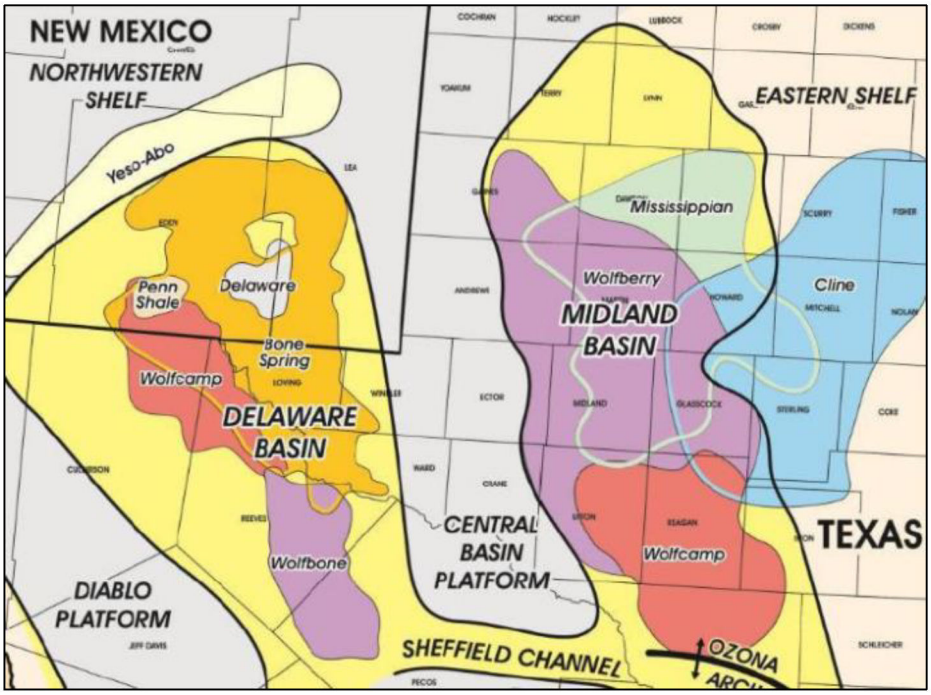


**Figure 1.1 Map of Tectonic Subdivision of the Permian Basin[3]**

As part of the efforts to address the challenge, 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 address the transmission needs in the Delaware Basin area. In December 2019, ERCOT completed the Delaware Basin Load Integration Study to identify potential long lead

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

time transmission improvements (i.e., new 345-kV transmission lines) to accommodate the rapid oil and gas development. The study developed a roadmap 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 loads assumed in the Delaware Basin Load Integration Study were provided by the TSPs in the area based on the surveys of their high-use oil and gas customers. The Stage 1 upgrade in the roadmap was endorsed in June 2021 and is expected to be complete in 2023.

The TSPs serving the load in the Permian Basin area have also made significant efforts to better understand the underlying dynamics of oil and gas development throughout the region. This effort led to the completion of a customer demand study 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.

ERCOT and the TSPs relevant to the area reviewed the demand forecast projected in the IHS Markit study and deemed that the forecast is reasonable and appropriate to be used for the local transmission/load interconnection study of the Permian Basin area. More details of the projected demand forecast from the IHS Markit study can be found in Section 2.2 of this report. ERCOT with significant support from the relevant TSPs completed this Permian Basin Load Interconnection Study in 2021 utilizing the demand forecast from the IHS Markit study to identify the reliability challenges and a set of transmission improvements to connect and reliably serve the existing and projected oil and gas loads in the Permian Basin. This report describes the study assumptions, methodology and the results of ERCOT's assessment.

ERCOT also reviewed the historical oil and gas activities and load growth in the Far West region. As shown in Figure 1.2, the oil rig count data showed that the oil and gas drilling activities in the Permian Basin area have been increasing since July 2020 although the activities temporarily declined in early 2020 due to COVID-19 and international oil markets. Figure 1.3 shows the historical peak demand in the Far West Weather Zone which also indicates the resumed rapid load growth in the area.

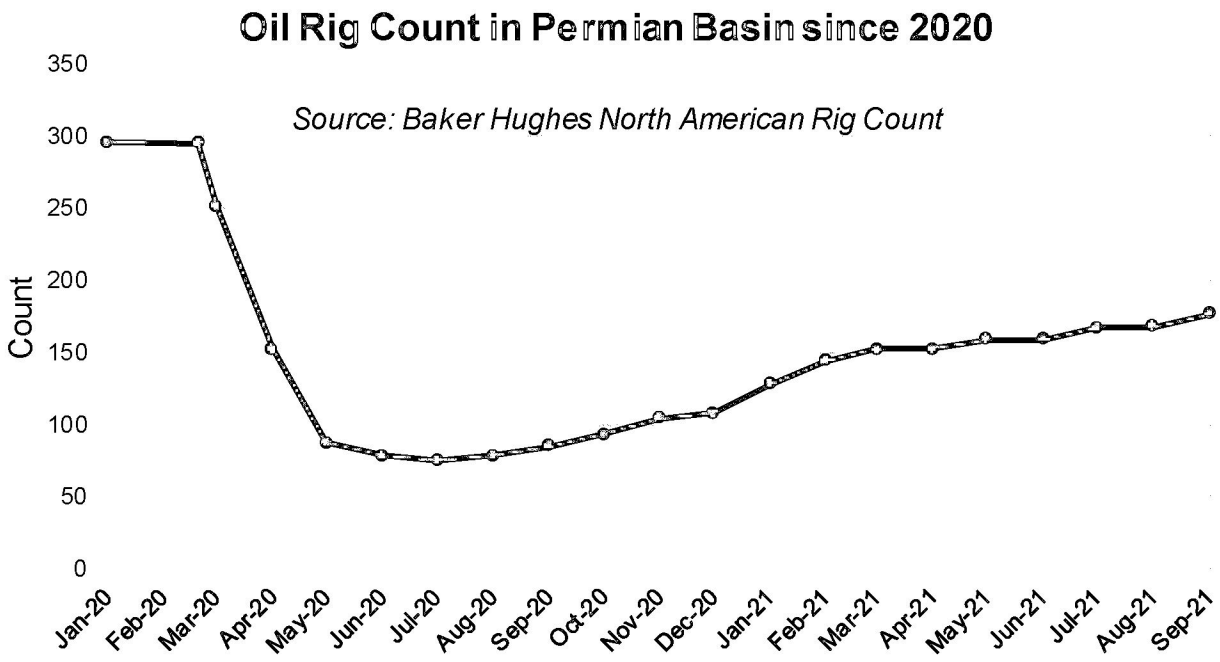


**Figure 1.2 Oil Rig Counts in Permian Basin**

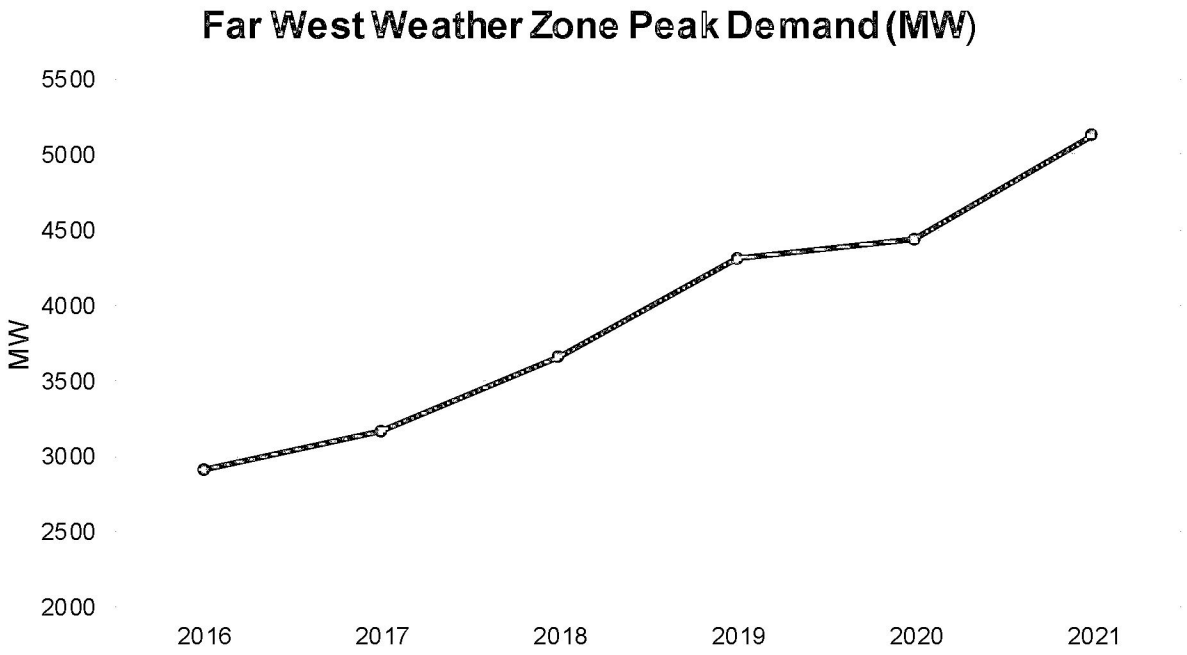


**Figure 1.3 Far West Weather Zone Historical Peak Demand**

# 2. Study Assumptions and Methodology

This section describes study assumptions and methodology employed in the Permian Basin Load Interconnection Study.

## 2.1. Study Area

The Permian Basin area spans most of the counties in the Far West Weather Zone plus five adjacent counties in the West Weather Zone. Table 2.1 shows the counties included in the study area in this study.

**Table 2.1 Counties in the Study Area**

| County | Weather Zone |
|---|---|
| Andrews | Far West |
| Borden | Far West |
| Crane | Far West |
| Crockett | Far West |
| Culberson | Far West |
| Dawson | Far West |
| Ector | Far West |
| Glasscock | Far West |
| Howard | Far West |
| Irion | West |
| Loving | Far West |
| Martin | Far West |
| Midland | Far West |
| Mitchell | West |
| Pecos | Far West |
| Reagan | Far West |
| Reeves | Far West |
| Schleicher | West |
| Scurry | West |
| Sterling | West |
| Upton | Far West |
| Ward | Far West |
| Winkler | Far West |

## 2.2. Study Assumption

### 2.2.1. Reliability Case

The following starting case was used to develop study cases for year 2025 and 2030 in the study:

- The 2025 West/Far West (WFW) summer peak case[4] from the 2020 RTP (posted in October 2020 in the ERCOT MIS site)

[4] https://mis.ercot.com/secure/data-products/grid/regional-planning?id=PG7-173-M

### 2.2.2. Study Case Loads

The IHS Markit study provides an in-depth analysis of the oil and gas industry and provides an electricity demand forecast in the Permian Basin area through 2030.

As described in Section 1, ERCOT and the TSPs relevant to the area reviewed the demand forecast from the IHS Markit study and deemed that the forecast is reasonable and appropriate to be used in this study. The TSPs made a joint effort and mapped the granular load forecast data to the substation level. The substation level load includes the load connecting to the existing substations and the projected new loads that require new interconnections to the existing transmission grid. Figure 2.1 and Figure 2.2 show the geographic locations of the projected new loads for the year 2025 and 2030.

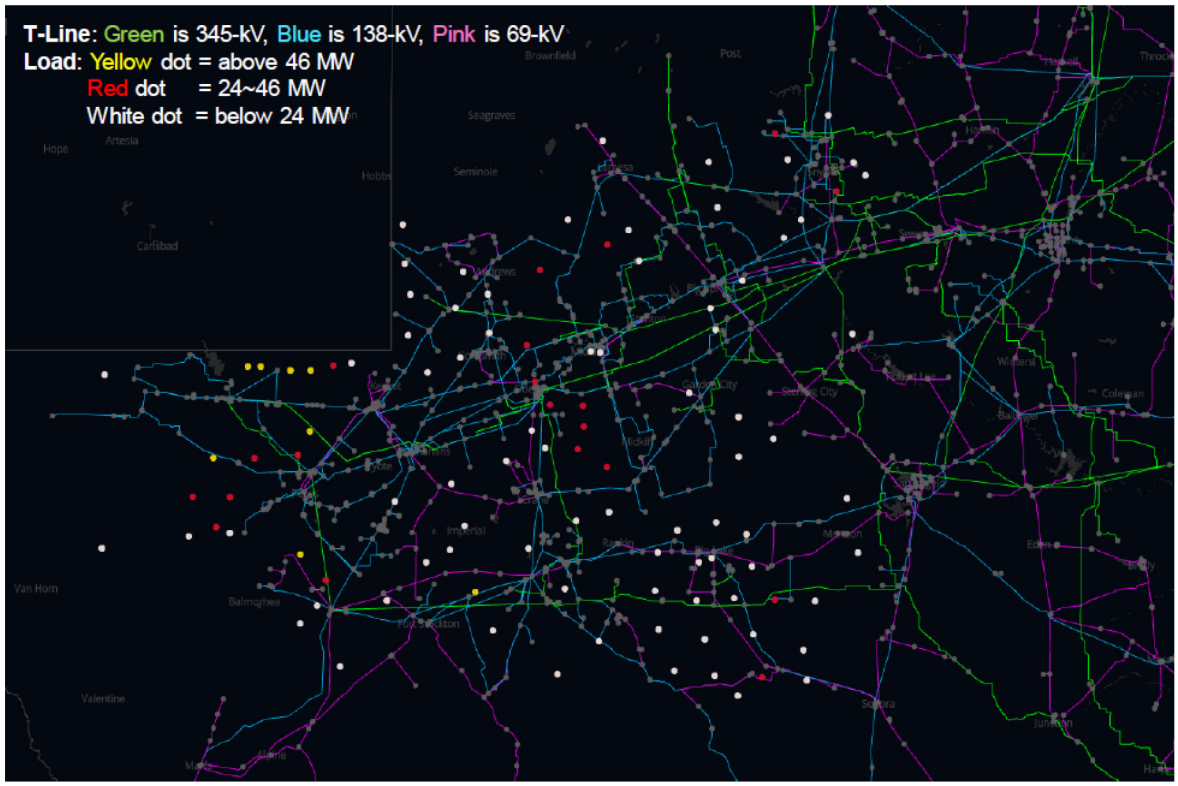


Figure 2.1 Approximate Locations of Projected New Loads for Year 2025

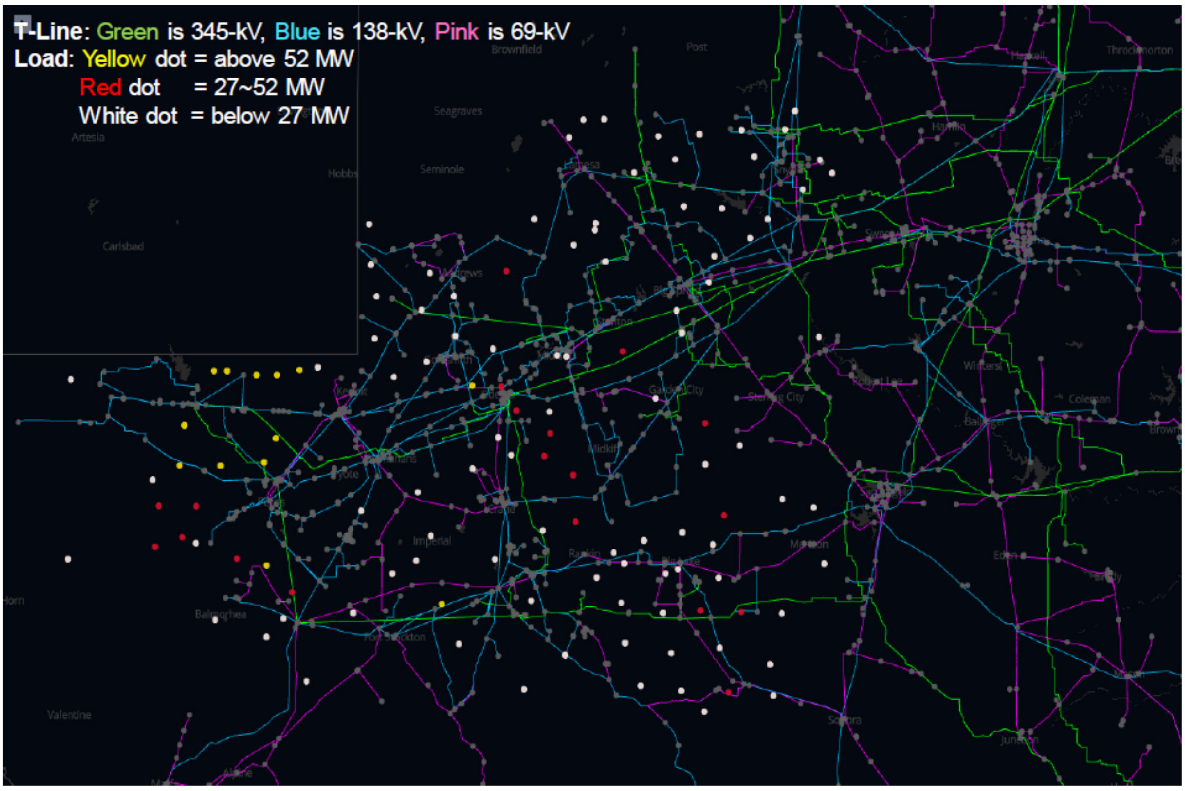


Figure 2.2 Approximate Locations of Projected New Loads for Year 2030

The load in the Permian Basin area in the starting case was updated with the substation level load derived from the demand forecast in the IHS Markit study to develop the study base case. Certain placeholder transmission interconnection projects were assumed to connect the projected new loads into the study base case. Table 2.2 summarizes the load level modeled in this Permian Basin Load Interconnection Study compared to the load in the 2020 RTP case.

Table 2.2 Permian Basin Load Projection for Year 2025 and 2030 in the Study

| Permian Basin Load | IHS Load Forecast (MW) | | 2020 RTP (MW) |
|---|---|---|---|
| | 2025 Load | 2030 Load | 2025 Load |
| Total Load at Existing Substations | 6,601 | 7,402 | 8,343 |
| Total Load Requiring New Transmission Interconnections | 1,850 | 2,568 | n/a |
| **Total Load** | **8,450** | **9,970** | **8,343** |

Table 2.3 shows the load projection by the locations in the study base cases.

Table 2.3 IHS Load Projection by Locations for Year 2025 and 2030

| Area | 2025 Load (MW) | 2030 Load (MW) |
|---|---|---|
| Delaware Basin | 3,789 | 4,898 |
| Far West (Excluded Delaware Basin) | 4,128 | 4,533 |
| West (Included Five Counties) | 532 | 539 |
| **Total** | **8,450** | **9,970** |

The reactive consumption of the projected new oil and gas load was assumed based on historical operational performance of existing oil and gas load in the Permian Basin area. Based on the review of the historical performance and inputs from the relevant TSPs, 0.97 power factor was used in this study for the projected new oil and gas loads. For the loads at the existing substations, the power factors were assumed the same as in the 2020 RTP case.

### 2.2.3. Transmission Topology

All RPG-approved Tier 1, 2, and 3 and all Tier 4 transmission projects expected to be in-service within the study area by the respective years were added to the corresponding study base cases based on the review of the ERCOT Transmission Project Information and Tracking (TPIT) report posted in October 2020. During the study, additional transmission projects expected to be in-service within the study area were also added to the study base cases based on the review of the June 2021 TPIT report. Table 2.4 lists the transmission projects added to the study base cases.

**Table 2.4 Transmission Additions for Year 2025 and 2030**

| ERCOT Project # | Project Title | Projected In-Service Date (Month/Year) | Planning Charter Tier |
|---|---|---|---|
| 54255 | Rebuild Rio Pecos – Lynx Ckt 2 (1926 ACSS) | Dec-20 | Tier 4 |
| 55372 | Conversion of TNMP Gomez to 138-kV service. | Dec-20 | Tier 4 |
| 57173 | TNMP Soaptree Switching Station | Dec-20 | Tier 4 |
| 52311 | Add Gardendale 345-kV Switch | Dec-20 | Tier 4 |
| 52295 | Natural Dam 138-kV Switch | May-21 | Tier 4 |
| 57797 | Athey: Build 138-kV Station | Sep-21 | Tier 4 |
| 55367 | Wolfcamp: Build 138-kV box bay | Nov-21 | Tier 4 |
| 52322 | Establish Courtney Creek Switch | Dec-21 | Tier 4 |
| 58540 | Rebuild 16th St – Soaptree | Dec-21 | Tier 4 |
| 6719 | Twelvemile Substation Addition | Sep-22 | Tier 4 |
| 55470 | Bison to Ozona: Rebuild 69-kV line | Nov-22 | Tier 4 |
| 51788 | Amos Creek Circuit Breaker Addition | Nov-20 | Tier 4 |
| 52464 | Alamito Creek to Ft. Davis: Rebuild 69-kV line | May-23 | Tier 4 |
| 60489 | Adds Leon Creek Switching Station and Tarbush Tie | Sep-21 | Tier 4 |
| 60491 | Rebuild 16th Street-Airport with 1926 ACSS | Mar-22 | Tier 4 |
| 59402 | Add Midland East Switch 345/138-kV Autotransformer #2 | Dec-22 | Tier 3 |
| 62728 | Wink – Shifting Sands 69-kV Line Conversion to 138-kV | May-22 | Tier 4 |
| 63491, 63493, 63495, 63497 | Bakersfield to Big Hill 345-kV Second Circuit Addition Project | Summer 2023 | Tier 2 |

ERCOT also included the Stage 2 upgrade (adding a new Bearkat – North McCamey – Sand Lake 345-kV double-circuit line) identified in the Delaware Basin Load Integration Study in the 2030 study case since the load level in the Delaware Base area in the 2030 study case exceeded the trigger point of the Stage 2 upgrade as shown in Table 2.5. It indicates the need of a new transmission import path to the Delaware Basin area in the 2030 study case. More details about the Stage 2 upgrade were described in Section 4.3.

Table 2.5 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 345-kV double-circuit line | Import Needs |
| 3 | 4,582 | A new Riverton – Owl Hills 345-kV single-circuit 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 345-kV double-circuit line | Import Needs |

### 2.2.4. Generation

Planned generators in the West and Far West Weather Zones that met Planning Guide Section 6.9(1) requirements for inclusion in the base cases were added to the study cases based on the 2020 December Generation Interconnection Status (GIS) report posted on January 4, 2021. The added generators are listed in Table 2.6.

Table 2.6 Added Generators for Year 2025 and 2030

| GINR | Project Name | County | Projected COD | Fuel | Capacity (MW) |
|---|---|---|---|---|---|
| 17INR0052 | Horse13 CallD Repower | Taylor | 12/31/2020 | WIND | 44 |
| 17INR0061 | Capricorn IV Repower | Sterling | 12/31/2020 | WIND | 9 |
| 18INR0079 | Woodward I Repower | Pecos | 12/31/2020 | WIND | 0 |
| 19INR0121 | Galloway Solar | Concho | 10/01/2021 | SOLAR | 250 |
| 20INR0046 | Maverick Creek II W | Concho | 03/23/2021 | WIND | 118.8 |
| 21INR0357 | SP TX-12B BESS | Upton | 10/31/2021 | STORAGE | 22.68 |
| 21INR0365 | Bat Cave Energy Storage | Mason | 06/01/2021 | STORAGE | 100.49 |
| 21INR0431 | Galloway 2 Solar | Concho | 04/01/2022 | SOLAR | 110 |
| 21INR0449 | Panther Creek III Repower | Howard | 02/02/2021 | WIND | 15.96 |

Solar generation in the study area was assumed to be offline to represent a stressed system condition since the oil and natural gas loads are assumed to operate as constant loads throughout the day and night. The dispatch of Energy Storage Resource (ESR) and wind generation as well as solar generation outside of the study area were consistent with the 2020 RTP methodology. Generation retired, indefinitely mothballed, or to be decommissioned was turned off if it was not already offline in the case.

### 2.2.5. Capital Cost Estimates

Capital cost estimates of each transmission upgrade identified in this study were provided by the TSPs relevant to each upgrade. ERCOT used the cost estimates provided by the TSPs to calculate total project cost estimates for various projects. For new transmission lines requiring new rights of way, ERCOT assumed a routing adder of 20% to the straight distance between two end points.

## 2.3. Study Methodology

The existing transmission system in some local area was not sufficient to serve the assumed load, especially with the new load interconnections in the Delaware Basin area. In fact, the voltage instability issues were identified in the initial 2025 and 2030 study cases under system intact (i.e., N-0) conditions. The following local transmission upgrade was identified to address the voltage instability issues and applied to the study cases during the case development. This upgrade was assumed in-service during the reliability need analysis.

- Convert existing Barrilla Loop to 138-kV: Barrilla – Hoefs Road – Verhalen – Cherry Creek – Saragosa 69-kV line to 138-kV

ERCOT evaluated various transmission upgrade options and identified a set of transmission upgrades to address the reliability criteria violations in the study area. These transmission upgrades were then categorized as ERCOT preferred upgrades or placeholder upgrades.

