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PUC DOCKET NO. 53758

APPLICATION OF GRID UNITED TEXAS LLC FOR PARTIAL CERTIFICATE OF CONVENIENCE AND NECESSITY RIGHTS PURSUANT TO PURA §§ 37.051(C-1) AND 37.056(B)(2) TO INTERCONNECT AN HVDC FACILITY TO THE ERCOT TRANSMISSION GRID

BEFORE THE
PUBLIC UTILITY COMMISSION
OF TEXAS

JULY 5, 2022

PUC DOCKET NO. 53758

APPLICATION OF GRID UNITED TEXAS LLC FOR PARTIAL CERTIFICATE OF CONVENIENCE AND NECESSITY RIGHTS PURSUANT TO PURA §§ 37.051(C-1) AND 37.056(B)(2) TO INTERCONNECT AN HVDC FACILITY TO THE ERCOT TRANSMISSION GRID	**§**	**BEFORE THE PUBLIC UTILITY COMMISSION OF TEXAS**

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I. INTRODUCTION

COMES NOW, Grid United Texas LLC (Grid United Texas), and files this Application for Partial Certificate of Convenience and Necessity Rights Pursuant to Public Utility Regulatory Act[1] (PURA) §§ 37.051(c-1) and 37.056(b)(2) to interconnect an HVDC Facility to the ERCOT Transmission Grid (Application). By this Application, Grid United Texas seeks a finding by the Public Utility Commission of Texas (Commission) that the public convenience and necessity require, or will require, the interconnection of high voltage direct current (HVDC) converter facilities to LCRA Transmission Services Corporation's (LCRA TSC) Bakersfield Switching Station with an appropriate end-point station in El Paso Electric Company's (EPE) system that will allow the import of power into, and the export of power out of, the Electric Reliability Council of Texas (ERCOT) transmission grid by Grid United Texas. Further, Grid United Texas seeks a finding that the proposed interconnection is in the public interest. The Commission's findings will be limited to the interconnection and will not grant rights to Grid United Texas to construct and operate the interconnection at this time.

II. APPLICANT

Grid United Texas was created as an electric corporation in 2021. Grid United Texas is wholly owned by Grid United LLC (Grid United) with a mission to unite the U.S. electric grid by building new long-distance, interregional transmission lines to ensure that Americans have access

[1] TEX. UTIL. CODE §§ 11.001–66.017 (PURA).

to low-cost power when and where it is needed. Grid United Texas is headquartered in Houston, Texas. All of the employees working on behalf of Grid United Texas are employed by Grid United. Grid United Texas was formed as a wholly owned subsidiary of Grid United in order to develop and operate HVDC facilities in Texas.

III. APPLICANT'S AUTHORIZED REPRESENTATIVE

Grid United Texas' authorized representatives are:

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Craig Bennett
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100 Congress Avenue, Suite 1100
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cbennett@jw.com
aadams@jw.com

Kristen Golden
1717 West Loop South, Suite 1800
Houston, Texas 77027
(832) 878-6879
Email: Kristen.Golden@gridunited.com

Grid United Texas requests that all pleadings and other documents filed in this proceeding be served on the above-listed counsel at the contact information provided above.

IV. PROJECT OVERVIEW

The Pecos West Intertie Project (Proposed Project) is a proposed 1,500 MW HVDC interconnection between ERCOT and the Western Electricity Coordinating Council (WECC). The Proposed Project is proposed with an HVDC converter station at the LCRA TSC Bakersfield Switching Station in Pecos County, Texas, and an HVDC converter station at an EPE Station in El Paso County, Texas. Grid United Texas has evaluated interconnection at EPE's Caliente Station and Newman Station, but the EPE interconnection will be determined following further consultation with EPE and the U.S. Army regarding a potential crossing of Fort Bliss (for the Newman Station interconnection). An approximately 250 to 300 mile ±525 kilovolt (kV) overhead

HVDC tie line (Tie Line) will connect the HVDC converter stations at each end of the Proposed Project. The Proposed Project's HVDC technology allows ERCOT to maintain electrical isolation from the WECC system.

V. RELIEF REQUESTED

Under PURA § 37.051(c-1), a person seeking to interconnect a facility to the ERCOT transmission grid that enables additional power to be imported into or exported out of the ERCOT power grid must apply to the Commission for a certificate of convenience and necessity for such interconnection not later than the 180th day before the date the person seeks any order from the Federal Energy Regulatory Commission (FERC) related to the interconnection. Because the Proposed Project needs FERC approval to ensure the independence of the ERCOT grid is not compromised by the interconnection, Grid United Texas is first required to come to the Commission before seeking an interconnection order from the FERC.

However, determining routing, conducting an environmental assessment, and preparing all of the other necessary materials for a standard certificate of convenience and necessity (CCN) application is a costly and time-intensive process, all of which would be unnecessary if the Commission determines that the Proposed Project is not in the public interest or the FERC ultimately declines to issue the requested interconnection order. Therefore, what Grid United Texas seeks in this Application is partial authorization from the Commission regarding the propriety and necessity of the interconnection itself, thus allowing Grid United Texas to subsequently seek the necessary approvals from the FERC. Then, once the Commission has determined the public interest and necessity of the Proposed Project, and the FERC has issued an appropriate interconnection order, Grid United Texas can prepare the studies and notices for a more traditional routing CCN application for presentation to the Commission prior to the construction and operation of the Proposed Project—if such is determined appropriate at that time. This is efficient and allows the Commission to consider input into this critical project at an early stage, which can shape its development in a way that best serves the state's needs and policy goals.

VI. JURISDICTION

The Commission has jurisdiction over this matter pursuant to PURA § 37.051(c-1), which requires a person seeking to interconnect a facility to the ERCOT transmission grid that enables additional power to be imported into or exported out of the ERCOT power grid to apply to the

Commission for a certificate of convenience and necessity for such interconnection not later than the 180th day before the date the person seeks any order from the FERC related to the interconnection. PURA § 11.003(14) defines "person" to include "an individual, a partnership of two or more persons having a joint or common interest, a mutual or cooperative association, and a corporation, but does not include an electric cooperative." Grid United Texas is a corporation and, thus, is a person within the meaning of PURA §§ 11.003(14) and 37.051(c-1).

The Commission also has jurisdiction under PURA § 37.056(b)(2), which provides that the Commission may grant a CCN application "for the construction of a portion of the requested system, facility, or extension or the partial exercise of the requested right or privilege."

VII. PROPOSED NOTICE

Because Grid United Texas seeks only partial authorization at this time and has not prepared a full CCN application with proposed routing or environmental studies for the Tie Line facilities, it proposes that notice may be properly provided pursuant to PUC Procedural Rules 22.52 and 22.55. While the requirements of PUC Procedural Rule 22.52 inform the notice provided in this case, many of the requirements contained therein are not reasonably applicable to this proceeding. And, given the unique nature of this proceeding, Grid United Texas does not see the Application as fitting squarely within PUC Procedural Rule 22.52. Therefore, Grid United Texas believes that PUC Procedural Rule 22.55 should reasonably govern the processing of the Application, but with consideration of the requirements of PUC Procedural Rule 22.52. In light of this determination, Grid United Texas proposes the following notice:

- Mailed written direct notice to the county government of El Paso County and Pecos County, the two counties containing the existing station facilities proposed to be interconnected by the HVDC tie that is the basis of the Application;

- Mailed written direct notice to the City of El Paso, the only municipality located within five miles of one or more of the station facilities proposed to be interconnected by the HVDC tie proposed by the Application;

- Mailed written direct notice to EPE, LCRA TSC, Oncor Electric Delivery Company, AEP Texas, Electric Transmission Texas, Texas-New Mexico Power Company, the City of Garland, and Wind Energy Transmission Texas, which own and operate transmission facilities within five miles of one or more of the proposed points of interconnection for the Proposed Project;

- Mailed complete copy of the Application to the Office of Public Utility Counsel;
- Mailed written direct notice to ERCOT;
- An ERCOT Market Notice provided to ERCOT's NOTICE_GENERAL mailing list; and,
- Publication by the Commission of notice of this filing in the *Texas Register*.

The notice described above is designed to ensure that all potentially affected persons who would have an interest in the relief sought by this application will receive notice of it.

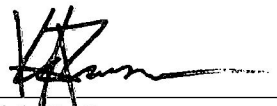
VIII. PROTECTIVE ORDER

Grid United Texas requests the adoption of the Commission's standard protective order, which is attached as Attachment 12 to the Application, to facilitate discovery and testimony of the parties to the proceeding.