Various transmission load interconnection upgrades were considered to connect the projected new loads in Figure 2.3. For example, a radial line from the nearest substation was considered as placeholder to connect the relatively smaller loads (e.g., white dots). For most of the bigger loads (e.g., red and yellow dots), the transmission interconnections were initially modeled based on the inputs from the TSPs as the placeholder. For Area 1, further detailed analysis was performed as described below.

Among the new loads in Figure 2.3, ERCOT and the relevant TSPs focused relatively more on Area 1 in the Delaware Basin area to identify proper local transmission load interconnection projects based on the following considerations:

- A large amount of projected new loads (e.g., red and yellow dots) are concentrated in Area 1 compared to other areas. Area 1 is in the Delaware Basin area which is the most profitable area for the oil and gas development in the Permian Basin according to the IHS Markit study report.
- Compared to other areas in the Permian Basin, Area 1 has limited existing transmission infrastructures.

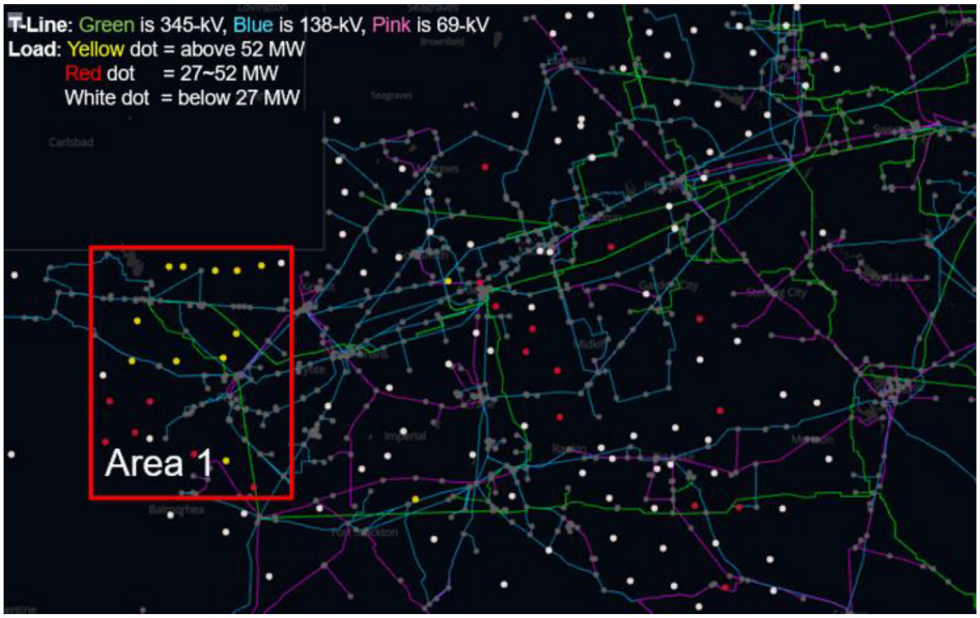


**Figure 2.3 Focused Area for New Transmission Interconnection**

### 2.3.1. Tools

ERCOT utilized the following software tool in this study:

- PowerWorld Simulator version 21 was used for SCOPF and steady state contingency and voltage stability analysis

### 2.3.2. Contingencies

All the NERC P1, P2-1, and P7 contingencies in the West and Far West Weather Zones were evaluated for the AC power flow analyses. ERCOT also evaluated G-1+N-1 and X-1+N-1 contingencies in the study area.

For the G-1+N-1 analyses, the following generator outages were considered to represent the anticipated significant G-1 conditions in the study area:

- Permian Basin all five units (340 MW)
- Odessa Combined Cycle Train 1 (497 MW)

For the X-1+N-1 analyses, the following 345/138-kV transformers were considered to represent the anticipated significant X-1 conditions for the study area:

- Riverton 345/138-kV transformer 1
- Sand Lake 345/138-kV transformer 1
- Wolf 345/138-kV transformer 1
- Quarry Field 345/138-kV transformer 1
- Solstice 345/138-kV transformer 1
- Odessa EHV 345/138-kV transformer 1

### 2.3.3. Criteria

The reliability assessment was performed based on NERC Reliability Standard TPL-001-4, ERCOT Nodal Protocol and Planning Criteria.

# 3. Reliability Need

The 2025 and 2030 study base cases were evaluated to determine if system improvements would be necessary to meet the projected demand forecast in the Permian Basin area. The reliability assessment results revealed that both thermal overloads and voltage instability would occur without system improvements. Table 3.1 summarizes the reliability analysis results under N-0, N-1, G-1+N-1, and X-1+N-1 contingencies for the 2025 and 2030 study base cases. No cascading issues were identified in this study. More details of the reliability analysis results were described in the subsequent sections. Transmission upgrades were identified in Section 4 to address these reliability criteria violations.

**Table 3.1 Summary of the Reliability Violations**

| Reliability Needs | 2025 Case | 2030 Case |
|---|---|---|
| Number of Unsolvable Contingencies | 2 | 17 |
| Transmission Line Overloads | ~ 196 miles of 345-kV line<br>~ 347 miles of 138-kV line<br>~ 127 miles of 69-kV line | ~ 269 miles of 345-kV line<br>~ 366 miles of 138-kV line<br>~ 177 miles of 69-kV line |
| Transformer Overloads | Three 345/138-kV transformers<br>Four 138/69-kV transformers | Seven 345/138-kV transformers<br>Six 138/69-kV transformers |

## 3.1. Reliability Needs Inside Delaware Basin Area

The Delaware Basin area mainly includes six counties in Far West Weather Zone: Culberson, Loving, Pecos, Reeves, Ward, and Winkler. The total loads in the Delaware Basin area in the study base cases are 3,789 MW and 4,898 MW in 2025 and 2030 respectively.

Several transmission upgrades, including both the 345-kV and 138-kV upgrades, have been completed in recent years to accommodate the rapid load growth in the Delaware Basin area. The newly built 345-kV lines, Odessa EHV/Moss – Wolf – Quarry Field – Riverton – Sand lake – Solstice – Bakersfield recommended in FWTP and FWTP2, extended the extra high voltage transmission system in the Far West to the Delaware Basin area and formed a loop to serve the underlying system. These 345-kV lines are connected to the 138-kV transmission facilities distributing power flows through the newly added Wolf, Quarry Field, Riverton, Sand Lake, and Solstice 345/138-kV transformers. These 345-kV upgrades together with other 138-kV upgrades such as the Horseshoe Springs Switch – Riverton Switch 138-kV Second Circuit Project and the Ward/Winkler Transmission Improvement Project are sufficient to meet projected near-term load forecast in the Delaware Basin area. However, with the IHS projected load level up to 2030 in this study, the existing transmission system in the Delaware Basin area could experience significant reliability criteria violations without additional transmission upgrades.

The reliability study results showed that there is no unsolvable contingency in the 2025 case, but ten unsolvable contingencies in the 2030 case. Besides the unsolvable consistencies, thermal overloads were also observed in the Delaware Basin area as shown in Table 3.2.

**Table 3.2 Summary of the Reliability Violations Inside Delaware Basin Area**

| Reliability Needs | 2025 Case | 2030 Case |
|---|---|---|
| Number of Unsolvable Contingencies | 0 | 10 |
| Transmission Line Overloads | ~ 18 miles of 138-kV line<br>~ 7 miles of 69-kV line | ~ 20 miles of 138-kV line<br>~ 29 miles of 69-kV line |
| Transformer Overloads | none | Four 345/138-kV transformers<br>Two 138/69-kV transformers |

The following sections describe the details of the thermal violations in those six counties in the Delaware Basin area.

### 3.1.1. Reliability Needs in Culberson, Loving, and Winkler Counties

The existing transmission overloads in Culberson, Loving, and Winkler Counties were all occurred in the 2030 case as shown in Table 3.3.

**Table 3.3 Thermal Overloads in Culberson, Loving, and Winkler Counties**

| Overloaded Element | Limiting Contingency | Percent Overload | |
|---|---|---|---|
| | | 2025 | 2030 |
| Wink – California Tnp 69-kV line | Base Case | < 100 | 123.7 |
| Wink Tnp 138/69-kV transformer 1 | Wink Tnp 138/69-kV transformer 2 | < 100 | 106.5 |
| Wink Tnp 138/69-kV transformer 2 | Wink Tnp 138/69-kV transformer 1 | < 100 | 106.5 |
| Riverton 345/138-kV transformer 1 | Quarry Field 345/138-kV transformer 1 + Riverton 345/138-kV transformer 2 | < 100 | 104.2 |
| Riverton 345/138-kV transformer 2 | Quarry Field 345/138-kV transformer 1 + Riverton 345/138-kV transformer 1 | < 100 | 104.0 |

### 3.1.2. Reliability Needs in Reeves and Ward Counties

Reeves County has the highest load projection in the study area, 1,430 MW in 2025 and 1,824 MW in 2030. With the projected load level in the 2030 case, both thermal overloads and voltage instability issues were observed in this area. Table 3.4 lists the thermal overloads.

**Table 3.4 Thermal Overloads in Reeves and Ward Counties**

| Overloaded Element | Limiting Contingency | Percent Overload | |
|---|---|---|---|
| | | 2025 | 2030 |
| Caymus TNP – Gas Pad 138-kV line | Base Case | < 100 | 130.7 |
| Sand Lake – Cochise TNP 138-kV ckt 1 | Sand Lake – Cochise TNP 138-kV ckt 2 | < 100 | 109.7 |
| Sand Lake – Cochise TNP 138-kV ckt 2 | Sand Lake – Cochise TNP 138-kV ckt 1 | < 100 | 109.7 |
| Sand Lake 345/138-kV transformer 2 | Sand Lake 345/138-kV transformer 1 | < 100 | 105.8 |
| Sand Lake 345/138-kV transformer 1 | Sand Lake 345/138-kV transformer 2 | < 100 | 105.5 |

### 3.1.3. Reliability Needs in Pecos County

All the identified reliability needs in Pecos County are all related to the thermal overloads of the existing 69-kV and 138-kV lines. Table 3.5 lists the thermal overloads in Pecos County.

**Table 3.5 Thermal Overloads in Pecos County**

| Overloaded Element | Limiting Contingency | Percent Overload | |
|---|---|---|---|
| | | 2025 | 2030 |
| Fort Stockton – Leon Creek TNP 138-kV line | Lynx – Tombstone 138-kV line | 125.4 | 125.8 |
| Wolfcamp Tap – Coyanosa 69-kV line | Base Case | 101.4 | 121 |
| Wolfcamp – Coyanosa 69-kV line | Base Case | 101.4 | 121 |
| Wolfcamp Tap – Courtney Creek 69-kV line | Base Case | < 100 | 119.9 |
| 16th Street – Fort Stockton TNP 69-kV line | Base Case | 108.1 | 109.4 |
| Yucca – Royalty 69-kV line | Base Case | < 100 | 103.8 |
| Lynx – Tombstone 138-kV line | Base Case | 100.0 | 101.1 |

## 3.2. Reliability Needs Outside Delaware Basin Area

The reliability needs outside of the Delaware Basin area are mainly divided into the following three regions:

- Dawson, Borden, and Scurry Counties
- Ector, Midland, Howard, and Mitchell Counties
- Upton, Reagan, and Irion Counties.

Table 3.6 summarizes the reliability violations outside of the Delaware Basin area.

**Table 3.6 Summary of the Reliability Violations Outside Delaware Basin Area**

| Reliability Needs | 2025 Case | 2030 Case |
|---|---|---|
| Number of Unsolvable Contingencies | 2 | 7 |
| Transmission Line Overloads | ~ 196 miles of 345-kV line<br>~ 329 miles of 138-kV line<br>~ 120 miles of 69-kV line | ~ 269 miles of 345-kV line<br>~ 346 miles of 138-kV line<br>~ 148 miles of 69-kV line |
| Transformer Overloads | Three 345/138-kV transformers<br>Four 138/69-kV transformers | Three 345/138-kV transformers<br>Four 138/69-kV transformers |

The following sections describe the details of thermal violations outside of the Delaware Basin area.

### 3.2.1. Reliability Needs in Dawson, Borden, and Scurry Counties

The existing 138-kV transmission systems in Dawson, Borden, and Scurry Counties are relatively old and have low normal and emergency ratings. The power flow from the Willow Valley 345-kV source goes through the 138-kV transmission system to serve the load in the area, causing the thermal overloads shown in Table 3.7.

**Table 3.7 Thermal Overloads in Dawson, Borden, and Scurry Counties**

| Overloaded Element | Limiting Contingency | Percent Overload | |
|---|---|---|---|
| | | 2025 | 2030 |
| Lamesa – Jim Payne – Dawson – Alkali Lake 138-kV line | Vealmoor – Long Draw 345-kV line | 110.2 | 131.0 |
| Scurry – Kndrsacrc – Knapp 138-kV line | Scurry County South – Long Draw/Faraday 345-kV double-circuit line | 109.3 | 124.7 |
| Lamesa – Key Sub – Gail Sub – Willow Valley Switch 138-kV line | Base Case | 128.8 | 117.3 |
| Knapp – Bluff Creek Switch – Exxon Sharon Ridge 138-kV line | Scurry County South – Long Draw/Faraday 345-kV double-circuit line | < 100 | 109.2 |
| Deep Creek Sub – Sacroc 138-kV line | Odessa Combined Cycle Train 1 + Dermott – Scurry County South 345-kV double-circuit line | < 100 | 104.9 |
| Howard Switch – Vealmoor 138-kV line | Odessa Combined Cycle Train 1 + Buzzard Draw – Koch Tap 138-kV line | < 100 | 102.9 |

### 3.2.2. Reliability Needs in Ector, Midland, Howard, and Mitchell Counties

The Morgan Creek – Odessa EHV 345-kV path includes the existing Morgan Creek – Longshore – Quail/Odessa EHV 345-kV double-circuit line and the Morgan Creek – Falcon Seaboard – Midland East – Midland County NW 345-kV single-circuit line. The Morgan Creek – Odessa EHV 345-kV path

is one of the major backbone transmission systems in the area, and the path is connected to a number of 138-kV transmission facilities distributing power flows through multiple 345/138-kV transformers located along the path. In addition, since the newly built FWTP and FWTP2 extended the 345-kV transmission lines from Moss and Odessa EHV to the Delaware Basin area, more power is expected to flow through the Morgan Creek – Odessa EHV 345-kV path toward the newly built 345-kV lines as the load in the Delaware Basin area continues to grow.

The study results indicated that the existing system can no longer reliably serve the projected demand in the area without upgrading the existing 345-kV lines along the path. Table 3.8 lists the 345-kV level thermal overload issues along the Morgan Creek – Odessa EHV path. Table 3.9 shows the summary of the thermal overloads of the 138-kV and 69-kV systems in the area.

**Table 3.8 345-kV Thermal Overloads on the Morgan Creek – Odessa EHV Path**

| Overloaded Element | Limiting Contingency | Percent Overload | |
|---|---|---|---|
| | | 2025 | 2030 |
| Morgan Creek – Tonkawa 345-kV line | Morgan Creek – Champion Creek/Bitter Creek 345-kV double-circuit line | 115.0 | 164.2 |
| Consavvy – Midessa South 345-kV line | Quail – Odessa EHV 345-kV line | 129.0 | 127.0 |
| Quail – Odessa EHV 345-kV line | Consavvy – Midessa South 345-kV line | 124.8 | 122.8 |
| Morgan Creek – Longshore 345-kV line | Bakersfield – Cedar Canyon 345-kV double-circuit line | < 100 | 122.5 |
| Midland East – Falcon Seaboard 345-kV line | Morgan Creek – Longshore – Consavvy 345-kV double-circuit line | 109.3 | 121.2 |
| Consavvy 345/138-kV transformer | Consavvy – Midessa South/Quail 345-kV double-circuit line | 124.2 | 119.2 |
| Odessa EHV 345/138-kV transformer 2 | Odessa EHV – Moss/Wolf 345-kV double-circuit line | 112.8 | 116.1 |
| Morgan Creek – Falcon Seaboard 345-kV line | Morgan Creek – Longshore – Consavvy 345-kV double-circuit line | < 100 | 106.6 |
| Longshore Fly – Consavvy 345-kV line | Permian Basin Five Units + Big Hill – Schneeman Draw 345-kV double-circuit line | 101.4 | 106.2 |
| Longshore – Consavvy 345-kV line | Odessa Combined Cycle Train 1 + Bakersfield – Cedar Canyon 345-kV double-circuit line | 115.5 | 104.8 |
| Midessa South 345/138-kV transformer | Odessa Combined Cycle Train 1 + Consavvy – Quail & Odessa EHV – Midessa South 345-kV double-circuit line | 101.2 | 104.8 |
| Morgan Creek – Longshore Fly 345-kV line | Odessa Combined Cycle Train 1 + Bakersfield – Cedar Canyon 345-kV double-circuit line (2025); Morgan Creek – Longshore 345-kV line (2030) | 105.4 | 101.8 |
| Midessa South – Odessa EHV 345-kV line | Quail – Odessa EHV 345-kV line | 104.0 | 101.1 |

**Table 3.9 138-kV and 69-kV Thermal Overloads in Ector, Midland, Howard, and Mitchell Counties**

| Overloaded Element | Limiting Contingency | Percent Overload | |
|---|---|---|---|
| | | 2025 | 2030 |
| Stanton East – Spraberry 69-kV line | Spraberry 138/69-kV transformer | 152.0 | 165.3 |
| Midkiff 138/69-kV transformer | Spraberry 138/69-kV transformer | 117.6 | 136.3 |
| China Grove – Getty Tap 138-kV line | Vealmoor – Long Draw 345-kV line | 105.4 | 116.4 |
| General Tire Switch – Edwards Tap – Judkins 138-kV line | Permian Basin Five Units + Wolf – Moss/Odessa EHV 345-kV double-circuit line | 112.3 | 110.0 |
| Morgan Creek – McDonald 138-kV line | Base Case | 119.6 | 109.0 |
| Sterling City – Sterling County 69-kV line | Bakersfield – Cedar Canyon 345-kV double-circuit line | < 100 | 108.4 |
| Odessa EHV – Yarbrough Sub – Wolf 138-kV line | Permian Basin Five Units + Wolf – Moss/Odessa EHV 345-kV double-circuit line | 115.8 | 107.7 |
| Getty Tap – Big Spring 138-kV line | Vealmoor – Long Draw 345-kV line | < 100 | 106.7 |
| Odessa North – Odessa 138-kV line | Permian Basin Five Units + Odessa EHV – Moss/Wolf 345-kV double-circuit line | 108.0 | 106.5 |
| Stanton East 138/69-kV transformer | Spraberry 138/69-kV transformer | 100.1 | 106.2 |
| Spraberry 138/69-kV transformer | Midkiff – Reagan Shell Tap 69-kV line | 105.9 | 105.8 |
| Odessa EHV – Big Three Odessa Tap – Odessa Southwest 138-kV line | Odessa EHV – Moss/Wolf 345-kV double-circuit line | 104.7 | 105.1 |

### 3.2.3. Reliability Needs in Upton, Reagan, and Irion Counties

The study results indicated that some of the existing 69-kV and 138-kV lines are no longer able to reliably serve the projected demand even under the N-0 contingency condition. Table 3.10 summarizes the thermal overloads in this area.

**Table 3.10 Thermal Overloads in Upton, Reagan, and Irion Counties**

| Overloaded Element | Limiting Contingency | Percent Overload | |
|---|---|---|---|
| | | 2025 | 2030 |
| Big Lake – Barnhart 69-kV line | Barnhart – Cassava 69-kV line | < 100 | 129.6 |
| Rio Pecos – McCamey – Rankin4 69-kV line | Base Case | 116.0 | 126.4 |
| Cassava – San Angelo Mathis Field 69-kV line | Bakersfield – Cedar Canyon 345-kV double-circuit line | 105.4 | 120.9 |
| Rio Pecos 138/69-kV transformer 1 | Rio Pecos 138/69-kV transformer 2 | 100.4 | 110.4 |
| Jerry – Big Lake 138-kV line | Odessa Combined Cycle Train 1 + Big Hill – Schneeman Draw 345-kV double-circuit line | < 100 | 106.3 |
| Twin Buttes – Hargrove – Pumpjack – Jerry 138-kV line | Bakersfield – Cedar Canyon 345-kV double-circuit line (2025); Base Case (2030) | 128.5 | 104.0 |

# 4. Project Evaluation

Multiple transmission projects were evaluated in this section to address the reliability violations identified in Section 3.

## 4.1. Transmission Upgrades Inside Delaware Basin Area

The transmission upgrades inside the Delaware Basin area are divided into the following three areas:

- Culberson, Loving, and Winkler Counties
- Reeves and Ward Counties
- Pecos County

### 4.1.1. Culberson, Loving, and Winkler Counties

The conversion of the TNMP Wink – California – Wickett 69-kV line to 138-kV was identified to address the overloads of the Wink - California Tnp 69-kV line and Wink Tnp 138/69-kV transformers in the 2030 study case under NERC P0 and P1 contingencies. More details of the reliability needs are available in Table 3.3.

The four new loads #4, #7, #15, and #66 (total of 233 MW in 2030) shown in Figure 4.1 need new connections to the existing transmission grid. ERCOT evaluated the following two options to interconnect these new loads into the system.

- Option A: Add new 138-kV lines to connect the new loads #4, #7, #15, and #66 to 138-kV Kyle Ranch Substation
- Option B: Add new 138-kV lines to connect the new loads #4, #7, #15, and #66 to 138-kV Quarry Field Substation, and connect new load #66 to Keystone Substation to form a 138-kV loop

Connecting the new load #4 to Kyle Ranch (~ 4 miles) in Option A has a shorter distance compared to connecting it to Quarry Field (~ 10 miles) in Option B. However, Option A is expected to result in negative impact on the loading of the Riverton 345/138-kV transformer 2. The loading on the existing Riverton 345/138-kV transformer 2 is expected to be close to its emergency rating under the critical G-1+N-1 contingency condition in Option A. Therefore, ERCOT recommends Option B, shown in Figure 4.1, as the preferred option to connect the new loads in Loving and Winkler Counties.

According to the June 2021 TPIT report, the existing Keystone 69-kV Substation conversion to 138-kV in Option B is scheduled to be in-service by summer 2022 as part of the Tier 4 project TPIT # 62728: Wink - Shifting Sands (i.e., Keystone) 69-kV line conversion to 138-kV.

In summary, the following two transmission upgrades were identified in Culberson, Loving, and Winkler Counties.

- Convert existing TNMP Wink – California – Wickett 69-kV line to 138-kV (identified in 2030 study case)
- Add new 138-kV lines to connect the new loads #4, #7, #15, and #66 to 138-kV Quarry Field Substation, and then connect new load #66 to Keystone Substation to form a 138-kV loop (identified in 2025 study case)

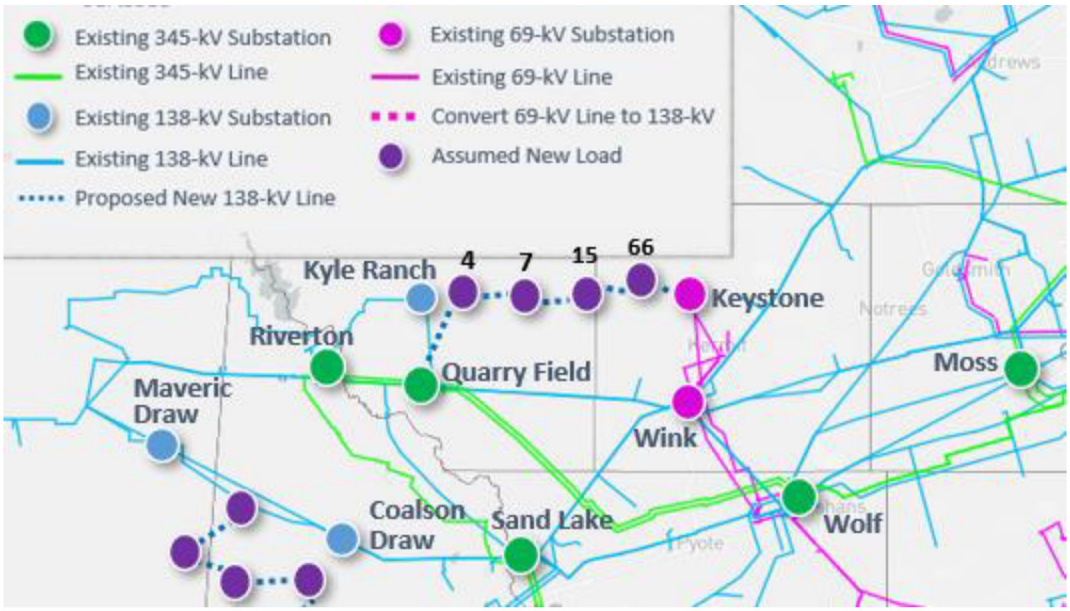


Figure 4.1 Loving and Winkler County Transmission Interconnection

### 4.1.2. Reeves and Ward Counties

Reeves County has the highest load projection in the study area, 1,430 MW in 2025 and 1,824 MW in 2030. Among these total load projections, 362 MW in 2025 and 566 MW in 2030 are related to new loads requiring new connections to the existing transmission grid. In addition to the new load connection projects, upgrades associated with existing transmission facilities were also identified to address the reliability needs in Reeves and Ward Counties listed in Section 3.1.2.