IX. CONCLUSION

In conclusion, Grid United Texas requests that the Commission find that the public convenience and necessity require, or will require, the interconnection of HVDC converter facilities to LCRA TSC's Bakersfield Switching Station with an appropriate end-point station in EPE's system that will allow the import of power into, and the export of power out of, the ERCOT transmission grid by Grid United Texas. Further, Grid United Texas requests that the Commission find that the proposed interconnection is in the public interest.

Respectfully submitted,



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ATTORNEYS FOR GRID UNITED TEXAS LLC

APPLICATION OF GRID UNITED TEXAS LLC FOR PARTIAL CERTIFICATE OF CONVENIENCE AND NECESSITY RIGHTS PURSUANT TO PURA §§ 37.051(C-1) AND 37.056(B)(2) TO INTERCONNECT AN HVDC FACILITY TO THE ERCOT TRANSMISSION GRID

DOCKET NO. 53758

Submit seven (7) copies of the application and all attachments supporting the application. If the application is being filed pursuant to 16 Tex. Admin. Code § 25.101(b)(3)(D) (TAC) or 16 TAC § 25.174, include in the application all direct testimony. The application and other necessary documents shall be submitted to:

Public Utility Commission of Texas
Attn: Filing Clerk
1701 N. Congress Ave.
Austin, Texas 78711-3326

Note: As used herein, the term "joint application" refers to an application for proposed transmission facilities for which ownership will be divided. All applications for such facilities should be filed jointly by the proposed owners of the facilities.

1. **Applicant (Utility) Name:** Grid United Texas LLC (Grid United Texas)

Certificate Number:	Not applicable.
Street Address:	1717 West Loop South, Suite 1800 Houston, Texas 77027
Mailing Address:	1717 West Loop South, Suite 1800 Houston, Texas 77027

2. **Please identify all entities that will hold an ownership interest or an investment interest in the proposed project but which are not subject to the Commission's jurisdiction.**

Grid United Texas, which is wholly owned by Grid United LLC (Grid United), will hold the majority ownership interest in the project that is the subject of this Application. No entities will hold an ownership or investment interest in the project that are not subject to the jurisdiction of the Public Utility Commission of Texas (PUC or Commission).

3.

Person to Contact:	Ben Semmes
Title/Position:	Project Development Director
Phone Number:	346-206-1674
Mailing Address:	1717 West Loop South, Suite 1800 Houston, Texas 77027
Email Address:	Ben.Semmes@gridunited.com
Alternate Contact:	Kris Zadlo
Title/Position:	Chief Development Officer
Phone Number:	312-848-5308
Mailing Address:	1717 West Loop South, Suite 1800 Houston, Texas 77027
Email Address:	Kris.Zadlo@gridunited.com

Legal Counsel:	Kirk Rasmussen
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Mailing Address:	1717 West Loop South, Suite 1800 Houston, Texas 77027
Email Address:	Kristen.Golden@gridunited.com

4. Project Description:
Name or Designation of Project

The Pecos West Intertie Project (Proposed Project) is proposed as an initial 1,500 MW high voltage direct current (HVDC) interconnection between the Western Electricity Coordinating Council (WECC) and the Electric Reliability Council of Texas (ERCOT). The Proposed Project is currently anticipated to connect at the LCRA Transmission Services Corporation (LCRA TSC) Bakersfield Station in Pecos County, Texas, and at an appropriate El Paso Electric Company (EPE) station in El Paso County, Texas. Currently, Grid United Texas has evaluated EPE's Caliente and Newman stations.

Provide a general description of the project, including the design voltage rating (kV), the operating voltage (kV), the CREZ Zone(s) (if any) where the project is located (all or in part), any substations and/or substation reactive compensation constructed as part of the project, and any series elements such as sectionalizing switching devices, series line compensation, etc. For HVDC transmission lines, the converter stations should be considered to be project components and should be addressed in the project description.

If the project will be owned by more than one party, briefly explain the ownership arrangements between the parties and provide a description of the portion(s) that will be owned by each party. Provide a description of the responsibilities of each party for implementing the project (design, Right-of-Way acquisition, material procurement, construction, etc.).

If applicable, identify and explain any deviation in transmission project components from the original transmission specifications as previously approved by the Commission or recommended by a PURA § 39.151 organization.