#### 4.1.2.1 New Load Connection Projects

Figures 4.2 and 4.3 show the transmission interconnections to the new loads in 2025 and 2030. There are seven new loads in Reeves County which need connections to the existing transmission grid in 2030 as shown in Figure 4.3.

Below are the identified new 138-kV transmission lines to interconnect these new loads into the system in 2025:

- Tap a new 138-kV station on existing Coalson Draw – Maveric Draw 138-kV line, about 7.3 miles away from Coalson Draw
- Add new 138-kV lines to connect the new loads #5, #111, #23, and #12 to the new station on the Coalson Draw – Maveric Draw 138-kV line
- Add new 138-kV lines to connect the new loads #38 and #21 to Faulkner Substation

In 2030, the following additional new transmission lines are needed to form a 138-kV loop to reliably serve the projected load in this area:

- Add a new 138-kV line to connect the new load #108 to Verhalen Substation. This new load appears in 2030
- Add a new 138-kV line to connect the new loads #12 and #21 to form a 138-kV loop in 2030
- Add a new 138-kV line to connect the new load #108 to Faulkner to form a 138-kV loop in 2030

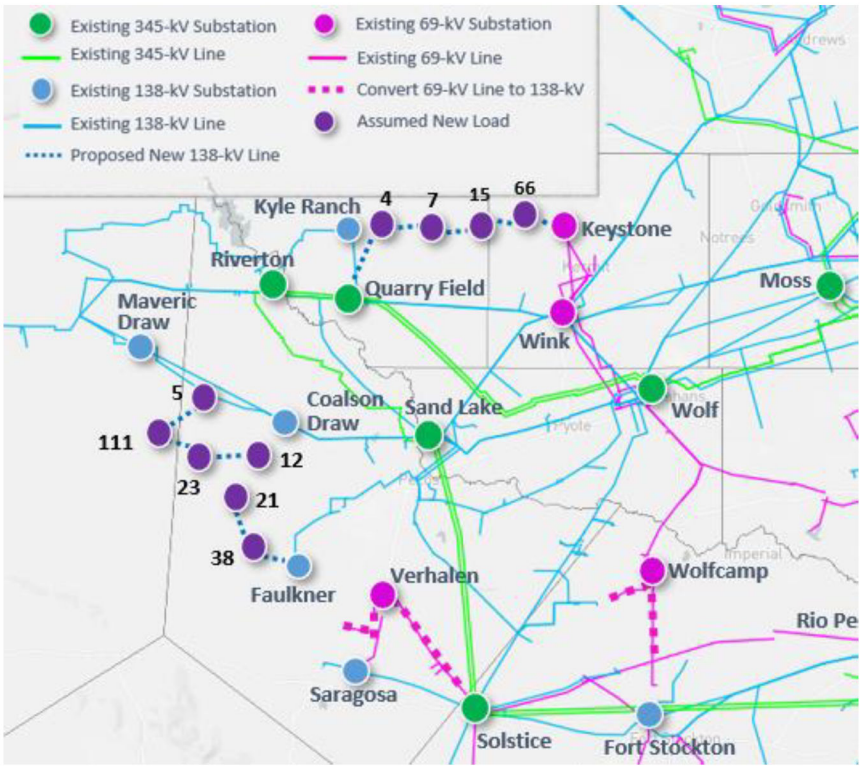


Figure 4.2 Reeves County Transmission Interconnection in 2025

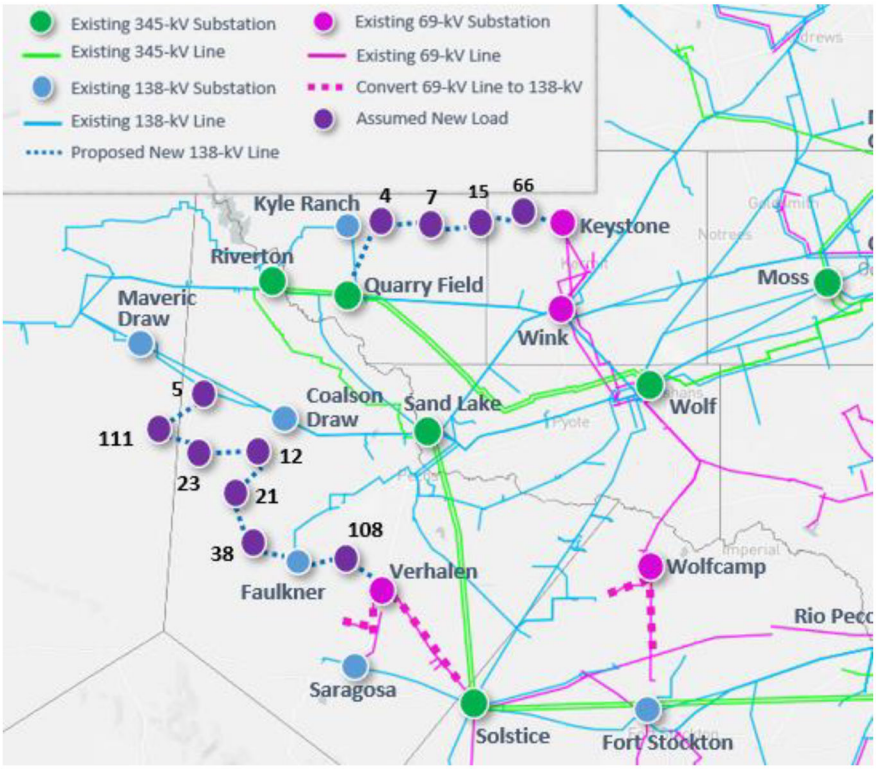


Figure 4.3 Reeves County Transmission Interconnection in 2030

#### 4.1.2.2 Upgrades Associated with Existing Transmission Facilities

The conversion of the Barrilla Loop to 138-kV was identified to address the voltage instability issues in Reeves County.

As shown in Table 3.4 in Section 3, thermal overloads of the Sand Lake 345/138-kV transformers and Sand Lake – Cochise 138-kV double-circuit line were observed in the 2030 case under NERC P1 (N-1) contingencies. The overloads of the Sand Lake 345-kV transformers are substantially higher under the critical X-1+N-1 contingency conditions. This indicates that additional 345/138-kV transformation capacity is needed in this area to serve the projected load. ERCOT tested the following three options that involve looping the existing Solstice – Sand Lake 345-kV line into the 138-kV system with two new 345/138-kV transformers near the existing IH20 138-kV Substation to address the reliability needs.

- Option A: Loop Solstice – Sand Lake 345-kV double-circuit line at IH20 Substation
- Option B: Loop Solstice – Sand Lake 345-kV double-circuit line at Collie Field Substation
- Option C: Loop Solstice – Sand Lake 345-kV double-circuit line at Saddleback Substation

Option A resolves all the violations without any additional upgrades. Option A also has more 138-kV outlets compared to Option B and Option C.

Option B and Option C also resolve the violations but need additional upgrades. Option B needs to upgrade additional 2.95 miles of existing 138-kV line from Collie Field Tap to IH20. Option C needs to upgrade additional 4.88 miles of existing 138-kV line from Saddleback to IH20.

Based on the comparison, ERCOT recommends Option A as the preferred option to address the reliability need in the area.

Details of the identified transmission upgrades associated with the existing transmission facilities in Reeves and Ward Counties are described below:

- Convert existing Barrilla Loop to 138-kV: Barrilla – Hoefs Road – Verhalen – Cherry Creek – Saragosa 69-kV line to 138-kV (identified in 2025 study case)
- Establish a new IH20 345-kV Substation and install two new 345/138-kV transformers and loop the existing Solstice – Sand Lake 345-kV double-circuit line into the new IH20 Substation (identified in 2030 study case)
- Terminal equipment upgrade associated with existing Caymus TNP - Gas Pad 138-kV line (identified in 2030 study case)

### 4.1.3. Pecos County

All the identified reliability issues in Pecos County are related to the thermal overloads of the existing 69-kV and 138-kV lines. The following transmission upgrades were identified in the 2025 study case to address the reliability needs in Table 3.5:

- Convert existing Yucca – Wolfcamp – Courtney Creek 69-kV line to 138-kV
- Upgrade existing Lynx – Tombstone – Fort Stockton138-kV line
- Upgrade existing Fort Stockton – Leon Creek 138-kV line
- Upgrade existing 16th Street – Fort Stockton TNP 69-kV line

## 4.2. Transmission Upgrades Outside Delaware Basin Area

The transmission upgrades outside of the Delaware Basin area are mainly in three areas:

- Dawson, Borden, and Scurry Counties

- Ector, Midland, Howard, and Mitchell Counties
- Upton, Reagan, and Irion Counties

### 4.2.1. Dawson, Borden, and Scurry Counties

As shown in Table 3.7, thermal overloads were observed in Dawson, Borden, and Scurry Counties, and the following transmission upgrades were identified to address the reliability needs:

- Upgrade existing Sacroc – Deep Creek Sub – Snydrs 138-kV line (identified in 2030 study case)
- Upgrade existing Scurry – Kndrsacrc – Knapp 138-kV line (identified in 2025 study case)
- Upgrade existing Knapp – Bluff Creek Switch – Willow Valley Switch 138-kV line (identified in 2030 study case)
- Upgrade existing Lamesa - Key Sub – Gail Sub – Willow Valley Switch 138-kV line (identified in 2025 study case)
- Upgrade existing Lamesa – Jim Payne – Dawson – Alkali Lake 138-kV line (identified in 2025 study case)

### 4.2.2. Ector, Midland, Howard, and Mitchell Counties

Majority of the thermal overloads, especially the 345-kV transmission level, were occurred in Ector, Midland, Howard, and Mitchell Counties. This section describes the details of the transmission upgrades identified to address the reliability needs in this area.

#### 4.2.2.1 345-kV Transmission Upgrades

The following transmission upgrades were identified in 2025 study case and recommended by ERCOT.

- Upgrade #1: Rebuild existing Morgan Creek – Tonkawa 345-kV line using double-circuit capable structures and add a 2nd circuit
- Upgrade #2: Rebuild existing Morgan Creek – Falcon Seaboard – Midland East – Midland County NW 345-kV line using double-circuit capable structures and add a 2nd circuit
- Upgrade #3: Upgrade existing Morgan Creek – Longshore – Odessa EHV 345-kV double-circuit line
- Upgrade #4: Establish a new 345/138-kV substation at Consavvy with two new transformers; Loop existing Longshore – Midessa South 345-kV line into Consavvy; Loop existing Grelton – Odessa EHV 345-kV line into Consavvy; Loop existing South Midland – Pronghorn 138-kV line and Midland East – Spraberry 138-kV line into Consavvy
- Upgrade #5: Upgrade existing Midessa South 345/138-kV transformer and add a 2nd Midessa South 345/138-kV transformer
- Upgrade #6: Establish a new 345/138-kV substation at Reiter (~ 3 miles south of Odessa EHV 345-kV Substation) with two new transformers, and loop existing Odessa EHV – Moss/Wolf 345-kV double-circuit line into Reiter; Establish a new 345-kV substation at Quail East (~ 2.5 miles east of Quail 345-kV Substation), and loop existing Odessa EHV – Midessa South 345-kV and Quail – Longshore Fly 345-kV line into Quail East; Add a new Quail East - Reiter 345-kV double-circuit line (~ 2.5 miles)

Among the six upgrades, Upgrades #1, #2, #3, and #5 are the upgrades of existing transmission facilities to address some of the reliability needs identified in Table 3.8. Upgrades #4, #5, and #6 are

related to adding new transmission facilities to address the remaining reliability needs in Table 3.8. Details of Upgrades #4 and #6 including option evaluations were discussed below.

Upgrade #4 is needed to serve the load in Midland County. As shown in Table 3.8, under certain P7 contingency related to the segment of the Morgan Creek – Longshore – Odessa EHV 345-kV double-circuit line, all the flow from the Morgan Creek to Odessa EHV path redirected to Consavvy resulted in the overload of the Consavvy 345/138-kV transformer. Several options were evaluated to address the reliability need, and the performance of each option was compared in Table 4.1.

**Table 4.1 Options to Address Consavvy Transformer Overload**

| Option | Option Description | Percent Loading | |
|---|---|---|---|
| | | 2025 | 2030 |
| Option 1 | Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers;<br>Loop existing Longshore – Midessa South 345-kV line into Consavvy | 102.7 | 89.3 |
| Option 2 | Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers;<br>Loop existing Longshore – Midessa South 345-kV line into Consavvy;<br>Loop existing Grelton – Odessa EHV 345-kV line into Consavvy | 78.7 | 76.7 |
| Option 3 | Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers;<br>Loop existing Longshore – Midessa South and Longshore Fly – Quail 345-kV double-circuit line into Consavvy;<br>Loop existing Grelton – Odessa EHV 345-kV line into Consavvy | 92.2 | 93.3 |

As shown in Table 4.1, Option 2 adds a new Consavvy 345-kV source to serve the load in Midland County while relieving the overload on the Consavvy transformer under X-1+N-1 contingency condition of one Consavvy 345/138-kV transformer and the related P7 contingency. Based on the study results, ERCOT recommends Option 2 as the preferred solution.

Odessa EHV 345/138-kV transformer 2 is overloaded in both 2025 and 2030 cases. According to the TSP, upgrading the existing Odessa EHV transformer or adding additional transformer at Odessa EHV are not feasible options due to the space constraints and based on TSP's practice. As such, four transmission upgrade options were evaluated to address this overload issue. The details of the options and performance were compared in Table 4.2.

**Table 4.2 Options to Address Odessa EHV Transformer 2 Overload**

| Option | Option Description | Percent Loading | |
|---|---|---|---|
| | | 2025 | 2030 |
| Option 1 | Add a new Midessa South – Moss 345-kV single-circuit line (~20 miles) | 96.1 | 98.1 |
| Option 2 | Establish a new 345/138-kV substation at Reiter with two new 345/138-kV transformers, and loop existing Odessa EHV – Moss/Wolf 345-kV double-circuit line into Reiter;<br>Establish a new 345/138-kV substation at Quail East with two new 345/138-kV transformers, and loop existing Odessa EHV – Midessa South 345-kV and Quail – Longshore Fly 345-kV double-circuit line into Quail East;<br>Add a new Quail East – Reiter 345-kV double-circuit line (~2.5 miles) | 64.8 | 64.7 |
| Option 3 | Establish a new 345/138-kV substation at Reiter with two new 345/138-kV transformers, and loop existing Odessa EHV – Moss/Wolf 345-kV double-circuit line into Reiter; | 80.4 | 80.6 |

| | | | |
|---|---|---|---|
| | Establish a new 345-kV substation at Quail East, and loop existing Odessa EHV – Midessa South 345-kV and Quail – Longshore Fly 345-kV double-circuit line into Quail East;<br>Add a new Quail East – Reiter 345-kV double-circuit line (~2.5 miles) | | |
| Option 4 | Establish a new 345/138-kV substation at Reiter with two new 345/138-kV transformers, and loop existing Odessa EHV – Moss/Wolf 345-kV double-circuit line into Reiter;<br>Add a new Reiter – Midessa South 345-kV double-circuit line (~6 miles) | 89.5 | 91.7 |

The study results showed that Options 2 and 3 performed better than Options 1 and 4. Option 3 is less costly than Option 2 since Option 3 does not require the new 138-kV Quail East Substation and two new 345/138-kV transformers. As such, ERCOT recommends Option 3 as the preferred upgrade.

#### 4.2.2.2 138-kV and 69-kV Transmission Upgrades

Besides the 345-kV level upgrades, the following 138-kV and 69-kV transmission upgrades were identified to address the reliability needs in Table 3.9:

- Upgrade existing China Grove – Getty Tap 138-kV line (identified in 2025 study case)
- Upgrade existing Getty Tap – Big Spring 138-kV line (identified in 2020 study case)
- Upgrade existing Morgan Creek – McDonald 138-kV line (identified in 2025 study case)
- Upgrade existing Odessa EHV – Big Three Odessa Tap – Odessa Southwest 138-kV line (identified in 2025 study case)
- Upgrade existing Sterling City – Sterling County 69-kV line (identified in 2030 study case)
- Convert existing Spraberry – Midkiff 69-kV line to 138-kV (identified in 2025 study case)
- Upgrade existing Salt Flat – Pronghorn – Consavvy 138-kV line (identified in 2025 study case)
- Upgrade existing Odessa EHV – Rexall – General Tire Switch – Edwards Tap – Judkins – Sandhills Tap – Wolf 138-kV line (identified in 2025 study case)
- Upgrade existing Moss – Wolf 138-kV line (identified in 2025 study case)
- Upgrade existing Odessa North – Odessa 138-kV line (identified in 2025 study case)
- Upgrade existing Odessa EHV – Yarbrough Sub – Wolf 138-kV line (identified in 2025 study case)
- Upgrade existing Holt – Scharbauer POI 138-kV line (identified in 2025 study case)

### 4.2.3. Upton, Reagan, and Irion County Projects

The following transmission upgrades were identified in the 2025 study case to address the reliability needs in Table 3.10.

- Upgrade existing Twin Buttes – Hargrove – Pumpjack – Big Lake 138-kV line
- Convert existing Rio Pecos – Big Lake 69-kV line to 138-kV
- Convert existing Big Lake – San Angelo Concho 69-kV line to 138-kV

Since the new loads in Upton, Reagan, and Irion Counties are relatively smaller and sparse compared to other loads in the Delaware Basin or Midland area, these transmission upgrades are considered as placeholders. Further review of these upgrades will be required if submitted for RPG review.

## 4.3. Stage 2 Upgrade

ERCOT completed the Delaware Basin Load Integration Study in December 2019 and identified a roadmap of preferred system upgrades to meet future demand growth in the Delaware Basin area and improve the capability to import power into the Delaware Basin area. The roadmap involves five stages of the long lead time 345-kV upgrades as shown in Table 2.5. Among the upgrades, the Stage 1 upgrade which adds a second circuit on the existing Big Hill – Bakersfield 345-kV line was endorsed by ERCOT in June 2021 and is expected to be implemented in 2023.

As described in Section 2.2.3, the load level associated with the Delaware Base area in the 2030 study case is expected to exceed the trigger point of the Stage 2 upgrade (i.e., a new Bearkat – North McCamey – Sand Lake 345-kV double-circuit line). Although ERCOT conducted the detailed analysis of the need for the Stage 2 upgrade in the Delaware Basin Load Integration Study, ERCOT performed additional analysis in this Permian Basin Load Interconnection Study to reconfirm the need for the Stage 2 upgrade. The additional analysis was performed using the 2030 study case without the Stage 2 upgrade, and the results showed voltage instability under multiple P7 contingencies (i.e., N-1 conditions).

As described in Sections 4, 5, and 6 of the Delaware Basin Load Integration Study, ERCOT evaluated a number of import path options as alternatives to the Stage 2 upgrade, including a new Faraday – Lamesa – Clearfork – Riverton 345-kV double-circuit line (i.e., the Stage 5 upgrade). Due to more mileages of new rights-of-way and higher project costs of those alternatives, ERCOT proposed the addition of a new Bearkat – North McCamey – Sand Lake 345-kV double-circuit line as the Stage 2 upgrade in the Delaware Basin Load Integration Study.

Based on the results of the Delaware Basin Load Integration Study and this Permian Basin Load Interconnection Study, ERCOT recommends the Stage 2 upgrade as a new transmission import path to the Delaware Basin area in the 2030 study case:

- Stage 2 upgrade: add a new Bearkat – North McCamey – Sand Lake double-circuit 345-kV line (~164 miles), with the minimum normal and emergency rating of at least 2564 MVA

# 5. Summary of the Transmission Upgrades

As discussed in Section 4, various transmission upgrades were developed to address the reliability criteria violations identified in the Permian Basin Load Interconnection Study. The long lead time transmission upgrades (e.g., RPG Tier 1 and Tier 2 projects) and the new load connections in the Delaware Basin area which form a 138-kV loop are considered as preferred projects. The remaining transmission upgrades are considered as placeholder projects and may require further review. The placeholder projects include the transmission upgrades that are expected to be potential RPG Tier 3 and Tier 4 projects as well as the transmission upgrades in Upton, Reagan, and Irion Counties which are at the border of the Permian Basin study area. Table 5.1 summarizes the transmission upgrades identified in this study. The total cost of the preferred transmission upgrades is estimated to be approximately $1.5 Billion.

**Table 5.1 Summary of the Identified Transmission Upgrades in 2025 and 2030**

| Reliability Upgrades | Unit | Project Consideration |
|---|---|---|
| New 345-kV Line | ~ 295 miles | Preferred |
| Existing 345-kV Line Upgrade | ~ 211 miles | Preferred |
| New 345-kV Substation | 4 | Preferred |
| New 345/138-kV Transformer | 7 | Preferred |
| New 138-kV Line | ~ 128 miles | Preferred |
| Existing 138-kV Line Upgrade | ~ 449 miles | Placeholder |
| 69-kV line to 138-kV Conversion | ~ 313 miles | Placeholder |
| Reactive Support Need | ~ 400 MVAR | Placeholder |

Table 5.2 lists the details of the preferred transmission upgrades identified in this study. Figures 5.1 and 5.2 show the maps of the preferred reliability upgrades identified in the 2025 and 2030 cases.

**Table 5.2 List of the Preferred Transmission Upgrades**

| Project ID | Preferred Transmission Upgrades | Assumed Rate A/B (MVA) in Study Case | Year of Study Case with Reliability Need Starting to Appear | Approximate Cost Estimate ($M) |
|---|---|---|---|---|
| 1 | Rebuild existing Morgan Creek – Tonkawa 345-kV line using double-circuit capable structures and add a 2nd circuit | 2988/2988 | 2025 | 100.58 |
| 2 | Rebuild existing Midland East – Falcon Seaboard 345-kV line using double-circuit capable structures and add a 2nd circuit | 1792/1792 | 2025 | 196.47 |
| 2 | Rebuild existing Morgan Creek – Falcon Seaboard 345-kV line using double-circuit capable structures and add a 2nd circuit | 1792/1792 | 2030 | |
| 2 | Rebuild existing Midland East – Midland County NW 345-kV line using double-circuit capable structures and add a 2nd circuit | 1792/1792 | 2025 | |
| 3 | Upgrade existing Morgan Creek – Longshore 345-kV line | 1792/1792 | 2030 | 393.88 |
| 3 | Upgrade existing Morgan Creek – Longshore Fly 345-kV line | 1792/1792 | 2025 | |
| 3 | Establish a new 345/138-kV substation at Consavvy with two new 345/138-kV transformers;<br>Loop existing Longshore – Midessa South 345-kV line into Consavvy and upgrade Longshore – Consavvy line; | 1792/1792 | 2025 | |

| | | | | |
|---|---|---|---|---|
| | Loop existing South Midland – Pronghorn 138-kV line and Midland East – Spraberry 138-kV line into Consavvy | | | |
| 3 | Upgrade Consavvy – Midessa South 345-kV line | 1792/1792 | 2025 | |
| 3 | Upgrade existing Longshore Fly – Quail 345-kV line | 1792/1792 | 2025 | |
| 3 | Loop existing Grelton – Odessa EHV 345-kV line into Consavvy | 1723/1723 | 2025 | |
| 3 | Upgrade existing Midessa South – Odessa EHV 345-kV line | 1792/1792 | 2025 | |
| 3 | Upgrade existing Quail – Odessa EHV 345-kV line | 1792/1792 | 2025 | |
| 3 | Upgrade existing Midessa South 345/138-kV transformer and add a 2nd Midessa South 345/138-kV transformer | 600/600 | 2025 | |
| 18 | Add Verhalen – New Load 90108 138-kV line | 483/ 483 | 2025 | 6.60 |
| 24 | Establish a new IH20 345-kV Substation and install two new 345/138-kV transformers | 700/750 | 2030 | 65.55 |
| 24 | Loop existing Solstice – Sand Lake 345-kV double-circuit line at the new IH20 345-kV Substation | 2988/2988 | 2030 | |
| 25 | Establish a new 345/138-kV Reiter Substation with two new 345/138-kV transformers;<br>Establish a new 345-kV Quail East Substation;<br>Add a new Quail East – Reiter 345-kV double-circuit line | 2988/2988 | 2025 | 104.65 |
| 31 | Add Quarry Field – New Load 90004 138-kV line | 614/614 | 2025 | 80.23 |
| 31 | Add New Load 90004 – New Load 90007 – New Load 90015 – New Load 90066 – Keystone 138-kV line | 614/614 | 2025 | |
| 31 | Add capacitor bank (90 Mvar) at new load bus 90004 | | 2025 | |
| 33 | Add ONC90005_TAP – New Load 90005 138-kV line | 617/617 | 2025 | 67.25 |
| 33 | Add New Load 90005 – New Load 90111 – New Load 90023 – New Load 90012 138-kV line | 614/614 | 2025 | |
| 33 | Add capacitor bank (90 Mvar) at new load bus 90012 | | 2025 | |
| 34 | Add New Load 90012 – New Load 90021 138-kV line | 617/617 | 2030 | 29.6 |
| 35 | Add Faulkner – New Load 90038 – New Load 90021 138-kV line | 617/617 | 2025 | 33.8 |
| 35 | Add capacitor bank (90 Mvar) at new load bus 90021 | | 2030 | |
| 36 | Add Faulkner – New Load 90108 138-kV line | 617/617 | 2030 | 17.55 |
| 42 | Add Bearkat – North McCamey 345-kV double-circuit line | 2564/2564 | 2030 | 392.41 |
| 42 | Add North McCamey – Sand Lake 345-kV double-circuit line | 2564/2564 | 2030 | |

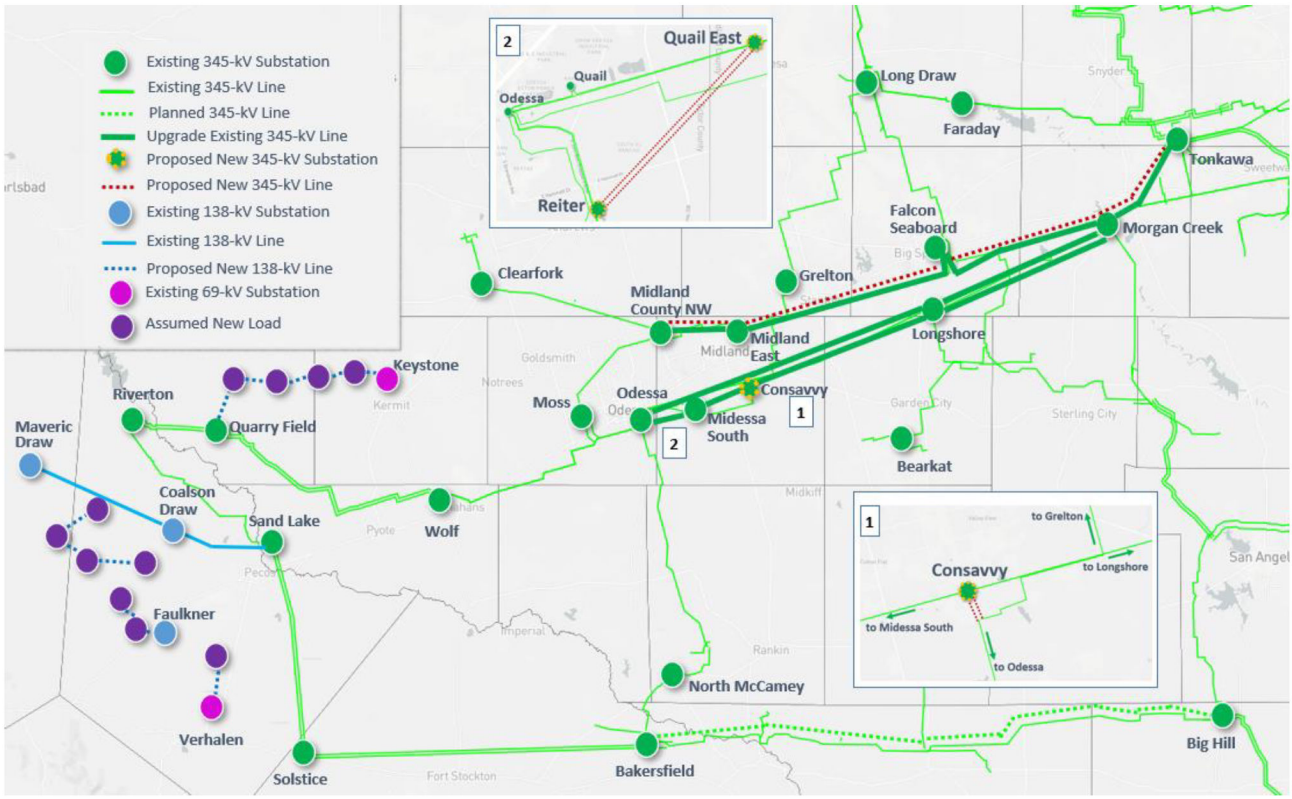


Figure 5.1 Preferred Reliability Upgrades for 2025

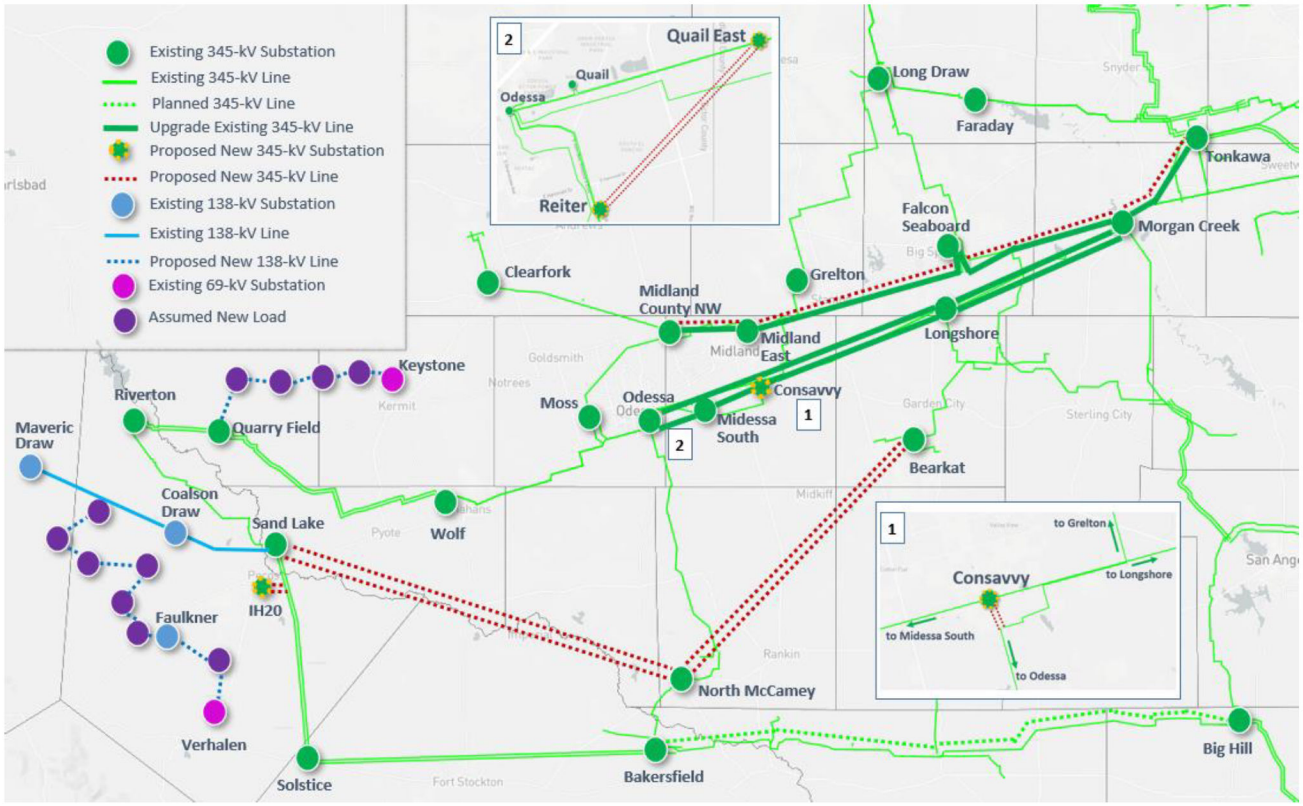


Figure 5.2 Preferred Reliability Upgrades for 2030

Table 5.3 lists the placeholder transmission upgrades identified in this study.

**Table 5.3 List of the Placeholder Transmission Upgrades**

| Project ID | Placeholder Transmission Upgrades | Year of Study Case with Reliability Need Starting to Appear | Approximate Cost Estimate ($M) |
|---|---|---|---|
| 4 | Upgrade existing Sacroc – Deep Creek Sub – Snydrs 138-kV line | 2030 | 24.23 |
| 5 | Upgrade existing Scurry – Kndrsacrc – Knapp 138-kV line | 2025 | 19.44 |
| 6 | Upgrade existing Knapp – Bluff Creek Switch 138-kV line | 2030 | 46.02 |
| 6 | Upgrade existing Bluff Creek Switch – Willow Valley Switch 138-kV line | 2030 | |
| 7 | Upgrade exisitng Lamesa – Key Sub – Gail Sub – Willow Valley Switch 138-kV line | 2025 | 45.09 |
| 8 | Upgrade existing Lamesa – Jim Payne – Dawson – Alkali Lake 138-kV line | 2025 | 28.98 |
| 9 | Upgrade existing China Grove – Getty Tap 138-kV line | 2025 | 56.86 |
| 10 | Upgrade existing Getty Tap – Big Spring 138-kV line | 2030 | 20.63 |
| 11 | Upgrade existing Morgan Creek – McDonald 138-kV line | 2025 | 46.66 |
| 12 | Upgrade existing Odessa EHV – Big Three Odessa Tap – Odessa Southwest 138-kV line | 2025 | 21.16 |
| 13 | Upgrade existing Lynx – Tombstone – Fort Stockton 138-kV line | 2025 | 38.60 |
| 14 | Upgrade existing Fort Stockton – Leon Creek 138-kV line | 2025 | 3.58 |
| 15 | Upgrade existing Twin Buttes – Hargrove – Pumpjack – Big Lake 138-kV line | 2025 | 65.05 |
| 16 | Upgrade existing Sterling City – Sterling County 69-kV line | 2030 | 2.48 |
| 17 | Upgrade existing 16th Street – Fort Stockton TNP 69-kV line | 2025 | 0.75 |
| 18 | Convert existing Barrilla Loop 69-kV line to 138-kV | 2025 | 46.81 |
| 18 | Add Verhalen – New Load 90008 138-kV line | 2025 | |
| 18 | Add Hoefs Road – New Load 90026 138-kV line | 2025 | |
| 18 | Add capacitor bank (90 Mvar) at new load bus 90008 | 2025 | |
| 19 | Convert existing Yucca – Wolfcamp – Courtney Creek 69-kV line to 138-kV | 2025 | 75.50 |
| 20 | Convert existing Big Lake – San Angelo Concho 69-kV line to 138-kV | 2025 | 61.24 |
| 21 | Convert existing Rio Pecos – Big Lake 69-kV line to 138-kV | 2025 | 114.00 |
| 22 | Convert existing Spraberry – Midkiff 69-kV line to 138-kV | 2025 | 6.84 |
| 23 | Convert existing TNMP Wink – California – Wickett 69-kV to 138-kV | 2030 | 14.46 |
| 26 | Upgrade existing Odessa EHV – Rexall – General Tire Switch – Edwards Tap – Judkins – Sandhills Tap – Wolf 138-kV line | 2025 | 62.74 |
| 27 | Upgrade existing Moss – Wolf 138-kV line | 2025 | 39.30 |
| 28 | Upgrade existing Odessa North – Odessa 138-kV line | 2025 | 15.76 |

| | | | |
|---|---|---|---|
| 29 | Upgrade existing Odessa EHV – Yarbrough Sub – Wolf 138-kV line | 2025 | 63.11 |
| 30 | Upgrade existing Holt – Scharbauer POI 138-kV line | 2025 | 10.46 |
| 32 | Add Kyle Ranch – New Load 90001 – New Load 90006 138-kV line | 2025 | 3.97 |
| 35 | Add New Load 90021 - New Load 90032 138-kV line | 2025 | 17.0 |
| 37 | Add ONC90002_TAP – New Load 90002 138-kV line | 2025 | 18.37 |
| 37 | Add capacitor bank (24 Mvar) at new load bus 90002 | 2030 | |
| 38 | Add Three Mile Draw Switch – New Load 90106 138-kV line | 2030 | 13.54 |
| 39 | Add ONC90009_TAP – New Load 90009 138-kV line | 2025 | 14.53 |
| 41 | Increase the capacitor bank at bus 1323 to 18.4 Mvar from 9.2 Mvar | 2030 | 0.50 |
| 44 | Upgrade existing Salt Flat – Pronghorn – Consavvy 138-kV line | 2025 | 15.70 |
| 45 | Terminal equipment upgrade for existing Caymus TNP – Gas Pad 138-kV line | 2030 | 0.50 |

# 6. Conclusion

The purpose of this Permian Basin Load Interconnection Study was to identify transmission upgrades that are necessary to connect projected oil and gas loads in the Permian Basin area.

This study identified a list of the transmission upgrades, including both the preferred and placeholder projects, required by 2025 and 2030 to address the identified reliability criteria violations in the study area.

The preferred projects may be endorsed by ERCOT based on the results of this Permian Basin Load Interconnection Study if they are submitted for RPG review. The total cost of the preferred transmission upgrades is estimated to be approximately $1.5 Billion. The placeholder projects are expected to require further analysis if submitted for RPG review.

# 7. Appendix

| | |
|---|---|
| **7.1. Appendix A: Reliability Violations** | Appendix A - Reliability Violations |
| **7.2. Appendix B: List of All Transmission Upgrades and Corresponding Reliability Need** | Appendix B - List of All Transmission Up |
| **7.3. Appendix C: Maps of All Transmission Upgrades** | Appendix C - Maps of All Transmission U |

# WEST TEXAS 345 KV INFRASTRUCTURE REBUILD PROJECT

ERCOT RPG Submittal
November 3, 2023

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# Executive Summary

The need to expand and rebuild Oncor's transmission facilities in West Texas is being driven by load growth, load integration requests, and the need to rebuild aging facilities. The aging facilities in this area need extensive upgrades and modifications to meet surging customer load and current planning and design standards. This project addresses the need to expand and further reinforce the transmission system in West Texas.

The need for this project is derived from the recommendations in ERCOT's Permian Basin Load Interconnection Study – Final Update presentation, presented by ERCOT at the October 15, 2021 Regional Planning Group (RPG) meeting. The Permian Basin Load Interconnection (PBLI) Study was performed by ERCOT with input from affected Transmission Service Providers (TSPs) and other RPG stakeholders. The final PBLI study report was published by ERCOT on December 8, 2021. The study identified transmission reliability needs resulting from continued expansion of the oil and natural gas industry in the Permian Basin area. In the PBLI Study, ERCOT identified a set of 'Preferred' and a set of 'Placeholder' transmission upgrade projects, with the understanding that ERCOT could use the PBLI Study as part of ERCOT's Independent Review of a 'Preferred' RPG Project. This RPG Project presents and provides the justification for many of the ERCOT designated 'Preferred' transmission upgrades in the PBLI Study in this single submittal. This Proposed RPG Project includes components of ERCOT's 'Preferred' Project IDs 1, 2, 3, and 25, with each of the applicable Project ID components being modeled in the analysis. Some of the components of the ERCOT 'Preferred' Projects list have already been submitted and approved by ERCOT and the RPG, (see the Introduction section of this Proposed RPG Project).

An integral part of this Proposed RPG Project is the reconfiguration of the Morgan Creek Switch and the rebuild of the 345 kV Lines from Morgan Creek – Tonkawa, Morgan Creek – Midland County Northwest, and Morgan Creek – Odessa EHV. The Morgan Creek Switch property is currently shared between Oncor and Vistra. Due to the size of the proposed Morgan Creek Switch rebuild, the land constraints necessary to rebuild the switch, and the routing constraints with the existing property, Morgan Creek Switch will need to be broken up into two separate switch stations (Ranger Camp and Cattleman 345/138 kV Switches) to accommodate the 345 kV, 138 kV, and 69 kV facilities and a third station (Morgan Creek 138 kV Switch) to be rebuilt to interconnect the existing Morgan Creek generation. The 345 kV lines from Morgan Creek to Tonkawa, Morgan Creek to Midland County Northwest, and Morgan Creek to Odessa EHV will each need to be rebuilt with newer structures and higher ampacity conductor.

Oncor is proposing a Tier 1 project that will consist of the following elements:

- Establish the new Ranger Camp 345/138/69 kV Switch, approximately 1.0 mile north of the existing Morgan Creek 345/138 kV Switch, including two 600 MVA, 345/138 kV autotransformers, and one 177 MVA, 138/69 kV autotransformer. The Ranger Camp 345/138/69 kV Switch will initially be installed with (1) a 14-breaker, 345 kV, breaker-and-a-half bus arrangement, (2) a 16-breaker, 138 kV, breaker-and-a-half bus arrangement, and 3) a 2-breaker, 69 kV, single bus arrangement. All terminal and associated equipment will meet or exceed 5000 A for 345 kV, 3200 A for 138 kV and 2000 A for 69 kV;
    - Connect the existing 69 kV lines into the new Ranger Camp Switch:
        - Morgan Creek – Colorado City 69 kV Line (normal and emergency rating of 81 MVA)
        - Morgan Creek – Big Spring 69 kV Line (normal and emergency rating of 62 MVA)

  - Connect the existing 138 kV lines into the new Ranger Camp Switch:
    - Morgan Creek – Eskota 138 kV Line (normal and emergency rating of 186 MVA)
    - Morgan Creek – Barber Lake West 138 kV Line (normal and emergency rating of 186 MVA)
    - Morgan Creek – Barber Lake East 138 kV Line (normal and emergency rating of 186 MVA)
    - Morgan Creek – Sun 138 kV Line (normal and emergency rating of 186 MVA)
    - Morgan Creek – Cosden 138 kV Line (normal and emergency rating of 287 MVA)
  - Reroute the existing Morgan Creek – Falcon Seaboard 345 kV Line (normal and emergency rating of 956 MVA) approximately 1.4 miles, on new right-of-way (ROW), to loop into the new Ranger Camp Switch;
  - Reroute the existing Morgan Creek – Tonkawa 345 kV Line (normal and emergency rating of 1072 MVA) approximately 1.7 miles, with approximately 0.76 miles of existing ROW and approximately 0.94 miles of new ROW, to loop into the new Ranger Camp Switch;
  - Relocate the existing 177 MVA, 138/69 kV autotransformer from Morgan Creek Switch to the new Ranger Camp Switch;
- Establish the new Cattleman 345/138 kV Switch, approximately 2.0 miles southwest of the existing Morgan Creek 345/138 kV Switch, including two 600 MVA, 345/138 kV autotransformers. The Cattleman 345/138 kV Switch will initially be installed with (1) a 15-breaker, 345 kV, breaker-and-a-half bus arrangement, and (2) a 9-breaker, 138 kV, breaker-and-a-half bus arrangement. All terminal and associated equipment will meet or exceed 5000 A for 345 kV, and 3200 A for 138 kV;
  - Connect the existing McDonald Road – Morgan Creek 138 kV Line (normal and emergency rating of 329 MVA) into the new Cattleman Switch, using new ROW;
  - Reroute the existing Morgan Creek – Champion Creek/LCRA Bitter Creek 345 kV Double-Circuit (DCKT) Line (normal and emergency rating of 1072 MVA) approximately 2.5 miles, with approximately 1.25 miles of existing ROW and approximately 1.25 miles of new ROW, to loop into the new Cattleman Switch;
  - Reroute the existing Morgan Creek – LCRA Gasconades 345 kV Line (normal and emergency rating of 1434 MVA) approximately 2.5 miles, with approximately 0.37 miles of existing ROW and approximately 2.13 miles of new ROW, to loop into the new Cattleman Switch;
  - Connect the existing Morgan Creek – Consavvy 345 kV Line (normal and emergency rating of 1072 MVA) and the existing Morgan Creek – Longshore 345 kV Line (normal and emergency rating of 1072 MVA) into the new Cattleman Switch, using existing ROW;
- Establish the new approximately 4.2 mile Cattleman – Ranger Camp 345 kV DCKT Line (normal and emergency rating of 2987 MVA) using double-circuit capable structures with two circuits in place, using new ROW;
- Rebuild the Morgan Creek 138 kV Switch, in the existing Morgan Creek 345/138 kV Switchyard. The Morgan Creek 138 kV Switch will be rebuilt from the existing 12-breaker, 138 kV double-bus arrangement to a 10-breaker, 138 kV, breaker-and-a-half bus arrangement. All terminal and associated equipment will meet or exceed 3200 A for 138 kV. This portion of the Proposed RPG Project includes the following elements:
  - Establish two approximately 0.1 mile Morgan Creek – Morgan Creek CT Yard 138 kV Lines (normal and emergency rating of 614 MVA) using separate single-circuit capable structures with one circuit in place, using existing ROW;

  - Establish a new approximately 1.2 miles Morgan Creek - Ranger Camp 138 kV DCKT Line (normal and emergency rating of 614 MVA) using double-circuit capable structures with two circuits in place, using existing ROW;
  - Establish a new approximately 3.3 miles Morgan Creek - Cattleman 138 kV DCKT Line (normal and emergency rating of 614 MVA) using double-circuit capable structures with two circuits in place, using approximately 0.82 miles of existing ROW and approximately 2.48 miles of new ROW;
- Establish the new Prong Moss 345 kV Switch, approximately 29.4 miles southwest of the existing Morgan Creek 345/138 kV Switch along the existing 345 kV Morgan Creek – Midland East 345 kV Line corridor, and approximately 7.0 miles south of the existing Falcon Seaboard generating station. The Prong Moss 345 kV Switch will initially be installed with a 12-breaker, 345 kV, breaker-and-a-half bus arrangement. All terminal and associated equipment will meet or exceed 5000 A;
  - Construct an approximately 0.1 mile loop of the existing Morgan Creek – Falcon Seaboard 345 kV Line (normal and emergency rating of 956 MVA) into the new Prong Moss 345 kV Switch, approximately 7.0 miles south of Falcon Seaboard, using new ROW;
  - Construct an approximately 0.1 mile loop of the existing Falcon Seaboard – Midland East 345 kV Line (normal and emergency rating of 956 MVA) into the new Prong Moss 345 kV Switch, approximately 7.0 miles south of Falcon Seaboard, using new ROW;
  - The existing 345 kV double-circuit line from Falcon Seaboard Switch to the newly proposed location of Prong Moss 345 kV Switch will tie into the new Prong Moss 345 kV Switch but will not be rebuilt as part of this Proposed RPG Project;
- Modify the existing Tonkawa 345 kV Switch by adding one new 5000 A breaker-and-a-half rung with two new 5000 A, 345 kV circuit breakers on the new rung;
- Rebuild the existing 21.3 mile Morgan Creek – Tonkawa 345 kV Line (previously Morgan Creek – Tonkawa, now Ranger Camp – Tonkawa) by:
  - Rebuilding the existing 21.3 mile 345 kV circuit with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA), on double-circuit capable structures with one circuit in place, using existing ROW;
  - Installing one new 21.3 mile 345 kV circuit with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA) on the vacant side of the structures;
- Rebuild the existing 70.6 mile Morgan Creek – Midland East 345 kV Line (previously Morgan Creek – Falcon Seaboard – Midland East, now Ranger Camp – Prong Moss – Midland East) by:
  - Rebuilding the existing approximately 29.4 mile Ranger Camp – Prong Moss 345 kV circuit with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA) using double-circuit capable structures with one circuit in place, using existing ROW;
  - Installing one new 29.4 mile Ranger Camp – Prong Moss 345 kV circuit with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA) on the vacant side of the new structures;
  - Rebuilding the existing approximately 41.2 mile Prong Moss – Midland East 345 kV circuit with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA) using double-circuit capable structures with one circuit in place, using existing ROW;

  - Installing one new 41.2 mile Prong Moss – Midland East 345 kV circuit with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA) on the vacant side of the new structures;
- Rebuild the existing 17.3 mile Midland East – Midland County Northwest 345 kV Line by:
  - Rebuilding the existing approximately 17.3 mile Midland East – Midland County Northwest 345 kV circuit with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA) using double-circuit capable structures with one circuit in place, with approximately 16.3 miles of existing ROW and 1.0 mile of new ROW;
  - Installing one new 17.3 mile Midland East – Midland County Northwest 345 kV circuit with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA) on the vacant side of the new structures;
- Rebuild the existing Midland County Northwest 345 kV Switch buswork and terminal equipment to meet or exceed 5000 A;
  - Modify the existing Midland County Northwest 345 kV Switch by adding one new 5000 A breaker-and-a-half rung with two new 5000 A, 345 kV circuit breakers on the new rung;
- Rebuild the existing 88.7 miles Morgan Creek – Odessa EHV 345 kV DCKT Line (previously Morgan Creek – Odessa EHV, now Cattleman – Odessa EHV) by:
  - Rebuilding the existing 88.7 mile Morgan Creek – Odessa EHV 345 kV DCKT Line with a conductor rated 5000 A or greater (normal and emergency rating of 2987 MVA) using double-circuit capable structures with two circuits in place, using existing ROW;
  - Convert the existing Longshore 345 kV Switch from a 6-breaker ring-bus configuration into an 11-breaker, 345 kV, breaker-and-a-half bus arrangement. All terminal and associated equipment will meet or exceed 5000 A for 345 kV;
    - Construct an approximately 0.1 mile loop of the existing Morgan Creek – Longshore Flyby – Consavvy 345 kV Line into the rebuilt Longshore 345 kV Switch;
  - Upgrade all terminal equipment at the existing 2-breaker Midessa South 345 kV Switch to meet or exceed 5000 A;
  - Upgrade all terminal equipment at the existing Quail East 345 kV Switch, 3-breaker ring bus to meet or exceed 5000 A;
  - Upgrade terminal equipment on two 345 kV breaker-and-a-half rungs of the existing Odessa EHV Switch to meet or exceed 5000 A;
  - Upgrade two 345 kV single breaker terminals and main bus at the existing Odessa EHV Switch to meet or exceed 5000 A;
- Establish the new Reiter 345/138 kV Switch, including two 600 MVA, 345/138 kV autotransformers, approximately 3.0 miles south of the existing Odessa EHV 345/138 kV Switch, along the Odessa EHV – Moss/Wolf 345 kV DCKT Line corridor. The Reiter 345/138 kV Switch will initially be installed with (1) a 12-breaker, 345 kV, breaker-and-a-half bus arrangement and (2) a 10-breaker, 138 kV, breaker-and-a-half bus arrangement. All terminal and associated equipment will meet or exceed 5000 A for 345 kV, and 3200 A for 138 kV;
  - Construct an approximately 0.2 mile loop of the existing Odessa EHV - Moss 138 kV Line (normal and emergency rating of 614 MVA) into the new Reiter 138 kV Switch, using new ROW;

  - Construct an approximately 0.1 mile loop of the existing Odessa EHV - Wolf 138 kV Line (normal and emergency rating of 614 MVA) into the new Reiter 138 kV Switch, using new ROW;
  - Construct an approximately 0.1 mile loop of the existing Odessa EHV – Moss & Odessa EHV – Wolf 345 kV DCKT Line (normal and emergency rating of 2987 MVA) into the new Reiter 345 kV Switch, using new ROW;
- Modify the existing Tesoro 345 kV Switch by adding two new 5000 A breaker-and-a-half rungs with two new 5000 A, 345 kV circuit breakers on each rung;
- Construct a new approximately 4.0 mile Reiter – Tesoro 345 kV DCKT Line (normal and emergency rating of 2987 MVA) using double-circuit capable structures with two circuits in place, using new ROW;

Table 3 below lists the components of this Proposed RPG Project that will likely require a CCN filing.