General Description of Project

The Proposed Project is a new HVDC interconnection between LCRA TSC's existing Bakersfield Station in Pecos County in ERCOT and an appropriate EPE station in El Paso County in WECC. Currently, Grid United Texas has evaluated EPE's Caliente and Newman stations, and both would be feasible alternatives. Because the Proposed Project will connect to the ERCOT transmission grid and allow power to be exported out of or imported into the ERCOT power grid, it is subject to the requirements of PURA § 37.051(c-1), which requires that a certificate of convenience and necessity (CCN) be obtained from the Public Utility Commission of Texas (Commission).

Grid United Texas is requesting in this Application to be granted partial authorization under a CCN. Following a Commission determination that the public convenience and necessity require, or will require, the Proposed Project interconnection and the necessary orders for the Proposed Project have been obtained from the Federal Energy Regulatory Commission (FERC) pursuant to Sections 210, 211, and 212 of the Federal Power Act, if necessary, Grid United Texas will file a subsequent CCN application with the Commission for approval of the route of the HVDC tie line (Tie Line) facilities necessary to connect the HVDC converter stations.

The eastern connection of the Proposed Project at the LCRA TSC Bakersfield Station is located in the McCamey Competitive Renewable Energy Zone (CREZ). In order to establish the HVDC interconnection between ERCOT and WECC, Grid United Texas proposes to own and operate an HVDC converter station at each end of the interconnection with HVDC tie line facilities extending approximately 250 to 300 miles between the convertor stations. One HVDC converter will connect to an EPE Station in WECC, and the other will connect to the LCRA TSC Bakersfield Station in ERCOT. There will be no adjacent direct connection of WECC and ERCOT, and ERCOT will maintain authority over its grid at the HVDC converter connected to the LCRA TSC Bakersfield Station. Each HVDC converter will act like a separator and ensure that the two grids remain independent of one another. The HVDC converter stations at each end of the Proposed Project will convert electricity between Alternating Current (AC) and Direct Current (DC). When operating, HVDC converter stations can operate in one of two modes: rectifier mode (converting AC power to DC power) or inverter mode (converting DC power back to AC power). In other words, each converter station will be capable of converting AC power into DC power or vice versa (i.e., the converters will be bi-directional in nature). Grid United Texas is proposing HVDC technology for two reasons. First, transmission of power through AC lines is difficult to control. HVDC technology allows for precise power control allowing ERCOT to maintain electrical isolation from adjacent grids. Second, HVDC technology offers the most efficient means of transmitting large amounts of power over long distances with lower losses than AC transmission lines. It is further anticipated that

LCRA TSC and EPE will expand the existing Bakersfield and Caliente or Newman 345kV stations to accommodate the interconnection of the AC tie line from the converter stations.

Ownership Arrangements

Grid United Texas will design, procure, construct, operate, and maintain the HVDC convertor stations necessary to connect ERCOT and WECC, including all conductors, wires, structures, hardware, and rights-of-way (ROW) necessary for the tie line facilities between the convertor stations. LCRA TSC will construct, own, and operate the facilities necessary to allow for the interconnection at the Bakersfield Switching Station in Pecos County and EPE will construct, own, and operate the facilities necessary to allow for the interconnection at the Caliente or Newman Substations in El Paso County.

Deviation from original PURA § 39.151 organization (ERCOT)

The Proposed Project, which was previewed with ERCOT's technical team on May 5, 2022, is being presented at ERCOT's Regional Planning Group on Tuesday July 19, 2022, for review shortly after submission of this application. HVDC ties between ERCOT and another power grid (e.g., WECC) are not subject to ERCOT's planning review under the current ERCOT Planning Guide.

5. Conductor and Structures:

Conductor Size and Type:	Grid United Texas has not yet determined the conductor size and type for the HVDC tie line facilities that will be associated with the Proposed Project. Such information will be presented in a subsequent CCN application for the HVDC tie line facilities, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC.
Number of conductors per phase:	N/A
Continuous Summer Static Current Rating (A):	N/A
Continuous Summer Static Line Capacity at Operating Voltage (MVA):	N/A
Continuous Summer Static Line	

Capacity at Design Voltage (MVA): N/A

Type and Composition of Structures: Grid United Texas has not yet determined the type and composition of the structures necessary for the HVDC tie line facilities that will be associated with the Proposed Project. Grid United Texas will consider utilizing monopoles, lattice towers, and guyed lattice structures for the Proposed Project and will determine the structure type based on engineering constraints, stakeholder input, and cost considerations. Such information will be presented in a subsequent CCN application for the HVDC tie line facilities, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC.