This Proposed RPG Project will (1) address ERCOT's identified reliability projects, (2) resolve identified thermal overloads in the ERCOT Permian Basin Load Integration study, (3) improve system operational flexibility, (4) increase system load serving capacity, (5) create an additional 345 kV source for West Texas and (6) upgrade and retire aging infrastructure.

This Tier 1 RPG project in Scurry, Mitchell, Howard, Glasscock, Martin, Midland, and Ector counties is estimated to cost $1.12 billion. The estimated cost of this RPG reflects the fact that the vast majority of the work necessary to complete the various project components associated with this submittal will need to be performed on energized transmission elements ("hot" work) and/or will require construction of temporary by-pass transmission facilities. This type of work on this project is essential for a variety of reasons.

First, obtaining clearances on the existing 345 kV lines would be impractical and risk system reliability. The analysis contained herein demonstrates that thermal violations on various 345 kV lines would occur under certain existing single-circuit 345 kV contingencies, and therefore taking clearances on the existing 345 kV lines would create unfavorable system conditions. Second, load growth in West Texas has been driven primarily by the oil and gas industry. As a result, it is becoming less scalable, because load remains relatively persistent even during off-peak periods when construction is usually performed. Third, obtaining clearances in West Texas is becoming more challenging. Clearance moratoriums are getting longer and more restricted. At times, depending on system conditions and additional work in the area, ERCOT has been required to cancel construction clearances required to perform work on a given project. Clearance cancellations present the worst of both worlds from a project timing and cost perspective, because it necessitates costly hot work but also results in cascading project schedule disruptions based on the shift or disappearance of the clearance previously relied upon in the project work sequencing. Because Oncor does not have control over clearance schedules and clearance timing, it cannot rely on obtaining the necessary clearances while still maintaining a realistic expectation to meet the summer 2028 in-service date for these projects. Thus, performing the work necessary to complete this RPG in a timely and efficient manner requires the flow of 345 kV transmission into West Texas to be uninterrupted and necessitates 'hot' work and/or temporary by-pass transmission facilities for large portions of these projects.

This project is recommended for construction to meet a summer 2028 in-service date. The projected in-service date may change based on requirements for environmental assessment, licensing requests, regulatory approval, rights-of-way acquisition and construction progress. Oncor will work with ERCOT as necessary to develop and implement Constraint Management Plans based on summer 2028 operational conditions. In addition to RPG approval, multiple Certificates of Convenience and Necessity (CCNs) will be required for portions of this Proposed RPG Project, as listed in Table 3 below.

# Introduction

Oncor continues to see load growth in west Texas due to the high level of activity in the oil and gas industry. Demand is expected to continue to grow at a rapid pace, mainly driven by new loads and electrification activities, including conversion of gas-powered equipment to electrical operation or moving load from on-site generation to the grid to improve reliability. This growth forecast is supported in the ERCOT Permian Basin Load Interconnection (PBLI) Study report which states that electric load in west Texas is expected to nearly double by 2030.

In order to meet the forecasted Permian Basin load, several projects will be required. Other RPG submittals Oncor has recently submitted or plans to submit for review in the near future are:

- Midland East Area Project (accepted by RPG 3/12/21);
- Consavyy 345/138 kV Switch Project (accepted by RPG 4/4/2022);
- Lenorah/Volta 345/138 kV Switch Project (accepted by RPG 4/4/2022);
- Tesoro (fka known as Quail East) 345/138 kV Switch Project (accepted by RPG 11/7/22);
- Rockhound 345/138 kV Switch Project;
- Prong Moss 345/138 kV Switch Project
- Prairieland 345/138 kV Switch and Prairieland – Quartz Sand 138 kV Line Project; and
- Multiple projects identified in the ERCOT Delaware Basin Load Interconnection Study.

The extent of the necessary transmission system changes and upgrades requires Oncor to submit major projects well in advance of the need, as it is anticipated that the completion of the Proposed RPG Project may take 4-5 years. Oncor's Proposed RPG Project provides a roadmap to improve and reinforce the 345 kV transmission grid in West and Far West Texas. Morgan Creek Switch is an aging facility, and in order to accommodate the aforementioned projects and the increasing area demand more generally, a rebuild of Morgan Creek Switch will be essential for maintaining operational flexibility and reliability in the area. Because of land and routing constraints, the Morgan Creek Switch portion of the Proposed RPG Project will result in two new 345/138 kV switches, Ranger Camp Switch and Cattleman Switch, and one rebuilt 138 kV switch, Morgan Creek Switch. Additionally, the ERCOT Permian Basin Load Interconnection Study recommended the existing single-circuit 345 kV Line from Tonkawa – Morgan Creek – Midland County Northwest, be rebuilt as a double-circuit 345 kV Line.

Figure 1 identifies the approximate location of the Proposed RPG Project, while Figure 2 provides a simplified one-line diagram illustrating the existing configuration of Morgan Creek Switch and adjacent facilities prior to the Proposed RPG Project.

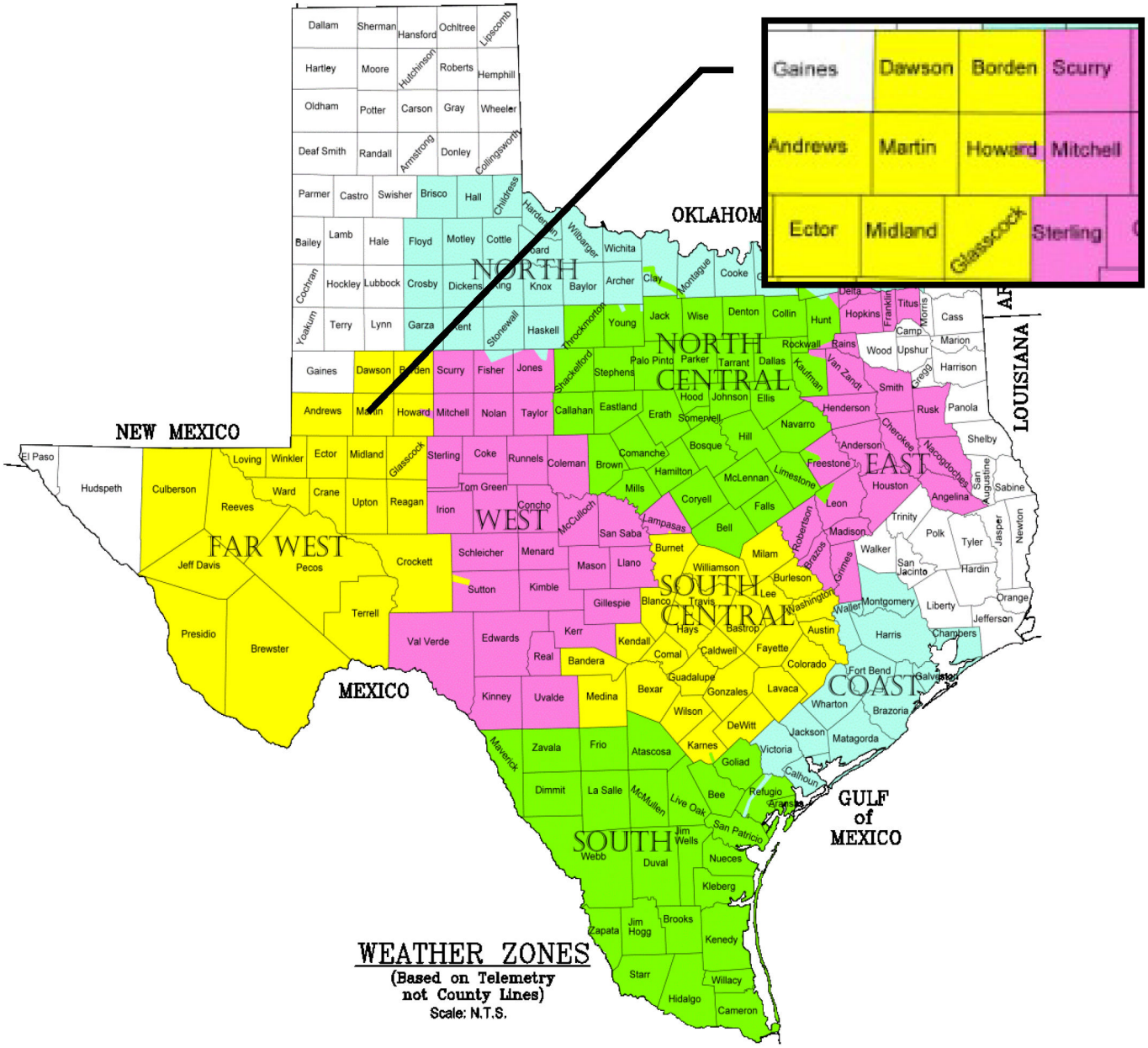


Figure 1. Proposed Project Approximate Location

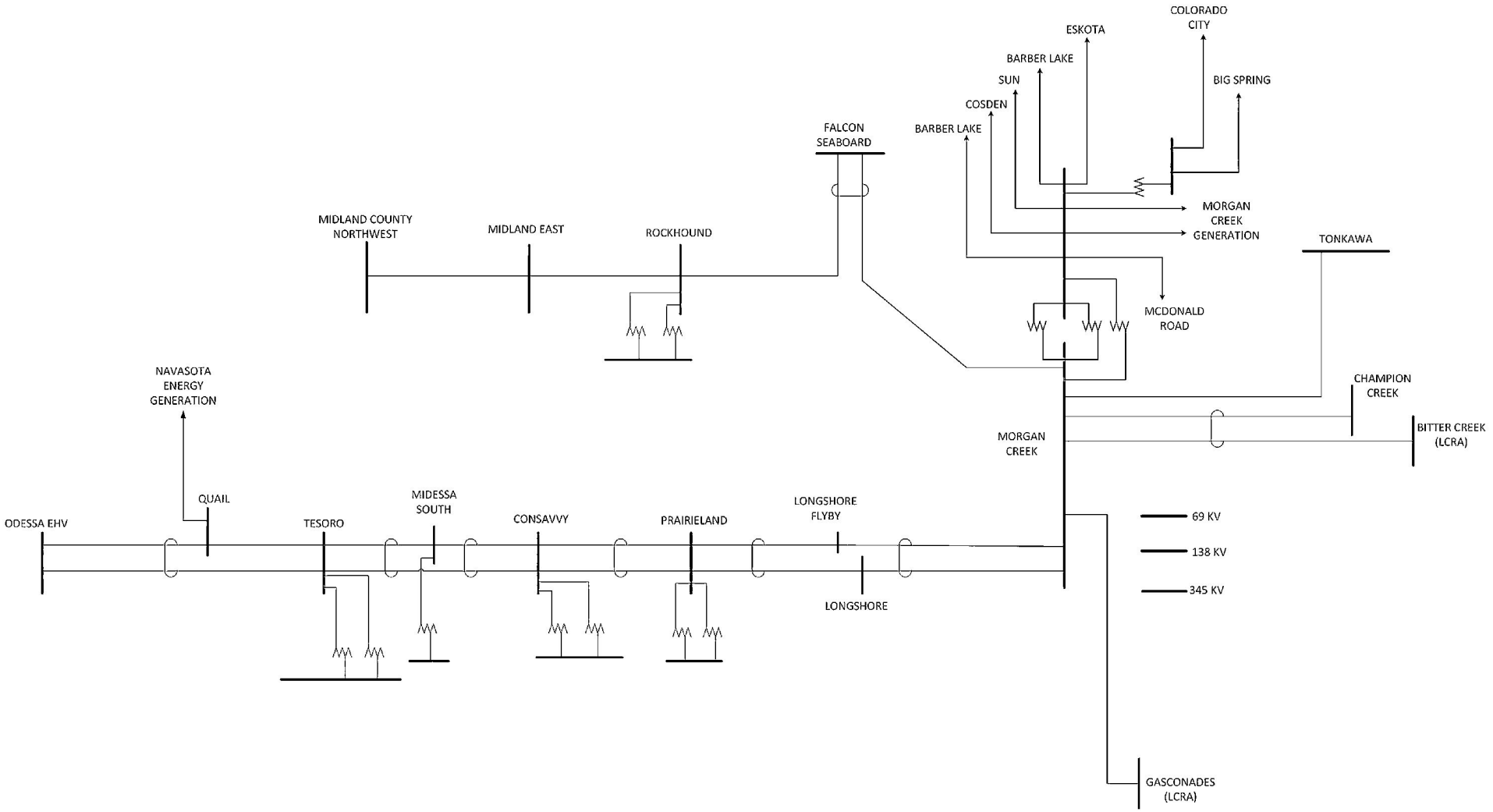


Figure 2. West Texas 345 kV Infrastructure Rebuild Pre-Project Configuration

# Purpose and Necessity

The ERCOT Permian Basin Load Interconnection Study and Oncor's analysis identified several transmission upgrades that will be necessary to connect oil and gas loads in the Permian Basin area. The Proposed RPG Project will be necessary to accommodate the upgrades identified in Oncor's analysis and in the ERCOT Permian Basin Load Integration Study. This project, along with the others listed in the Introduction, will be vital to maintaining reliability and operational flexibility within the region for the foreseeable future.

## Steady-State Analysis

Oncor performed a comparative steady-state analysis under Summer 2028 conditions which revealed thermal overloads on various 345 kV lines in the West Texas portion of Oncor's transmission grid. These overloads were identified under various contingency conditions, including some N-1 contingency scenarios. The case used for this study was the ERCOT Steady State Working Group (SSWG) case published October 10, 2022 (22SSWG_2028_SUM1_U1_Final_10102022). Relevant off-cycle IDVs published on the ERCOT Market Information System (MIS) as of May 18, 2023 were applied to the base case. Additionally, the base case was modified to include approximately 800 MW of newly signed Oncor loads in West Texas and Far West Texas through May 18, 2023. To determine the Proposed RPG Project's potential adverse impacts to system voltages and thermal loading limits, contingency analysis for this project was performed in accordance with NERC Reliability Standard TPL-001-5.1 and ERCOT Planning Guide Reliability Performance Criteria 4.1.1.1 (1) (d). The results justifying the need for the proposed project, in addition to the results listed in the ERCOT Permian Basin Load Interconnection Study, are summarized in Table 1. The subsequent results after the completion of the Proposed RPG Project are summarized in Table 2.

| Pre-Project Thermal Loading | | | | |
|---|---|---|---|---|
| NERC Category | Contingency | | Monitored Element | 2028 Summer % Loading Without Proposed Projects |
| | Initial Event (PSSE Buses) | Second Event (PSSE Buses) | | |
| P1 | Prairieland - Morgan Creek 345 kV Line (18548 - 19000 id 1, 19000 - 1030 id 1) | N/A | Longshore - Prairieland 345 kV Line | 107.5 |
| | Consavvy - Prairieland 345 kV Line 1 (11387 - 18548 id 1) | N/A | Consavvy - Prairieland 345 kV Line 2 | 99.4 |
| | Consavvy - Prairieland 345 kV Line 2 (11387 - 18548 id 2) | N/A | Consavvy - Prairieland 345 kV Line 1 | 99.4 |
| P7 | Morgan Creek - Champion Creek/LCRA Bitter Creek 345 kV Double-circuit Line (1030 - 1414 id 1, 1030 - 71050 id 1) | N/A | Morgan Creek - Tonkawa 345 kV Line | 129.1 |
| | Prairieland - Longshore/Morgan Creek 345 kV Double-circuit Line (18548 -1058 id 1, 18548 - 19000 id 1, 19000 - 1030 id 1) | N/A | Falcon Seaboard - Rockhound 345 kV Line | 105.8 |
| P3 | Either Odessa Ector CC Train (130321 id C1, 130322 id C2, 130323 id C0) | Prairieland - Morgan Creek 345 kV Line (18548 - 19000 id 1, 19000 - 1030 id 1) | Morgan Creek - Longshore 345 kV Line | 95.1 |
| | | Consavvy - Prairieland 345 kV Line 1 (11387 - 18548 id 1) | Consavvy - Prairieland 345 kV Line 2 | 114.7 |
| | | Consavvy - Prairieland 345 kV Line 2 (11387 - 18548 id 2) | Consavvy - Prairieland 345 kV Line 1 | 114.7 |
| | | Prairieland - Longshore 345 kV Line (18548 -1058 id 1) | Prairieland - Morgan Creek 345 kV Line | 102.9 |
| EP3 | Either Odessa Ector CC Train (130321 id C1, 130322 id C2, 130323 id C0) | Morgan Creek - Champion Creek/LCRA Bitter Creek 345 kV Double-circuit Line (1030 - 1414 id 1, 1030 - 71050 id 1) | Morgan Creek - Tonkawa 345 kV Line | 143.3 |
| | | Prairieland - Longshore/Morgan Creek 345 kV Double-circuit Line (18548 -1058 id 1, 18548 - 19000 id 1, 19000 - 1030 id 1) | Falcon Seaboard - Rockhound 345 kV Line | 116.4 |
| | Falcon Seaboard CC Train (130001 id C1, 130002 id C2, 130003 id C0) | Prairieland - Longshore/Morgan Creek 345 kV Double-circuit Line (18548 -1058 id 1, 18548 - 19000 id 1, 19000 - 1030 id 1) | Falcon Seaboard - Morgan Creek 345 kV Line | 108.8 |
| EP6 | Consavvy 345/138 kV Autotransformer 1 (11386, 11387, 11388 id 1) | Consavvy - Midessa South/Tesoro 345 kV Double-circuit Line (11387 - 18540 id 1, 11387 - 1125 id 1) | Consavvy 345/138 kV Autotransformer 2 | 100.5 |
| | Consavvy 345/138 kV Autotransformer 2 (11386, 11387, 11389 id 2) | Consavvy - Midessa South/Tesoro 345 kV Double-circuit Line (11387 - 18540 id 1, 11387 - 1125 id 1) | Consavvy 345/138 kV Autotransformer 1 | 100.5 |
| | Einstein 345/138 kV Autotransformer (23852, 23874, 23875 id 1) | Bearkat - North McCamey 345 kV Double-circuit Line (59903 - 76000 id 1, 59903 - 76000 id 2) | Longshore - Prairieland 345 kV Line | 120.8 |

Table 1 – Worst Post-Contingency Line Loading (Pre-Project)

| Post-Project Thermal Loading | |
|---|---|
| **Monitored Element** | **2028 Summer Worst % Loading After Proposed Projects (All Contingencies)** |
| Ranger Camp - Cattleman 345 kV Line 1 | 18.8 |
| Ranger Camp - Cattleman 345 kV Line 2 | 18.8 |
| Falcon Seaboard - Prong Moss 345 kV Line 1 | 24.6 |
| Falcon Seaboard - Prong Moss 345 kV Line 2 | 24.6 |
| Midland East - Rockhound 345 kV Line 1 | 25.1 |
| Midland East - Rockhound 345 kV Line 2 | 25.1 |
| Ranger Camp - Prong Moss 345 kV Line 1 | 29.9 |
| Ranger Camp - Prong Moss 345 kV Line 2 | 29.9 |
| Cattleman - Longshore 345 kV Line 1 | 32.5 |
| Cattleman - Longshore 345 kV Line 2 | 32.5 |
| Consavvy - Prairieland 345 kV Line 1 | 36.1 |
| Consavvy - Prairieland 345 kV Line 2 | 36.1 |
| Ranger Camp - Tonkawa 345 kV Line 1 | 37.0 |
| Ranger Camp - Tonkawa 345 kV Line 2 | 37.0 |
| Prong Moss - Rockhound 345 kV Line 1 | 38.2 |
| Prong Moss - Rockhound 345 kV Line 2 | 38.2 |
| Longshore - Prairieland 345 kV Line 1 | 42.9 |
| Longshore - Prairieland 345 kV Line 2 | 42.9 |
| Consavvy 345/138 kV Autotransformer 1 | 84.4 |
| Consavvy 345/138 kV Autotransformer 2 | 84.4 |

Table 2 – Worst Post-Contingency Line Loading (Post-Project)

## Dynamic Analysis

Oncor performed a dynamic stability analysis to evaluate the impact of the addition of this project on the transmission system. The analysis was conducted using two of the Dynamic Working Group (DWG) cases published in May 2022 (DWG SUM2029 and DWG HWLL2026). The HWLL 2026 case was adjusted to match the long-term topology to create an off- peak 2028 case, designated as HWLL2028. System topology updates necessary to implement the Proposed RPG Project were used in both study cases. Contingencies included in NERC Categories P1, P3, P4, P6, and P7 were studied. NERC Categories P2 and P5 were omitted as NERC category P4 contingencies are more impactful than P2, and P5 contingencies generally would not be applicable given Oncor's redundant system protection philosophy within the study area. The results of the dynamic stability assessment indicate that the proposed project will not have an adverse effect on transmission system dynamic stability in the project vicinity. Oncor will continue to perform annual dynamic analysis for this area.

### Subsynchronous Resonance (SSR) Screening

The Proposed Project was screened in 2029 Summer Peak conditions (DWG 2029 Summer Peak case published May 2022). The study was performed with and without the Proposed Project in-service, and the project did not result in a reduction in the number of outages required to create a radial path between a generator and a series compensated line. Since the project will not increase the likelihood of a radial condition occurring with respect to pre-project system conditions, no further SSR analysis is warranted.

### Short-Circuit Study

Oncor evaluated the short-circuit impacts of the Proposed Project using the System Protection Working Group (SPWG) case "22_SPWG_2027_FY_06302022_FINAL". The SPWG case was modified to include changes associated with the proposed project, as well as other Oncor system changes that occurred since the development of the SPWG case. The analysis revealed that the Proposed RPG Project did cause various 138 kV breakers, in the vicinity of the project, to become overdutied. The cost of the overdutied breakers is not included in the cost of this Proposed RPG Project. All identified overdutied breakers will be replaced with upgraded breakers over the next 4 – 5 years, prior to or in connection with energization of the Proposed RPG Project, with other breakers identified during Oncor's annual Overdutied Breaker Analysis. Oncor will continue to perform annual short-circuit studies.

## Project Description

In order to address the identified reliability concerns, Oncor recommends the project components listed in the Executive Summary section.

Figure 3 provides a simplified one-line diagram illustrating the configuration of Morgan Creek Switch and adjacent facilities after the Proposed RPG Project.

## One-Line Diagram

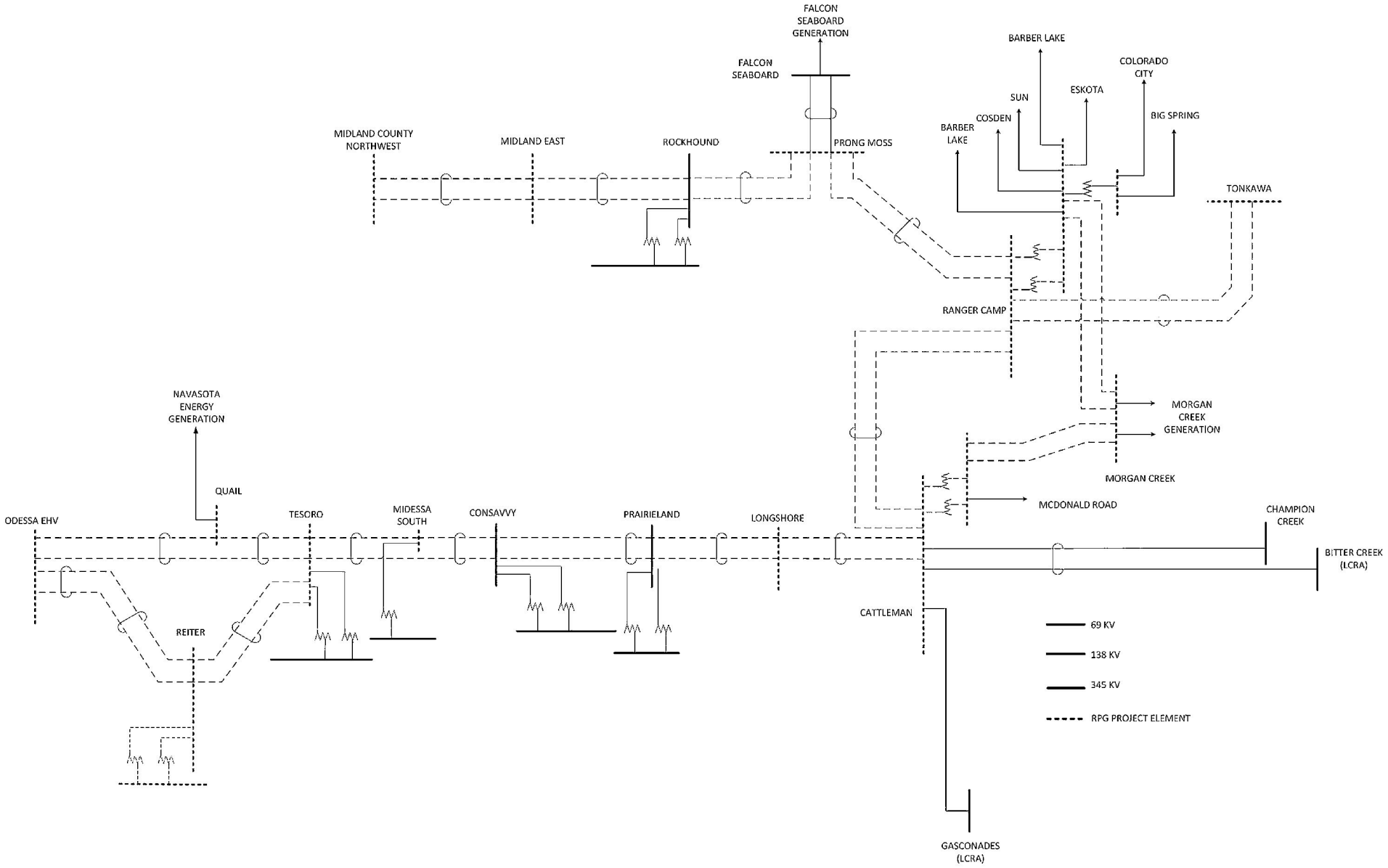


Figure 3. West Texas 345 kV Infrastructure Rebuild Post-Project Configuration

## Alternative Solutions Considered

Given the age and state of the existing Morgan Creek Switch and 345 kV lines in West Texas, this project was deemed necessary to accommodate the substantial increases in area demand in general, and the specific upgrades identified in the ERCOT Permian Basin Load Interconnection Study in particular. As mentioned in the Executive Summary and in the Introduction of this submittal, the ERCOT Permian Basin Load Integration Study recommended all of the proposed upgrades included in this Proposed RPG Project.

As a result of the interconnectedness of the existing system, there are no alternatives to many of the upgrade and station reconfigurations discussed above. However, due to the inability of taking multiple, extended clearance outages to rebuild the existing 345 kV lines and stations Oncor did analyze the possibility of constructing additional 345 kV circuits, on new structures within new ROW, next to the existing 345 kV transmission lines leaving Morgan Creek Switch. This alternative does provide certain advantages, avoidance of "hot work", creation of an alternative transmission path into the area, and other operational, resiliency, and flexibility benefits to the system. However, building additional 345 kV transmission lines, adjacent and parallel to, the existing 345 kV transmission lines would require the purchase of additional new ROWs and would also require a CCN for each new 345 kV transmission line, resulting in additional time to complete and the likelihood of higher costs. Nevertheless, this alternative did not produce results similar to the Proposed RPG Project and Oncor did not deem this a viable alternative from a cost or timeliness perspective. No other additional alternatives were considered to the necessary upgrades listed in the ERCOT Permian Basin Load Interconnection Study, and confirmed in Oncor's analysis detailed in this Proposed RPG Project.

## Project Cost

| Component | Project Cost (Millions) | New ROW Required | CCN |
|---|---|---|---|
| Ranger Camp 345/138 kV Switch * | $94.76 | Yes | No |
| Cattleman 345/138 kV Switch * | $106.48 | Yes | No |
| Morgan Creek 138 kV Switch ** | $27.10 | Yes | Yes |
| Tonkawa – Morgan Creek 345 kV DCKT Line | $37.16 | No | Yes |
| Morgan Creek – Odessa EHV 345 kV DCKT Line | $362.70 | Yes | No |
| Morgan Creek – Midland East 345 kV DCKT Line | $307.34 | No | Yes |
| Midland East – Midland County NW 345 kV DCKT Line | $90.02 | Yes | Yes |
| Reiter 345/138 kV Switch | $70.04 | No | No |
| Reiter – Tesoro 345 kV DCKT Line | $20.74 | Yes | Yes |
| **TOTALS** | **$1,116.34** | | |

* - Switch cost includes line reroutes and reconnections
** - This cost includes a new 138 kV line from Morgan Creek Switch – Cattleman Switch

Table 3. Proposed RPG Solution Project Cost Summary

## Recommendation

In order to accommodate the system upgrades outlined in the Permian Basin Load Interconnection Study, modernize aging infrastructure, and maintain operational flexibility and reliability, Oncor recommends that the West Texas 345 kV Infrastructure Rebuild Project be carried out to include the project components listed in the Executive Summary section.

In addition to the aging infrastructure, this project is necessary to accommodate the upgrades identified in the ERCOT Permian Basin Load Interconnection Study. The projected in-service date may change based on requirements for environmental assessment, licensing requests, regulatory approval, rights-of-way acquisition and construction progress. Completing the West Texas 345 kV Infrastructure Rebuild Project will meet reliability requirements, relieve thermal overloading, maintain acceptable system voltages, and provide adequate transmission capacity for the system under pre- and post-contingency conditions. The estimated cost for this Tier 1 Proposed RPG Project is $1.12 billion, based on the expectation that some elements of this project will be constructed using energized (hot) work processes. This project is recommended to meet a summer 2028 in-service date.

# ERCOT Independent Review of the Oncor West Texas 345-kV Infrastructure Rebuild Project

# Document Revisions

| Date | Version | Description | Author(s) |
|---|---|---|---|
| May 16, 2024 | 1.0 | Final | Ben Richardson |
| | | Reviewed by | Robert Golen, Prabhu Gnanam |

# Executive Summary

Oncor submitted the West Texas 345-kV Infrastructure Rebuild Project to the Regional Planning Group (RPG) on November 3, 2023. Oncor proposed this project to address load growth, load integration requests, the need to rebuild aging facilities and NERC TPL-001-5 reliability criteria violations. The expected in-service date (ISD) of this project is Summer 2028. This project is located in the West and Far West Weather Zones in Scurry, Mitchell, Howard, Glasscock, Martin, Midland, and Ector Counties.

ERCOT completed the Permian Basin Load Interconnection Study (PBLI)[1] in December 2021 to identify transmission upgrades, especially long lead time transmission upgrades, necessary to reliably serve the existing and projected oil and gas loads in the Permian Basin area. The Permian Basin area includes the Delaware Basin, Midland Basin, and Central Basin Platforms which covers most of the counties in the Far West Weather Zone plus five adjacent counties in the West Weather Zone. The geographic and reliability assessment scope of the West Texas 345-kV Infrastructure Rebuild Project are a subset of the Permian Basin Load Interconnection Study. The Permian Basin Load Interconnection Study stated that if the preferred upgrades identified in that study are submitted to Regional Planning Group (RPG) for review, ERCOT may use that study report as part of ERCOT Independent Review. The West Texas 345-kV Infrastructure Rebuild Project includes components of 'Preferred' Project IDs 1, 2, 3 and 25 identified by the Permian Basin Load Interconnection Study. More details of the Permian Basin Load Interconnection Study can be found in Appendix A.

Additionally, ERCOT completed an updated study which confirmed the need for this project and that the Oncor West Texas 345-kV Infrastructure Rebuild Project addresses the need.

Accordingly, based on this independent review, ERCOT recommends the following project as submitted by Oncor:

- Construct a new Ranger Camp 345/138/69-kV substation, approximately 1.0 miles north of the existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 14-breaker 345-kV breaker-and-a-half bus arrangement, and a 16-breaker, 138-kV breaker-and-a-half arrangement with one new 177 MVA (nameplate) 138/69-kV transformer, and a 2-breaker 69-kV single bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, 138-kV at least 765 MVA and 69-kV at least 239 MVA.
  - Disconnect the following 345-kV lines at Morgan Creek and terminate at new Ranger Camp 345-kV:
    - Morgan Creek to Falcon Seaboard adding approximately 1.4 miles of new Right of Way (ROW)
    - Morgan Creek to Tonkawa adding approximately 0.94 miles of new ROW
  - Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 138-kV:
    - Morgan Creek to Eskota
    - Morgan Creek to Barber Lake West
    - Morgan Creek to Barber Lake East
    - Morgan Creek to Sun
    - Morgan Creek to Cosden

[1] https://www.ercot.com/gridinfo/planning

  - Disconnect the following 69-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 69-kV:
    - Morgan Creek to Colorado City
    - Morgan Creek to Big Spring
  - Relocate the existing 177 MVA (nameplate) 138/69-kV transformer from Morgan Creek Switch to new Ranger Camp Switch
- Construct a new breaker-and-a-half rung with two new 345-kV breakers at Tonkawa 345-kV Switch. New breakers will be rated at least 2988 MVA
- Rebuild Morgan Creek (Ranger Camp) to Tonkawa 345-kV transmission line, replace with two new Morgan Creek (Ranger Camp) to Tonkawa 345-kV lines, with conductors rated to at least 2988 MVA, in existing (estimated 21.3 miles) ROW, installed on new, common double-circuit towers
- Construct a new Cattleman 345/138-kV Switch, approximately 2.0 miles southwest of existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 15-breaker 345-kV breaker-and-a-half bus arrangement and a 9-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA and 138-kV at least 765 MVA
- Disconnect the following 345-kV transmission lines at Morgan Creek and terminate at new Cattleman 345-kV:
  - Morgan Creek to Champion Creek/LCRA Bitter Creek double circuit transmission lines adding approximately 1.25 miles of new ROW
  - Morgan Creek to LCRA Gasconades adding approximately 2.13 miles of new ROW
  - Morgan Creek to Consavvy
  - Morgan Creek to Longshore
- Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Cattleman 138-kV:
  - Morgan Creek to McDonald Road using new ROW
- Construct two new Cattleman to Ranger Camp 345-kV transmission lines, with conductors rated to at least 2988 MVA, in a new (estimated 4.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Morgan Creek 138-kV Switch, in existing Morgan Creek 345/138-kV Switchyard from existing 12-breaker double-bus arrangement to a new 10-breaker 138-kV breaker-and-a-half bus arrangement. All 138-kV equipment will be rated at least 765 MVA
- Construct two new Morgan Creek to Morgan Creek CT Yard 138-kV transmission lines, with conductors rated to at least 614 MVA in existing (estimated 0.1 miles) ROW
- Construct two new Morgan Creek to Ranger Camp 138-kV transmission lines, with conductors rated to at least 614 MVA, in existing (estimated 1.2 miles) ROW, installed on new, common double-circuit towers
- Construct two new Morgan Creek to Cattleman 138-kV transmission lines, with conductors rated to at least 614 MVA, adding new (estimated 2.48 miles) ROW, installed on new, common double-circuit towers

- Construct a new Prong Moss 345-kV Switch, approximately 29.4 miles southwest of existing Morgan Creek 345/138-kV Switch, and along the existing Morgan Creek to Midland East 345-kV corridor, and approximately 7.0 miles south of the existing Falcon Seaboard generating station in a 12-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA
  - Tap Prong Moss 345-kV Switch into existing Morgan Creek (Ranger Camp) to Falcon Seaboard 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Tap Prong Moss 345-kV Switch into Falcon Seaboard to Midland East 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Rebuild Morgan Creek (Ranger Camp) to Prong Moss, replace with two new Morgan Creek (Ranger Camp) to Prong Moss 345-kV transmission lines with conductors rated at least 2988 MVA, in existing (estimated 29.4 miles) ROW installed on new, common double-circuit towers
  - Rebuild Prong Moss to Midland East 345-kV line, replace with two new Prong Moss to Midland East 345-kV transmission lines with conductors rated at least 2988 MVA, in existing estimated 41.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Midland County Northwest 345-kV Switch bus work and terminal equipment to be rated at least 2988 MVA, add one new 2-breaker 345-kV breaker-and-a-half rung rated to at least 2988 MVA
- Rebuild Midland East to Midland County Northwest 345-kV transmission line, replace with two new Midland East to Midland County Northwest 345-kV transmission lines, with conductors rated at least 2988 MVA, in 16.3 miles of existing ROW and 1.0 miles of new ROW, installed on new (estimated 17.3 miles) common double-circuit towers
- Rebuild Longshore 345-kV Switch, and upgrade from existing 6-breaker ring-bus configuration to a 11-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA
  - Tap the rebuilt Longshore 345-kV Switch into Morgan Creek (Cattleman) to Consavvy 345-kV transmission line with approximately 0.1 miles of line in existing ROW
- Upgrade all terminal equipment at 2-breaker Midessa South 345-kV Switch to at least 2988 MVA
- Upgrade all terminal equipment at 3-breaker, ring bus, Quail East 345-kV Switch to at least 2988 MVA
- Upgrade terminal equipment on two breaker-and-a-half rungs of Odessa EHV 345-kV Switch to at least 2988 MVA
- Upgrade all terminal equipment on both single breaker terminals and main bus at existing Odessa EHV 345-kV Switch to at least 2988 MVA
- Construct a new Reiter 345/138-kV Switch, approximately 3.0 miles south of the existing Odessa EHV 345/138-kV Switch along the existing Odessa EHV to Moss/Wolf 345-kV double-circuit transmission line, with two new 600 MVA (nameplate) 345/138-kV transformers, in a 12-breaker 345-kV breaker-and-a-half bus arrangement and a 10-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, and 138-kV at least 765 MVA
- Tap new Reiter 345-kV Switch into existing Odessa EHV to Moss & Odessa EHV to Wolf 345-kV double-circuit transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 2987 MVA in new ROW

- Tap new Reiter 138-kV Switch into existing Odessa EHV to Moss 138-kV transmission line with, approximately 0.2 miles, new transmission line segment rated to at least 614 MVA in a new ROW
- Tap new Reiter 138-kV Switch into existing Odessa EHV to Wolf 138-kV transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 614 MVA in new ROW
- Upgrade Tesoro 345-kV Switch by adding two new breaker-and-a-half rungs with two new breakers rated to at least 2988 MVA on each of the two new rungs
- Construct two new Reiter to Tesoro 345-kV transmission lines, with conductors rated to at least 2988 MVA, in new (estimated 4.0 miles) ROW, installed on new, common double-circuit towers
- Rebuild Morgan Creek (Cattleman) to Odessa EHV 345-kV double-circuit transmission lines, with conductors rated to at least 2988 MVA, in existing (estimated 88.7 miles) ROW installed on common double-circuit towers

The recommended project is a Tier 1 project estimated to cost $1.12 Billion. The estimated cost reflects the fact that the vast majority of the work necessary to complete the various project components will need to be performed on energized transmission elements and/or will require construction of temporary by-pass transmission facilities. The project is recommended for construction to meet a summer 2028 ISD. However, Oncor has advised that the projected in-service date may change based on requirements for various approvals, ROW acquisition and construction progress.

Multiple Certificate of Convenience and Necessity (CCN) filings will be required for this transmission project. Oncor will work with ERCOT as early as practical to develop outage plans needed for construction and implement Constraint Management Plans (CMP) based on summer 2028 operational conditions.

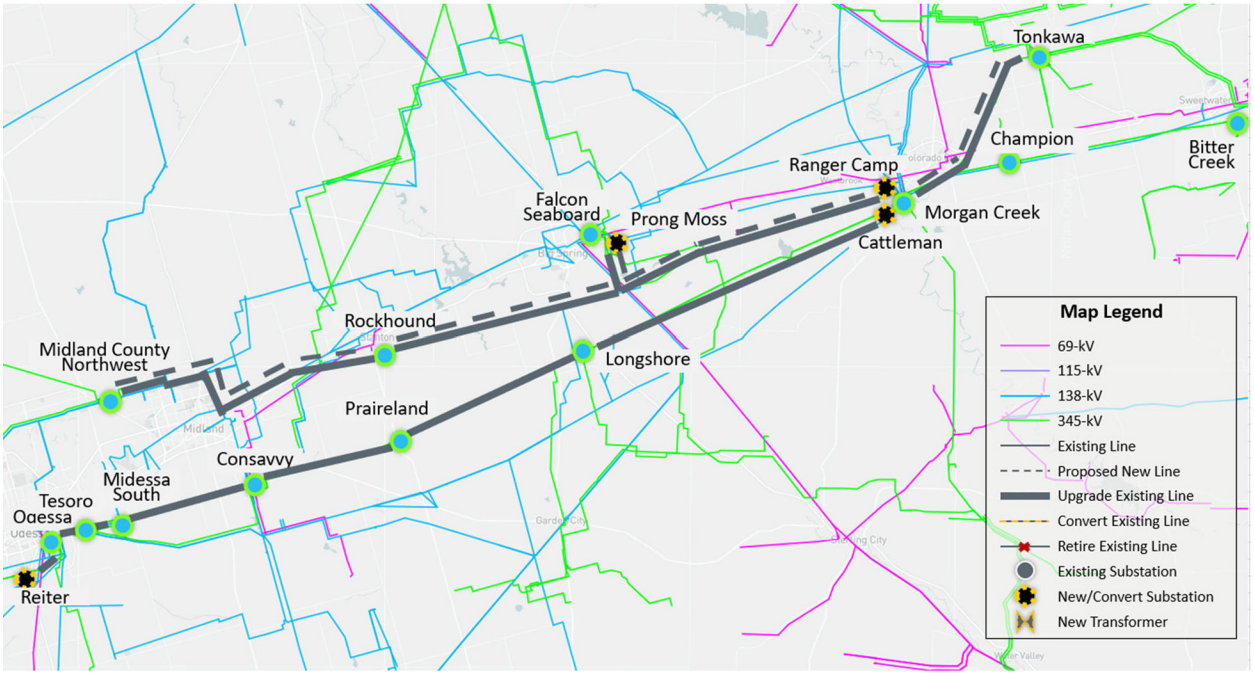


**Figure E.1: Map of Recommended Upgrades**

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# 1 Introduction

As part of the continuing efforts to address challenges in the Permian Basin, ERCOT completed the Permian Basin Load Interconnection Study (PBLI)[2] in December 2021 through extensive review and input by TSPs and stakeholders.

The PBLI 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 study[3]. 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 A, the Permian Basin Load Interconnection Study identified both preferred and placeholder transmission upgrades and stated that "If the preferred upgrades identified in [PBLI] are submitted to Regional Planning Group (RPG) for review, ERCOT may use [PBLI] as part of the ERCOT Independent Review". Some components of PBLI "Preferred upgrades" have already been submitted and approved by ERCOT and the RPG. The Oncor West Texas 345-kV Infrastructure Rebuild Project presents and re-confirms justification for PBLI 'Preferred' Projects IDs 1, 2, 3 and 25.

Oncor submitted the West Texas 345-kV Infrastructure Rebuild Project for RPG review to address load growth, load integration requests and the need to rebuild aging facilities. This submittal is provided in Appendix B.

This RPG project has an estimated cost of $1.12 Billion and is classified as a Tier 1 project pursuant to Protocol Section 3.11.4.3. The estimated cost reflects the fact that the vast majority of the work necessary to complete the various project components associated with this project will need to be performed on energized transmission elements and/or will require construction of temporary by-pass transmission facilities. The project is recommended for construction to meet a summer 2028 in-service date (ISD). However, Oncor has advised that the projected ISD may change based on requirements for various approvals, right-of-way (ROW) acquisition and construction progress.

Multiple Certificate of Convenience and Necessity (CCN) filings will be required for this transmission project. Oncor has committed to work with ERCOT as necessary to develop and implement Constraint Management Plans based on summer 2028 operational conditions.

Since the primary components of the West Texas 345-kV Infrastructure project have already been analyzed and identified as preferred upgrades in the Permian Basin Load Interconnection Study, ERCOT conducted the independent review of this RPG project by updating study results and assumptions to check if any recent system changes would potentially alter or modify the projects recommended in these studies. The following sections describe the details of the updated study assumptions, methodology, and the results of the ERCOT Independent Review.

[2] https://www.ercot.com/gridinfo/planning

[3] ERCOT_Letter_to_Commissioners_-_Follow-up_Status_Update_on_Permian

# 2 Study Assumptions and Methodology

ERCOT reviewed the RPG project submitted by Oncor and confirmed the submitted project aligns with the Permian Basin Load Interconnection 'Preferred' Projects IDs 1, 2, 3 and 25. As such, for this independent review, ERCOT utilized the study results from the 2021 Permian Basin Load Interconnection Study. Furthermore, ERCOT reviewed the 2023 RTP final reliability case to confirm the project need.

## 2.1 Study Assumptions for Reliability Analysis

ERCOT conducted the Permian Basin Load Interconnection Study in 2021 based on criteria contained in NERC reliability standard TPL-001-4, ERCOT Nodal Protocol and Planning Guide. The Permian Basin Load Interconnection also examined a number of transmission upgrade options to address the aggregate reliability needs within the Permian Basin. For this reason, no additional options were identified and examined for this independent review.

The following sections describe the study assumptions of this review using a 2023 RTP final case.

### 2.1.1 Steady-State Study Base Case

A Final 2023 RTP case, published on the Market Information System (MIS) on December 22, 2023, was used as reference case. The 2028 Summer season was selected for the study. The steady-state study base case for the West and Far West Weather Zones was constructed by updating transmission, generation, and loads and using the following 2028 Summer Peak Load Flow case as reference:

- 2023RTP_2028_SUM_WFW_12222023[4]

### 2.1.2 Transmission Topology

Transmission projects listed in Table 2.1, identified in the 2023 RTP as placeholders for West Texas 345-kV Infrastructure Rebuild Project, were removed to develop the study base case.

[4] 2023RTP_Final_Reliability

**Table 2.1 Transmission Projects Removed from Study Base Case**

| RTP Project ID | Project Name | TSP | County |
|---|---|---|---|
| 2021-FW19 | Morgan Creek SES - Longshore Switch 345-kV Line Upgrade | ONCOR | Mitchell, Howard |
| 2022-WFW2 | Midessa South SW - Consavvy - Longshore Switch - Morgan Creek SES 345-kV Line Upgrades | ONCOR | Midland, Howard, Mitchell |
| 2023-WFW2 | Morgan Creek SES - Falcon Seaboard - Midland East 345-kV Line Upgrade | ONCOR | Scurry |
| 2023-W12 | Morgan Creek SES - Tonkawa 345-kV Line Rebuild | ONCOR | Mitchell |

Transmission projects within the study area with ISD by June 2028 were added to the study base case. The ERCOT Transmission Project Information and Tracking (TPIT)[5] report from October 2023 was used as reference. The added TPIT projects are listed in Table 2.2 below.