Height of Typical Structures: Grid United Texas has not yet designed the structures necessary for the HVDC tie line facilities that will be associated with the Proposed Project but anticipates that most structures will range in height from 120 to 200 feet. In making such determination, Grid United Texas will consider landowner preference, optimal engineering design, and existing right-of-way constraints, among other factors. Such information will be presented in a subsequent CCN application for the HVDC tie line facilities, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC.

Explain why these structures were selected; include such factors as landowner preference, engineering considerations, and costs comparisons to alternate structures that were considered. Provide dimensional drawings of the typical structures to be used in the project.

Grid United Texas has not yet determined the type and composition of the structures necessary for the HVDC tie line facilities that will be associated with the Proposed Project.

Such information will be presented in a subsequent CCN application for the HVDC tie line facilities, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC.

For joint applications, provide and separately identify the above-required information regarding structures for the portion(s) of the project owned by each applicant.

Not applicable.

6. **Right-of-way:**

Miles of Right-of-Way: As currently projected, the Proposed Project will require an HVDC tie line of approximately 250-300 miles between the HVDC converter stations at the LCRA TSC Bakersfield Station and the selected EPE station. Grid United Texas will present specific ROW requirements for the HVDC tie line in a subsequent CCN application for such facilities, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC.

Miles of Circuit: As design for the HVDC tie line facilities associated with the Proposed Project has not been completed, the miles of circuit have not been determined but will be appropriate for an HVDC project of this size and length. Grid United Texas will provide detailed information on miles of circuit and other technical specifications, in a subsequent CCN application, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC.

Width of Right-of-Way: Grid United Texas has not yet determined the exact type and composition of the structures that will be utilized for the HVDC tie line facilities that will be associated with the Proposed Project.

Accordingly, the width of ROW necessary for the HVDC tie line facilities is not yet known, though Grid United Texas anticipates the ROW width will be between 150 and 200 feet (and potentially wider in select locations). Such information will be presented in a subsequent CCN application, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC.

Percent of Right-of-Way Acquired/ Donated/Available for use: None.

For joint applications, provide and separately identify the above-required information for each route for the portion(s) of the project owned by each applicant.

Not applicable.

Provide a brief description of the area traversed by the transmission line. Include a description of the general land uses in the area and the type of terrain crossed by the line.

The Proposed Project will consist of HVDC converter stations near the LCRA TSC Bakersfield Station in Pecos County (in ERCOT) and the selected EPE station in El Paso County (in WECC). The HVDC converter stations will require approximately 40 acres per station; Grid United Texas is currently evaluating converter station sites at the potential end point locations. The HVDC converter stations will be connected via an HVDC tie line extending approximately 250-300 miles between the end points. Grid United Texas has not yet performed a detailed routing analysis and environmental assessment for the HVDC tie line facilities. Such analysis will be performed, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC. It is reasonably anticipated that routes for the HVDC tie line facilities could extend through Pecos, Reeves, Jeff Davis, Culberson, Hudspeth, and El Paso Counties. A reasonable study area might also include Crane, Ward, and Loving Counties.

The area around the Bakersfield Station at the ERCOT end of the Proposed Project is primarily rural with a variety of scattered land uses including rural agricultural areas, oil and gas development, and wind and solar energy production.

The area around the Caliente Substation at the WECC end of the Proposed Project is primarily suburban and rural with a variety of scattered land uses including commercial

and residential development, transportation facilities, parks and recreation areas, and rural agricultural areas. The Caliente Substation sits adjacent to the southern border of Fort Bliss, a major US Army (Army) base. The Newman Substation is north of the Caliente Substation, and also sits adjacent to Fort Bliss. Maps showing the locations of these substations are attached to this Application as Attachments 1, 2, and 3. Use of the Newman Station would require the consent of the Army for the HVDC tie line facilities to cross Fort Bliss.

7. Substations or Switching Stations:

List the name of all existing HVDC converter stations, substations or switching stations that will be associated with the new transmission line. Provide documentation showing that the owner(s) of the existing HVDC converter stations, substations and/or switching stations have agreed to the installation of the required project facilities.