**Table 2.2 Transmission Projects Added to Study Base Case**

| TPIT Number | Project Name | County | Projected In-service Date | Planning Charter Tier |
|---|---|---|---|---|
| 77146 | Reconductor WNK-AAT-MDT-FSH | Winkler | Nov-23 | Tier 4 |
| 70964 | WETT 345 kV Volta witch | Howard | Jan-24 | Tier 3 |
| 71968 | Midkiff - Pemkiff 138 kV Line | Upton | May-24 | Tier 4 |
| 73434 | Shaw 138 kV POD | Reagan | May-24 | Tier 4 |
| 76212 | Model Coachwhip Sub | Ward | May-24 | Tier 4 |
| 73408 | Odysseus: Build new 345 kV Station | Coke | Oct-24 | Tier 4 |
| 71960 | Upgrade Grady - Expanse 138 kV Line | Martin | Dec-24 | Tier 4 |
| 71989 | Big Spring West - Stanton East 138 kV Line | Martin | Dec-24 | Tier 4 |
| 73043 | Peck – Driver 138-kV Line | Glasscock | Dec-24 | Tier 2 |
| 76686 | Add Hog Mountain 138 kV POD | Glasscock | Dec-24 | Tier 4 |
| 76232 | Reconductor Mivida-Coachwhip-Fishhook 2045 ACCC | Ward | May-26 | Tier 4 |
| 76291 | Upgraded Cedarville–BoneSpringsTap–Fishhook | Ward | May-26 | Tier 4 |
| 76293 | Upgraded Cedvale-MiDiva138KV | Ward | May-26 | Tier 4 |
| 77320 | Add CapBANK in COYANOSA | Ward | Jun-26 | Tier 4 |
| 77803<br>77807 | TNMP Silverleaf and Cowpen 345/138-kV Stations | Reeves, Ward | Jun-27 | Tier 1 |
| 73368 | Grey Well Draw - Buffalo 138 kV Second Circuit | Martin, Midland | Dec-24 | Tier 3 |
| 78374 | Rockhound 345/138-kV Switching Station | Martin, Midland | Dec-24 | Tier 3 |

### 2.1.3 Generation

Based on the December 2023 Generator Interconnection Status (GIS) report posted on the ERCOT website in January 2024[6], generator additions planned to connect to the study area, before June 2028,

[5] https://www.ercot.com/gridinfo/planning
[6] https://www.ercot.com/mp/data-products/data-product-details?id=PG7-200-ER

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 2.3. All the new generation units added to the case were dispatched consistent with the 2023 RTP methodology.

**Table 2.3 Generation Units Added to Study Case**

| GINR Number | Project Name | County | Capacity (MW) | Fuel | Projected Commercial Operation Date |
|---|---|---|---|---|---|
| 23INR0387 | Pioneer DJ Wind | Midland | 140.3 | WIN | 05/03/2024 |
| 23INR0470 | BoCo BESS | Borden | 155.5 | OTH | 06/22/2024 |
| 24INR0273 | Al Pastor BESS | Dawson | 100.8 | OTH | 09/02/2024 |

The status of each unit that was projected to be either indefinitely mothballed or retired at the time of the study were reviewed. The units listed in Table 2.4 were opened (turned off) in the study base case to reflect their mothballed/retired status.

**Table 2.4: List of Generation Opened to Reflect Mothballed/Retired/Forced Outage Status**

| Bus No | Unit Name | Capacity (MW) | Weather Zone |
|---|---|---|---|
| 110941 | SL_SL_G1 | 65.0 | Coast |
| 110942 | SL_SL_G2 | 65.0 | Coast |
| 110943 | SL_SL_G3 | 30.0 | Coast |
| 110944 | SL_SL_G4 | 30.0 | Coast |
| 130121 | SGMTN_SIGNALM2 | 6.6 | Far West |

### 2.1.4 Loads

The load level of the Far West Weather Zone remains the same as in the 2023 RTP case. The loads outside of the study Weather Zone, excluding the West and Far West Weather Zones, were adjusted as necessary for power balance consistent with the 2023 RTP assumptions.

## 2.2 Study Assumptions for Congestion Analysis

### 2.2.1 Base Case

The 2028 economic final case from the 2023 RTP was used to develop a study base case for congestion analysis.

### 2.2.2 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 study area expected to be in-service by 2028 were added to the study base case. The ERCOT TPIT report posted on October 2023, was used as reference. The added TPIT projects are listed in Appendix C.

### 2.2.3 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 January 2024 GIS report) were added to the study base case. The added generators are listed in Appendix C.

### 2.2.4 Loads

Loads were maintained consistent with the 2023 RTP economic model for the year 2028.

## 2.3 Methodology

This section lists the Contingencies and Criteria used for project review along with the tools used to perform each of the various analyses.

### 2.3.1 Contingencies and Criteria

The reliability assessments were performed based on NERC Reliability Standard TPL-001-5.1, ERCOT Protocols, and ERCOT Planning Criteria.

Contingencies were updated based on the changes made to the topology as described in Section 2.1 of this document. The following steady-state contingencies were simulated for the study region:

- P0 (System Intact)
- P1, P2-1, P7 (N-1 conditions);
- P2-2, P2-3, P4, and P5 (Extra High Voltage (EHV) only);
- P3-1: G-1 + N-1 (G-1: Odessa Ector CC Train, Falcon Seaboard CC Train); and
- P6-2: X-1 + N-1 (X-1: 345/138-kV Consavvy 345/138-kV transformer, Einstein 345/138-kV transformers).

All 69-kV and above buses, transmission lines, and transformers in the study region were monitored (excluding generator step-up transformers) and the following thermal and voltage limits were enforced:

- Thermal
  - Rate A (normal rating) for pre-contingency conditions; and
  - Rate B (emergency rating) for post-contingency conditions.
- Voltages
  - Voltages exceeding pre-contingency and post-contingency limits; and
  - Voltage deviations exceeding 8% on non-radial load buses.

### 2.3.2 Study Tool

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

- PowerWorld Simulator version 23 was used for security constrained optimal power flow (SCOPF) and steady state contingency analysis
- UPLAN version 12.3.0.29978 was used to perform the congestion analysis

# 3 Project Need

ERCOT conducted the review of the Permian Basin Load Interconnection Study, and the 2023 RTP summer peak final reliability case based on the study assumptions and methodologies described in Section 2.

## 3.1 Review of the 2023 Regional Transmission Plan (RTP) Case

ERCOT evaluated the 2023 RTP 2028 Summer Peak case based on the study assumptions and methodologies described in Section 2. The study results showed thermal overloads under NERC Category P1, P2-1, P3, P6-2 and P7 contingency conditions that confirmed the reliability need and matched results from the PBLI as well as the Oncor submittal.

West Texas 345-kV Infrastructure Rebuild Project upgrade will address these thermal overloads under the N-1, G-1+N-1, X-1+N-1 contingency conditions that resulted in thermal overloads as shown in Table 3.1.

**Table 3.1 Thermal Overloads in the 2023 RTP Case**

| Contingency Category | Thermal Overloads Base Case | Thermal Overloads West Texas 345-kV Infrastructure Rebuild Project Added |
|---|---|---|
| N-0 (P0) | None | None |
| N-1 (P1, P2-1, P7) | 58 miles of 345-kV lines | None |
| G-1+N-1 (P3) | 197 miles of 345-kV lines | None |
| X-1+N-1 (P6-2) | 57 miles of 345-kV lines | None |

## 3.2 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.

The results of the Permian Basin Load Interconnection Study reconfirmed the need for the West Texas 345-kV Infrastructure Rebuild Project upgrade to maintain grid reliability under N-1, G-1+N-1, X-1+N-1 contingency conditions that match those identified by the ERCOT independent review referenced in Section 3.1 of this report as well as those identified in the Oncor submittal.

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

# 4 Recommended Project

Based on this independent review and the Permian Basin Load Interconnection Study, ERCOT recommends the following project (West Texas 345-kV Infrastructure Rebuild Project):

- Construct a new Ranger Camp 345/138/69-kV substation, approximately 1.0 miles north of the existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 14-breaker 345-kV breaker-and-a-half bus arrangement, and a 16-breaker, 138-kV breaker-and-a-half arrangement with one new 177 MVA (nameplate) 138/69-kV transformer, and a 2-breaker 69-kV single bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, 138-kV at least 765 MVA and 69-kV at least 239 MVA.
  - Disconnect the following 345-kV lines at Morgan Creek and terminate at new Ranger Camp 345-kV:
    - Morgan Creek to Falcon Seaboard adding approximately 1.4 miles of new Right of Way (ROW)
    - Morgan Creek to Tonkawa adding approximately 0.94 miles of new ROW
  - Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 138-kV:
    - Morgan Creek to Eskota
    - Morgan Creek to Barber Lake West
    - Morgan Creek to Barber Lake East
    - Morgan Creek to Sun
    - Morgan Creek to Cosden
  - Disconnect the following 69-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 69-kV:
    - Morgan Creek to Colorado City
    - Morgan Creek to Big Spring
  - Relocate the existing 177 MVA (nameplate) 138/69-kV transformer from Morgan Creek Switch to new Ranger Camp Switch
- Construct a new breaker-and-a-half rung with two new 345-kV breakers at Tonkawa 345-kV Switch. New breakers will be rated at least 2988 MVA
- Rebuild Morgan Creek (Ranger Camp) to Tonkawa 345-kV transmission line, replace with two new Morgan Creek (Ranger Camp) to Tonkawa 345-kV lines, with conductors rated to at least 2988 MVA, in existing (estimated 21.3 miles) ROW, installed on new, common double-circuit towers
- Construct a new Cattleman 345/138-kV Switch, approximately 2.0 miles southwest of existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 15-breaker 345-kV breaker-and-a-half bus arrangement and a 9-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA and 138-kV at least 765 MVA
- Disconnect the following 345-kV transmission lines at Morgan Creek and terminate at new Cattleman 345-kV:

  - Morgan Creek to Champion Creek/LCRA Bitter Creek double circuit transmission lines adding approximately 1.25 miles of new ROW
  - Morgan Creek to LCRA Gasconades adding approximately 2.13 miles of new ROW
  - Morgan Creek to Consavvy
  - Morgan Creek to Longshore
- Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Cattleman 138-kV:
  - Morgan Creek to McDonald Road using new ROW
- Construct two new Cattleman to Ranger Camp 345-kV transmission lines, with conductors rated to at least 2988 MVA, in a new (estimated 4.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Morgan Creek 138-kV Switch, in existing Morgan Creek 345/138-kV Switchyard from existing 12-breaker double-bus arrangement to a new 10-breaker 138-kV breaker-and-a-half bus arrangement. All 138-kV equipment will be rated at least 765 MVA
- Construct two new Morgan Creek to Morgan Creek CT Yard 138-kV transmission lines, with conductors rated to at least 614 MVA in existing (estimated 0.1 miles) ROW
- Construct two new Morgan Creek to Ranger Camp 138-kV transmission lines, with conductors rated to at least 614 MVA, in existing (estimated 1.2 miles) ROW, installed on new, common double-circuit towers
- Construct two new Morgan Creek to Cattleman 138-kV transmission lines, with conductors rated to at least 614 MVA, adding new (estimated 2.48 miles) ROW, installed on new, common double-circuit towers
- Construct a new Prong Moss 345-kV Switch, approximately 29.4 miles southwest of existing Morgan Creek 345/138-kV Switch, and along the existing Morgan Creek to Midland East 345-kV corridor, and approximately 7.0 miles south of the existing Falcon Seaboard generating station in a 12-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA
  - Tap Prong Moss 345-kV Switch into existing Morgan Creek (Ranger Camp) to Falcon Seaboard 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Tap Prong Moss 345-kV Switch into Falcon Seaboard to Midland East 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Rebuild Morgan Creek (Ranger Camp) to Prong Moss, replace with two new Morgan Creek (Ranger Camp) to Prong Moss 345-kV transmission lines with conductors rated at least 2988 MVA, in existing (estimated 29.4 miles) ROW installed on new, common double-circuit towers
  - Rebuild Prong Moss to Midland East 345-kV line, replace with two new Prong Moss to Midland East 345-kV transmission lines with conductors rated at least 2988 MVA, in existing estimated 41.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Midland County Northwest 345-kV Switch bus work and terminal equipment to be rated at least 2988 MVA, add one new 2-breaker 345-kV breaker-and-a-half rung rated to at least 2988 MVA
- Rebuild Midland East to Midland County Northwest 345-kV transmission line, replace with two new Midland East to Midland County Northwest 345-kV transmission lines, with conductors rated at

least 2988 MVA, in 16.3 miles of existing ROW and 1.0 miles of new ROW, installed on new (estimated 17.3 miles) common double-circuit towers

- Rebuild Longshore 345-kV Switch, and upgrade from existing 6-breaker ring-bus configuration to a 11-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA
  - Tap the rebuilt Longshore 345-kV Switch into Morgan Creek (Cattleman) to Consavvy 345-kV transmission line with approximately 0.1 miles of line in existing ROW
- Upgrade all terminal equipment at 2-breaker Midessa South 345-kV Switch to at least 2988 MVA
- Upgrade all terminal equipment at 3-breaker, ring bus, Quail East 345-kV Switch to at least 2988 MVA
- Upgrade terminal equipment on two breaker-and-a-half rungs of Odessa EHV 345-kV Switch to at least 2988 MVA
- Upgrade all terminal equipment on both single breaker terminals and main bus at existing Odessa EHV 345-kV Switch to at least 2988 MVA
- Construct a new Reiter 345/138-kV Switch, approximately 3.0 miles south of the existing Odessa EHV 345/138-kV Switch along the existing Odessa EHV to Moss/Wolf 345-kV double-circuit transmission line, with two new 600 MVA (nameplate) 345/138-kV transformers, in a 12-breaker 345-kV breaker-and-a-half bus arrangement and a 10-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, and 138-kV at least 765 MVA
- Tap new Reiter 345-kV Switch into existing Odessa EHV to Moss & Odessa EHV to Wolf 345-kV double-circuit transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 2987 MVA in new ROW
- Tap new Reiter 138-kV Switch into existing Odessa EHV to Moss 138-kV transmission line with, approximately 0.2 miles, new transmission line segment rated to at least 614 MVA in a new ROW
- Tap new Reiter 138-kV Switch into existing Odessa EHV to Wolf 138-kV transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 614 MVA in new ROW
- Upgrade Tesoro 345-kV Switch by adding two new breaker-and-a-half rungs with two new breakers rated to at least 2988 MVA on each of the two new rungs
- Construct two new Reiter to Tesoro 345-kV transmission lines, with conductors rated to at least 2988 MVA, in new (estimated 4.0 miles) ROW, installed on new, common double-circuit towers
- Rebuild Morgan Creek (Cattleman) to Odessa EHV 345-kV double-circuit transmission lines, with conductors rated to at least 2988 MVA, in existing (estimated 88.7 miles) ROW installed on common double-circuit towers

# 5 Additional Analysis and Assessment

The recommended West Texas 345-kV Infrastructure Rebuild Project is categorized as a Tier 1 project, pursuant to ERCOT Protocol Section 3.11.4.3(1)(a). As required by Planning Guide Section 3.1.3(4), ERCOT performed generation and load sensitivity studies to identify the preferred option performance. Additionally, a Sub-Synchronous Resonance (SSR) Assessment was performed.

## 5.1 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 October 2023 GIS report, the following generators in the study area shown in Table 5.1 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 5.1 Generation Units with Signed IA**

| GINR | Project Name | County | Fuel | Capacity (MW) |
|---|---|---|---|---|
| 21INR0031 | Indigo Solar | Fisher | Solar | 125 |
| 23INR0300 | Greater Bryant G Solar | Midland | Solar | 42 |
| 21INR0268 | Greyhound Solar | Ector | Solar | 609 |
| 22INR0262 | Deville Solar | Callahan | Solar | 425 |
| 16INR0104 | Big Sampson Wind | Crockett | Wind | 400 |
| 23INR0086 | Hanson Solar | Coleman | Solar | 401 |
| 24INR0057 | Hanson Storage | Coleman | Other | 101 |
| 21INR0263 | Monarch Creek Wind | Throckmorton | Wind | 344 |
| 22INR0274 | Crowded Star Solar II | Jones | Solar | 189 |
| 21INR0207 | Quantum Solar | Haskell | Solar | 374 |
| 21INR0021 | Green Holly Solar | Dawson | Solar | 414 |
| 21INR0022 | Red Holly Solar | Dawson | Solar | 260 |
| 21INR0029 | Green Holly Storage | Dawson | Other | 50 |
| 21INR0033 | Red Holly Storage | Dawson | Other | 50 |
| 25INR0400 | Maldives Solar (Alternate POI) | Scurry | Solar | 184 |

These future resources did not have a material impact on the need for the West Texas 345-kV Infrastructure Rebuild Project.

## 5.2 Load Scaling Sensitivity Analysis

Per Planning Guide Section 3.1.3(4)(b), ERCOT evaluated the load scaling sensitivity and concluded that the load scaling assumed in the study case would not have any material impact on the project need because of the following reasons:

- The majority of the need is located in the northern section of the Far West Weather Zone, this region is remote enough from the rest of the ERCOT load as to not be affected by load scaling outside of the West and Far-West Weather Zones.
- The load scaling outside the stud area is not expected to have a material impact on the need for the West Texas 345-kV Infrastructure Rebuild Project.

## 5.3 Sub-synchronous resonance (SSR) Assessment

Pursuant to Protocol Section 3.22.1.3(2), ERCOT conducted an SSR screening assessment for the recommended West Texas 345-kV Infrastructure Rebuild Project and found no adverse SSR impacts to the existing and planned Generation Resources in the study area.

# 6 Congestion Analysis

ERCOT conducted a congestion analysis to identify any potential impact on system congestion related to the addition of the West Texas 345-kV Infrastructure Rebuild Project.

The results of the congestion analysis indicated no additional congestion in the area with the addition of the West Texas 345-kV Infrastructure Rebuild Project.

# 7 Conclusion

This report describes the ERCOT evaluation of the West Texas 345-kV Infrastructure Rebuild Project submitted Oncor. Based on the results of this independent review and the Permian Basin Load Interconnection Study, ERCOT recommends this RPG project to address the reliability need to accommodate the significant and rapid load growth in the area. The West Texas 345-kV Infrastructure Rebuild Project is estimated to cost $1.12 Billion and consists of the following upgrades:

- Construct a new Ranger Camp 345/138/69-kV substation, approximately 1.0 miles north of the existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 14-breaker 345-kV breaker-and-a-half bus arrangement, and a 16-breaker, 138-kV breaker-and-a-half arrangement with one new 177 MVA (nameplate) 138/69-kV transformer, and a 2-breaker 69-kV single bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, 138-kV at least 765 MVA and 69-kV at least 239 MVA.
  - Disconnect the following 345-kV lines at Morgan Creek and terminate at new Ranger Camp 345-kV:
    - Morgan Creek to Falcon Seaboard adding approximately 1.4 miles of new Right of Way (ROW)
    - Morgan Creek to Tonkawa adding approximately 0.94 miles of new ROW
  - Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 138-kV:
    - Morgan Creek to Eskota
    - Morgan Creek to Barber Lake West
    - Morgan Creek to Barber Lake East
    - Morgan Creek to Sun
    - Morgan Creek to Cosden
  - Disconnect the following 69-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 69-kV:
    - Morgan Creek to Colorado City
    - Morgan Creek to Big Spring
  - Relocate the existing 177 MVA (nameplate) 138/69-kV transformer from Morgan Creek Switch to new Ranger Camp Switch
- Construct a new breaker-and-a-half rung with two new 345-kV breakers at Tonkawa 345-kV Switch. New breakers will be rated at least 2988 MVA
- Rebuild Morgan Creek (Ranger Camp) to Tonkawa 345-kV transmission line, replace with two new Morgan Creek (Ranger Camp) to Tonkawa 345-kV lines, with conductors rated to at least 2988 MVA, in existing (estimated 21.3 miles) ROW, installed on new, common double-circuit towers
- Construct a new Cattleman 345/138-kV Switch, approximately 2.0 miles southwest of existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 15-breaker 345-kV breaker-and-a-half bus arrangement and a 9-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA and 138-kV at least 765 MVA

- Disconnect the following 345-kV transmission lines at Morgan Creek and terminate at new Cattleman 345-kV:
  - Morgan Creek to Champion Creek/LCRA Bitter Creek double circuit transmission lines adding approximately 1.25 miles of new ROW
  - Morgan Creek to LCRA Gasconades adding approximately 2.13 miles of new ROW
  - Morgan Creek to Consavvy
  - Morgan Creek to Longshore
- Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Cattleman 138-kV:
  - Morgan Creek to McDonald Road using new ROW
- Construct two new Cattleman to Ranger Camp 345-kV transmission lines, with conductors rated to at least 2988 MVA, in a new (estimated 4.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Morgan Creek 138-kV Switch, in existing Morgan Creek 345/138-kV Switchyard from existing 12-breaker double-bus arrangement to a new 10-breaker 138-kV breaker-and-a-half bus arrangement. All 138-kV equipment will be rated at least 765 MVA
- Construct two new Morgan Creek to Morgan Creek CT Yard 138-kV transmission lines, with conductors rated to at least 614 MVA in existing (estimated 0.1 miles) ROW
- Construct two new Morgan Creek to Ranger Camp 138-kV transmission lines, with conductors rated to at least 614 MVA, in existing (estimated 1.2 miles) ROW, installed on new, common double-circuit towers
- Construct two new Morgan Creek to Cattleman 138-kV transmission lines, with conductors rated to at least 614 MVA, adding new (estimated 2.48 miles) ROW, installed on new, common double-circuit towers
- Construct a new Prong Moss 345-kV Switch, approximately 29.4 miles southwest of existing Morgan Creek 345/138-kV Switch, and along the existing Morgan Creek to Midland East 345-kV corridor, and approximately 7.0 miles south of the existing Falcon Seaboard generating station in a 12-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA
  - Tap Prong Moss 345-kV Switch into existing Morgan Creek (Ranger Camp) to Falcon Seaboard 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Tap Prong Moss 345-kV Switch into Falcon Seaboard to Midland East 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Rebuild Morgan Creek (Ranger Camp) to Prong Moss, replace with two new Morgan Creek (Ranger Camp) to Prong Moss 345-kV transmission lines with conductors rated at least 2988 MVA, in existing (estimated 29.4 miles) ROW installed on new, common double-circuit towers
  - Rebuild Prong Moss to Midland East 345-kV line, replace with two new Prong Moss to Midland East 345-kV transmission lines with conductors rated at least 2988 MVA, in existing estimated 41.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Midland County Northwest 345-kV Switch bus work and terminal equipment to be rated at least 2988 MVA, add one new 2-breaker 345-kV breaker-and-a-half rung rated to at least 2988 MVA

- Rebuild Midland East to Midland County Northwest 345-kV transmission line, replace with two new Midland East to Midland County Northwest 345-kV transmission lines, with conductors rated at least 2988 MVA, in 16.3 miles of existing ROW and 1.0 miles of new ROW, installed on new (estimated 17.3 miles) common double-circuit towers
- Rebuild Longshore 345-kV Switch, and upgrade from existing 6-breaker ring-bus configuration to a 11-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA
  - Tap the rebuilt Longshore 345-kV Switch into Morgan Creek (Cattleman) to Consavvy 345-kV transmission line with approximately 0.1 miles of line in existing ROW
- Upgrade all terminal equipment at 2-breaker Midessa South 345-kV Switch to at least 2988 MVA
- Upgrade all terminal equipment at 3-breaker, ring bus, Quail East 345-kV Switch to at least 2988 MVA
- Upgrade terminal equipment on two breaker-and-a-half rungs of Odessa EHV 345-kV Switch to at least 2988 MVA
- Upgrade all terminal equipment on both single breaker terminals and main bus at existing Odessa EHV 345-kV Switch to at least 2988 MVA
- Construct a new Reiter 345/138-kV Switch, approximately 3.0 miles south of the existing Odessa EHV 345/138-kV Switch along the existing Odessa EHV to Moss/Wolf 345-kV double-circuit transmission line, with two new 600 MVA (nameplate) 345/138-kV transformers, in a 12-breaker 345-kV breaker-and-a-half bus arrangement and a 10-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, and 138-kV at least 765 MVA
- Tap new Reiter 345-kV Switch into existing Odessa EHV to Moss & Odessa EHV to Wolf 345-kV double-circuit transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 2987 MVA in new ROW
- Tap new Reiter 138-kV Switch into existing Odessa EHV to Moss 138-kV transmission line with, approximately 0.2 miles, new transmission line segment rated to at least 614 MVA in a new ROW
- Tap new Reiter 138-kV Switch into existing Odessa EHV to Wolf 138-kV transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 614 MVA in new ROW
- Upgrade Tesoro 345-kV Switch by adding two new breaker-and-a-half rungs with two new breakers rated to at least 2988 MVA on each of the two new rungs
- Construct two new Reiter to Tesoro 345-kV transmission lines, with conductors rated to at least 2988 MVA, in new (estimated 4.0 miles) ROW, installed on new, common double-circuit towers
- Rebuild Morgan Creek (Cattleman) to Odessa EHV 345-kV double-circuit transmission lines, with conductors rated to at least 2988 MVA, in existing (estimated 88.7 miles) ROW installed on common double-circuit towers

This project will require multiple CCN filings and the expected ISD for this project is summer 2028.

# Appendix

| | |
|---|---|
| Appendix A: Permian Basin Load Interconnection Study Report | ERCOT_Permian_Basin_Load_Interconne |
| Appendix B: Oncor West Texas 345-kV Infrastructure Rebuild Project RPG Submittal | Oncor West Texas 345 kV Infrastructur |
| Appendix C: Projects Added to Economics Case | Appenidx_C.pdf |

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**Date:** June 11, 2024
**To:** Board of Directors
**From:** Bob Flexon, Reliability and Markets (R&M) Committee Chair
**Subject:** Oncor West Texas 345-kV Infrastructure Rebuild Regional Planning Group (RPG) Project

## Issue for the ERCOT Board of Directors

**ERCOT Board of Directors Meeting Date:** June 18, 2024
**Item No.:** 12.2

**Issue:**
Whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should accept the recommendation of ERCOT staff to endorse the need for the Tier 1 Oncor West Texas 345-kV Infrastructure Rebuild Regional Planning Group (RPG) Project in order to meet the reliability requirements for the ERCOT System and address thermal overloads and load growth in the in Scurry, Mitchell, Howard, Glasscock, Martin, Midland, and Ector Counties in the West and Far West Weather Zones, which ERCOT staff has independently reviewed and which the Technical Advisory Committee (TAC) has voted unanimously to endorse.

**Background/History:**
Oncor proposed the West Texas 345-kV Infrastructure Rebuild Project in November 2023, a $1.12 billion, Tier 1 project with the expected in-service date of summer 2028, to meet reliability planning criteria. Protocol Section 3.11.4.7, Processing of Tier 1 Projects, requires ERCOT to independently review submitted projects. ERCOT verified the West Texas 345-kV Infrastructure Rebuild Project are components of the Preferred Project IDs 1, 2, 3 and 25 identified in the December 2021 Permian Basin Load Interconnection Study and addresses the need for a project under North American Electric Reliability Corporation (NERC) and ERCOT Planning Criteria to address thermal overloads on 218-miles of 345-kV transmission lines in Scurry, Mitchell, Howard, Glasscock, Martin, Midland, and Ector Counties in the West and Far West Weather Zones with the following ERCOT System improvements:

- Construct a new Ranger Camp 345/138/69-kV substation, approximately 1.0 miles north of the existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 14-breaker 345-kV breaker-and-a-half bus arrangement, and a 16-breaker, 138-kV breaker-and-a-half arrangement with one new 177 MVA (nameplate) 138/69-kV transformer, and a 2-breaker 69-kV single bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, 138-kV at least 765 MVA and 69-kV at least 239 MVA;
  - Disconnect the following 345-kV lines at Morgan Creek and terminate at new Ranger Camp 345-kV:

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    - Morgan Creek to Falcon Seaboard adding approximately 1.4 miles of new Right of Way (ROW)
    - Morgan Creek to Tonkawa adding approximately 0.94 miles of new ROW
  - Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 138-kV:
    - Morgan Creek to Eskota
    - Morgan Creek to Barber Lake West
    - Morgan Creek to Barber Lake East
    - Morgan Creek to Sun
    - Morgan Creek to Cosden
  - Disconnect the following 69-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 69-kV:
    - Morgan Creek to Colorado City
    - Morgan Creek to Big Spring
  - Relocate the existing 177 MVA (nameplate) 138/69-kV transformer from Morgan Creek Switch to new Ranger Camp Switch;
- Construct a new breaker-and-a-half rung with two new 345-kV breakers at Tonkawa 345-kV Switch. New breakers will be rated at least 2988 MVA;
- Rebuild Morgan Creek (Ranger Camp) to Tonkawa 345-kV transmission line, replace with two new Morgan Creek (Ranger Camp) to Tonkawa 345-kV lines, with conductors rated to at least 2988 MVA, in existing (estimated 21.3 miles) ROW, installed on new, common double-circuit towers;
- Construct a new Cattleman 345/138-kV Switch, approximately 2.0 miles southwest of existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 15-breaker 345-kV breaker-and-a-half bus arrangement and a 9-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA and 138-kV at least 765 MVA;
- Disconnect the following 345-kV transmission lines at Morgan Creek and terminate at new Cattleman 345-kV:
  - Morgan Creek to Champion Creek/LCRA Bitter Creek double circuit transmission lines adding approximately 1.25 miles of new ROW
  - Morgan Creek to LCRA Gasconades adding approximately 2.13 miles of new ROW
  - Morgan Creek to Consavvy
  - Morgan Creek to Longshore
- Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Cattleman 138-kV:
  - Morgan Creek to McDonald Road using new ROW
- Construct two new Cattleman to Ranger Camp 345-kV transmission lines, with conductors rated to at least 2988 MVA, in a new (estimated 4.2 miles) ROW, installed on new, common double-circuit towers;
- Rebuild Morgan Creek 138-kV Switch, in existing Morgan Creek 345/138-kV Switchyard from existing 12-breaker double-bus arrangement to a new 10-

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breaker 138-kV breaker-and-a-half bus arrangement. All 138-kV equipment will be rated at least 765 MVA;

- Construct two new Morgan Creek to Morgan Creek CT Yard 138-kV transmission lines, with conductors rated to at least 614 MVA in existing (estimated 0.1 miles) ROW;
- Construct two new Morgan Creek to Ranger Camp 138-kV transmission lines, with conductors rated to at least 614 MVA, in existing (estimated 1.2 miles) ROW, installed on new, common double-circuit towers;
- Construct two new Morgan Creek to Cattleman 138-kV transmission lines, with conductors rated to at least 614 MVA, adding new (estimated 2.48 miles) ROW, installed on new, common double-circuit towers;
- Construct a new Prong Moss 345-kV Switch, approximately 29.4 miles southwest of existing Morgan Creek 345/138-kV Switch, and along the existing Morgan Creek to Midland East 345-kV corridor, and approximately 7.0 miles south of the existing Falcon Seaboard generating station in a 12-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA;
  - Tap Prong Moss 345-kV Switch into existing Morgan Creek (Ranger Camp) to Falcon Seaboard 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Tap Prong Moss 345-kV Switch into Falcon Seaboard to Midland East 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Rebuild Morgan Creek (Ranger Camp) to Prong Moss, replace with two new Morgan Creek (Ranger Camp) to Prong Moss 345-kV transmission lines with conductors rated at least 2988 MVA, in existing (estimated 29.4 miles) ROW installed on new, common double-circuit towers
  - Rebuild Prong Moss to Midland East 345-kV line, replace with two new Prong Moss to Midland East 345-kV transmission lines with conductors rated at least 2988 MVA, in existing estimated 41.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Midland County Northwest 345-kV Switch bus work and terminal equipment to be rated at least 2988 MVA, add one new 2-breaker 345-kV breaker-and-a-half rung rated to at least 2988 MVA;
- Rebuild Midland East to Midland County Northwest 345-kV transmission line, replace with two new Midland East to Midland County Northwest 345-kV transmission lines, with conductors rated at least 2988 MVA, in 16.3 miles of existing ROW and 1.0 miles of new ROW, installed on new (estimated 17.3 miles) common double-circuit towers;
- Rebuild Longshore 345-kV Switch, and upgrade from existing 6-breaker ring-bus configuration to a 11-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA;

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- Tap the rebuilt Longshore 345-kV Switch into Morgan Creek (Cattleman) to Consavvy 345-kV transmission line with approximately 0.1 miles of line in existing ROW
- Upgrade all terminal equipment at 2-breaker Midessa South 345-kV Switch to at least 2988 MVA;
- Upgrade all terminal equipment at 3-breaker, ring bus, Quail East 345-kV Switch to at least 2988 MVA;
- Upgrade terminal equipment on two breaker-and-a-half rungs of Odessa EHV 345-kV Switch to at least 2988 MVA;
- Upgrade all terminal equipment on both single breaker terminals and main bus at existing Odessa EHV 345-kV Switch to at least 2988 MVA;
- Construct a new Reiter 345/138-kV Switch, approximately 3.0 miles south of the existing Odessa EHV 345/138-kV Switch along the existing Odessa EHV to Moss/Wolf 345-kV double-circuit transmission line, with two new 600 MVA (nameplate) 345/138-kV transformers, in a 12-breaker 345-kV breaker-and-a-half bus arrangement and a 10-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, and 138-kV at least 765 MVA;
- Tap new Reiter 345-kV Switch into existing Odessa EHV to Moss & Odessa EHV to Wolf 345-kV double-circuit transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 2987 MVA in new ROW;
- Tap new Reiter 138-kV Switch into existing Odessa EHV to Moss 138-kV transmission line with, approximately 0.2 miles, new transmission line segment rated to at least 614 MVA in a new ROW;
- Tap new Reiter 138-kV Switch into existing Odessa EHV to Wolf 138-kV transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 614 MVA in new ROW;
- Upgrade Tesoro 345-kV Switch by adding two new breaker-and-a-half rungs with two new breakers rated to at least 2988 MVA on each of the two new rungs
- Construct two new Reiter to Tesoro 345-kV transmission lines, with conductors rated to at least 2988 MVA, in new (estimated 4.0 miles) ROW, installed on new, common double-circuit towers; and
- Rebuild Morgan Creek (Cattleman) to Odessa EHV 345-kV double-circuit transmission lines, with conductors rated to at least 2988 MVA, in existing (estimated 88.7 miles) ROW installed on common double-circuit towers.

For construction to meet the summer 2028 in-service date, the West Texas 345-kV Infrastructure Rebuild Project requires Public Utility Commission of Texas (PUCT, Commission) approval of a Certificate of Convenience and Necessity. Oncor will work with ERCOT as early as practical to develop outage plans needed for construction and implement Constraint Management Plans (CMP) based on summer 2028 operational conditions.

ERCOT verified the West Texas 345-kV Infrastructure Rebuild Project are components of the Preferred Project IDs 1, 2, 3 and 25 identified in the December 2021 Permian Basin Load Interconnection Study and addresses the need in Scurry, Mitchell, Howard, Glasscock, Martin, Midland, and Ector Counties in the West and Far West Weather Zones. ERCOT's independent review verified the reliability need for the West Texas 345-kV Infrastructure Rebuild Project to satisfy ERCOT Planning Guide Section 4.1.1.2(1)(a), 4.1.1.2(1)(c) and 4.1.1.2(1)(d), Reliability Performance Criteria. Contingencies are the loss of a common tower, loss of a single generating unit followed by a single transmission element or common tower outage and loss of a single 345/138-kV transformer followed by a single transmission element or common tower outage, respectively.

RPG considered project overviews during meetings in January 2024 and May 2024. Between January 2024 and May 2024, ERCOT staff presented scope and status updates at RPG meetings in January, February, March, April, and May. Pursuant to paragraph (2) of Protocol Section 3.11.4.9, Regional Planning Group Acceptance and ERCOT Endorsement, ERCOT presented the Tier 1 project to TAC for review and comment, and on May 22, 2024, TAC unanimously endorsed the project as recommended by ERCOT. Pursuant to paragraph (1)(a) of Protocol Section 3.11.4.3, Categorization of Proposed Transmission Projects, projects with an estimated capital cost of $100 million or greater are Tier 1 projects, for which Protocol Section 3.11.4.7(2) requires endorsement by the Board. Pursuant to Section 3.11.4.9, ERCOT's endorsement of a Tier 1 project is obtained upon affirmative vote of the Board. Section IV(B)(2)(a) of the R&M Committee Charter requires the R&M Committee to review and make a recommendation to the Board regarding any Tier 1 project.

ERCOT's assessment of the Sub-Synchronous Resonance (SSR) of existing facilities in the Scurry, Mitchell, Howard, Glasscock, Martin, Midland, and Ector Counties in the West and Far West Weather Zones, conducted pursuant to Protocol Section 3.22.1.3, Transmission Project Assessment, yielded no adverse SSR impacts to the existing and planned generation resources at the time of the study. Results of the congestion analysis ERCOT conducted pursuant to Planning Guide Section 3.1.3, Project Evaluation, indicate no additional congestion in the area with the addition of the West Texas 345-kV Infrastructure Rebuild Project.

The project completion date may change depending on material acquisition, outage coordination, and construction. The estimated cost reflects the fact that the vast majority of the work necessary to complete the various project components will need to be performed on energized transmission elements and/or will require construction of temporary by-pass transmission facilities. Transmission Service Provider (TSP) cooperation with ERCOT could be necessary to develop and implement CMPs based on summer 2028 operational conditions.

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| The report describing the ERCOT Independent Review of the Oncor West Texas 345-kV Infrastructure Rebuild Project, including ERCOT staff's recommendation, is attached as ***Attachment A***. |
| **Key Factors Influencing Issue:**<br>1. ERCOT System improvements are needed to meet reliability planning criteria for the Scurry, Mitchell, Howard, Glasscock, Martin, Midland, and Ector Counties in the West and Far West Weather Zones.<br>2. ERCOT verified the Oncor West Texas 345-kV Infrastructure Rebuild Project are components of the Preferred Project IDs 1, 2, 3 and 25 identified in the December 2021 Permian Basin Load Interconnection Study and addresses the thermal overloads.<br>3. Protocol Section 3.11.4.7 requires Board endorsement of a Tier 1 project, which is a project with an estimated capital cost of $100 million or greater pursuant to Protocol Section 3.11.4.3(1)(a).<br>4. TAC voted unanimously to endorse the Tier 1 Oncor West Texas 345-kV Infrastructure Rebuild Regional Planning Group (RPG) Project, as recommended by ERCOT, on May 22, 2024. |
| **Conclusion/Recommendation:**<br>ERCOT staff recommends, and the R&M Committee is expected to recommend, that the Board endorse the need for the Tier 1 Oncor West Texas 345-kV Infrastructure Rebuild RPG Project, which ERCOT staff has independently reviewed and which TAC has voted unanimously to endorse based on NERC and ERCOT reliability planning criteria. |

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

WHEREAS, pursuant to Section 3.11.4.3(1)(a) of the Electric Reliability Council of Texas, Inc. (ERCOT) Protocols, projects with an estimated capital cost of $100 million or greater are Tier 1 projects, for which Section 3.11.4.7 requires endorsement by the ERCOT Board of Directors (Board); and

WHEREAS, after due consideration of the alternatives, the Board deems it desirable and in the best interest of ERCOT to accept ERCOT staff's and the and Reliability and Markets (R&M) Committee's recommendations to endorse the need for the Tier 1 Oncor West Texas 345-kV Infrastructure Rebuild Regional Planning Group Project, which ERCOT staff has independently reviewed and which the Technical Advisory Committee (TAC) has voted to endorse, based on North American Electric Reliability Corporation (NERC) and ERCOT reliability planning criteria;

THEREFORE, BE IT RESOLVED, that the Board hereby endorses the need for the Tier 1 Oncor West Texas 345-kV Infrastructure Rebuild Regional Planning Group Project, which ERCOT staff has independently reviewed and which TAC has voted to endorse, based on NERC and ERCOT reliability planning criteria, as recommended by ERCOT staff and the R&M Committee.

## CORPORATE SECRETARY'S CERTIFICATE

I, Jonathan M. Levine, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its June 18, 2024 meeting, the Board passed a motion approving the above Resolution by unanimous voice vote with no abstentions.

IN WITNESS WHEREOF, I have hereunto set my hand this 2nd day of July, 2024.

Jonathan M. Levine
Assistant Corporate Secretary

# ERCOT Independent Review of the Oncor West Texas 345-kV Infrastructure Rebuild Project

# Document Revisions

| Date | Version | Description | Author(s) |
|---|---|---|---|
| May 16, 2024 | 1.0 | Final | Ben Richardson |
| | | Reviewed by | Robert Golen, Prabhu Gnanam |

# Executive Summary

Oncor submitted the West Texas 345-kV Infrastructure Rebuild Project to the Regional Planning Group (RPG) on November 3, 2023. Oncor proposed this project to address load growth, load integration requests, the need to rebuild aging facilities and NERC TPL-001-5 reliability criteria violations. The expected in-service date (ISD) of this project is Summer 2028. This project is located in the West and Far West Weather Zones in Scurry, Mitchell, Howard, Glasscock, Martin, Midland, and Ector Counties.

ERCOT completed the Permian Basin Load Interconnection Study (PBLI)[1] in December 2021 to identify transmission upgrades, especially long lead time transmission upgrades, necessary to reliably serve the existing and projected oil and gas loads in the Permian Basin area. The Permian Basin area includes the Delaware Basin, Midland Basin, and Central Basin Platforms which covers most of the counties in the Far West Weather Zone plus five adjacent counties in the West Weather Zone. The geographic and reliability assessment scope of the West Texas 345-kV Infrastructure Rebuild Project are a subset of the Permian Basin Load Interconnection Study. The Permian Basin Load Interconnection Study stated that if the preferred upgrades identified in that study are submitted to Regional Planning Group (RPG) for review, ERCOT may use that study report as part of ERCOT Independent Review. The West Texas 345-kV Infrastructure Rebuild Project includes components of 'Preferred' Project IDs 1, 2, 3 and 25 identified by the Permian Basin Load Interconnection Study. More details of the Permian Basin Load Interconnection Study can be found in Appendix A.

Additionally, ERCOT completed an updated study which confirmed the need for this project and that the Oncor West Texas 345-kV Infrastructure Rebuild Project addresses the need.

Accordingly, based on this independent review, ERCOT recommends the following project as submitted by Oncor:

- Construct a new Ranger Camp 345/138/69-kV substation, approximately 1.0 miles north of the existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 14-breaker 345-kV breaker-and-a-half bus arrangement, and a 16-breaker, 138-kV breaker-and-a-half arrangement with one new 177 MVA (nameplate) 138/69-kV transformer, and a 2-breaker 69-kV single bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, 138-kV at least 765 MVA and 69-kV at least 239 MVA.
  - Disconnect the following 345-kV lines at Morgan Creek and terminate at new Ranger Camp 345-kV:
    - Morgan Creek to Falcon Seaboard adding approximately 1.4 miles of new Right of Way (ROW)
    - Morgan Creek to Tonkawa adding approximately 0.94 miles of new ROW
  - Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 138-kV:
    - Morgan Creek to Eskota
    - Morgan Creek to Barber Lake West
    - Morgan Creek to Barber Lake East
    - Morgan Creek to Sun
    - Morgan Creek to Cosden

[1] https://www.ercot.com/gridinfo/planning

- Disconnect the following 69-kV transmission lines at Morgan Creek and terminate at new Ranger Camp 69-kV:
  - Morgan Creek to Colorado City
  - Morgan Creek to Big Spring
- Relocate the existing 177 MVA (nameplate) 138/69-kV transformer from Morgan Creek Switch to new Ranger Camp Switch

- Construct a new breaker-and-a-half rung with two new 345-kV breakers at Tonkawa 345-kV Switch. New breakers will be rated at least 2988 MVA
- Rebuild Morgan Creek (Ranger Camp) to Tonkawa 345-kV transmission line, replace with two new Morgan Creek (Ranger Camp) to Tonkawa 345-kV lines, with conductors rated to at least 2988 MVA, in existing (estimated 21.3 miles) ROW, installed on new, common double-circuit towers
- Construct a new Cattleman 345/138-kV Switch, approximately 2.0 miles southwest of existing Morgan Creek 345/138-kV Switch, with two new 600 MVA (nameplate) 345/138-kV transformers, a 15-breaker 345-kV breaker-and-a-half bus arrangement and a 9-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA and 138-kV at least 765 MVA
- Disconnect the following 345-kV transmission lines at Morgan Creek and terminate at new Cattleman 345-kV:
  - Morgan Creek to Champion Creek/LCRA Bitter Creek double circuit transmission lines adding approximately 1.25 miles of new ROW
  - Morgan Creek to LCRA Gasconades adding approximately 2.13 miles of new ROW
  - Morgan Creek to Consavvy
  - Morgan Creek to Longshore
- Disconnect the following 138-kV transmission lines at Morgan Creek and terminate at new Cattleman 138-kV:
  - Morgan Creek to McDonald Road using new ROW
- Construct two new Cattleman to Ranger Camp 345-kV transmission lines, with conductors rated to at least 2988 MVA, in a new (estimated 4.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Morgan Creek 138-kV Switch, in existing Morgan Creek 345/138-kV Switchyard from existing 12-breaker double-bus arrangement to a new 10-breaker 138-kV breaker-and-a-half bus arrangement. All 138-kV equipment will be rated at least 765 MVA
- Construct two new Morgan Creek to Morgan Creek CT Yard 138-kV transmission lines, with conductors rated to at least 614 MVA in existing (estimated 0.1 miles) ROW
- Construct two new Morgan Creek to Ranger Camp 138-kV transmission lines, with conductors rated to at least 614 MVA, in existing (estimated 1.2 miles) ROW, installed on new, common double-circuit towers
- Construct two new Morgan Creek to Cattleman 138-kV transmission lines, with conductors rated to at least 614 MVA, adding new (estimated 2.48 miles) ROW, installed on new, common double-circuit towers

- Construct a new Prong Moss 345-kV Switch, approximately 29.4 miles southwest of existing Morgan Creek 345/138-kV Switch, and along the existing Morgan Creek to Midland East 345-kV corridor, and approximately 7.0 miles south of the existing Falcon Seaboard generating station in a 12-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA
  - Tap Prong Moss 345-kV Switch into existing Morgan Creek (Ranger Camp) to Falcon Seaboard 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Tap Prong Moss 345-kV Switch into Falcon Seaboard to Midland East 345-kV transmission line with, approximately 0.1 miles, new transmission line segment in new ROW
  - Rebuild Morgan Creek (Ranger Camp) to Prong Moss, replace with two new Morgan Creek (Ranger Camp) to Prong Moss 345-kV transmission lines with conductors rated at least 2988 MVA, in existing (estimated 29.4 miles) ROW installed on new, common double-circuit towers
  - Rebuild Prong Moss to Midland East 345-kV line, replace with two new Prong Moss to Midland East 345-kV transmission lines with conductors rated at least 2988 MVA, in existing estimated 41.2 miles) ROW, installed on new, common double-circuit towers
- Rebuild Midland County Northwest 345-kV Switch bus work and terminal equipment to be rated at least 2988 MVA, add one new 2-breaker 345-kV breaker-and-a-half rung rated to at least 2988 MVA
- Rebuild Midland East to Midland County Northwest 345-kV transmission line, replace with two new Midland East to Midland County Northwest 345-kV transmission lines, with conductors rated at least 2988 MVA, in 16.3 miles of existing ROW and 1.0 miles of new ROW, installed on new (estimated 17.3 miles) common double-circuit towers
- Rebuild Longshore 345-kV Switch, and upgrade from existing 6-breaker ring-bus configuration to a 11-breaker 345-kV breaker-and-a-half bus arrangement. All equipment will be rated at least 2988 MVA
  - Tap the rebuilt Longshore 345-kV Switch into Morgan Creek (Cattleman) to Consavvy 345-kV transmission line with approximately 0.1 miles of line in existing ROW
- Upgrade all terminal equipment at 2-breaker Midessa South 345-kV Switch to at least 2988 MVA
- Upgrade all terminal equipment at 3-breaker, ring bus, Quail East 345-kV Switch to at least 2988 MVA
- Upgrade terminal equipment on two breaker-and-a-half rungs of Odessa EHV 345-kV Switch to at least 2988 MVA
- Upgrade all terminal equipment on both single breaker terminals and main bus at existing Odessa EHV 345-kV Switch to at least 2988 MVA
- Construct a new Reiter 345/138-kV Switch, approximately 3.0 miles south of the existing Odessa EHV 345/138-kV Switch along the existing Odessa EHV to Moss/Wolf 345-kV double-circuit transmission line, with two new 600 MVA (nameplate) 345/138-kV transformers, in a 12-breaker 345-kV breaker-and-a-half bus arrangement and a 10-breaker 138-kV breaker-and-a-half bus arrangement. All 345-kV equipment will be rated at least 2988 MVA, and 138-kV at least 765 MVA
- Tap new Reiter 345-kV Switch into existing Odessa EHV to Moss & Odessa EHV to Wolf 345-kV double-circuit transmission line with, approximately 0.1 miles, new transmission line segment rated to at least 2987 MVA in new ROW