There are no existing HVDC converter stations in the area of the Proposed Project. As proposed, the HVDC converter stations associated with the Proposed Project will connect to ERCOT at the existing LCRA TSC Bakersfield Station and to WECC at the selected EPE station. LCRA General Manager Phil Wilson has provided a supportive letter on behalf of LCRA and LCRA TSC regarding the impact of the Proposed Project on LCRA TSC's facilities, which is included as Attachment 4 to this Application. Further, Grid United Texas has communicated with EPE regarding the Proposed Project and notified EPE of its desire to interconnect at an EPE station. In response, Kelly Tomblin, CEO of EPE has provided a supportive letter regarding the Proposed Project, which is included as Attachment 5 to the Application.

8. Estimated Schedule:

Estimated Dates of:	Start	Completion
Initial Application for Partial CCN Rights	July-22	TBD
Subsequent CCN Application, if applicable	Nov-23	Oct-24
Right-of-way and Land Acquisition	Oct-24	Mar-25
Preliminary Engineering and Design	Jan-23	Oct-25
Detailed Converter Design, Equipment Procurement, and Installation	Sept-24	Sept-28
Detailed Line Design, Equipment Procurement, and Installation	Oct-25	Sept-28

(inclusive of Construction of Facilities)		
Energize and Commission Facilities	Oct-28	Nov-28

9. Counties:
For each route, list all counties in which the route is to be constructed.

HVDC converter stations associated with the Proposed Project will be located in Pecos County, likely within a few miles of the existing LCRA TSC Bakersfield Station (in ERCOT) and in El Paso County within a similar distance to the selected EPE station (in WECC). The HVDC converter stations will be connected via an HVDC tie line extending approximately 250-300 miles between the end points. Grid United Texas has not yet performed a detailed routing analysis and environmental assessment for the HVDC tie line facilities. Such analysis will be performed, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC. It is reasonably anticipated that routes for the HVDC tie line facilities could extend through Pecos, Reeves, Jeff Davis, Culberson, Hudspeth, and El Paso Counties. A reasonable study area might also include Crane, Ward, and Loving Counties. See Attachment 1 for the study area that is anticipated.

10. Municipalities:
For each route, list all municipalities in which the route is to be constructed.

The proposed HVDC converter station sites near the existing LCRA TSC Bakersfield Station will not be located within, or within five miles of, a municipality. The proposed HVDC converter station sites near the selected EPE station will be located within the extra territorial jurisdiction of the City of El Paso. The HVDC converter stations will be connected via an HVDC tie line extending approximately 250-300 miles between the end points. Grid United Texas has not yet performed a detailed routing analysis and environmental assessment for the HVDC tie line facilities. Such analysis will be performed, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC. Other municipalities may be crossed or within five miles of the necessary HVDC tie line facilities and will be identified to the Commission in conjunction with the subsequent CCN application associated with such routing, if applicable.

For each applicant, attach a copy of the franchise, permit or other evidence of the city's consent held by the utility, if necessary or applicable. If franchise, permit, or other evidence of the city's consent has been previously filed, provide only the docket number of the application in which the consent was filed. Each applicant should

provide this information only for the portion(s) of the project which will be owned by the applicant.

Not applicable. No franchise, permit or other municipal consent are required by any municipality for the Commission's evaluation of this Application.

11. Affected Utilities:

Identify any other electric utility served by or connected to facilities in this application.

LCRA TSC owns the Bakersfield Station for the ERCOT interconnection location of the Proposed Project. EPE owns the Caliente and Newman stations at the WECC interconnection location of the Proposed Project. The HVDC converter stations will be connected to each other via an HVDC tie line extending approximately 250-300 miles between the end points. Grid United Texas has not yet performed a detailed routing analysis and environmental assessment for the HVDC tie line facilities. Such analysis will be performed, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC. Although no other electric utilities own or operate HVDC facilities in this area of Texas, it is anticipated that other electric utilities will own facilities in the area traversed by the proposed routing of the HVDC tie line facilities. Grid United Texas will identify such electric utilities for the Commission in conjunction with the CCN application associated with such routing.

Describe how any other electric utility will be affected and the extent of the other utilities' involvement in the construction of this project. Include any other electric utilities whose existing facilities will be utilized for the project (vacant circuit positions, ROW, substation sites and/or equipment, etc.) and provide documentation showing that the owner(s) of the existing facilities have agreed to the installation of the required project facilities.

See the response above.

12. Financing:

Describe the method of financing this project. For each applicant that is to be reimbursed for all or a portion of this project, identify the source and amount of the reimbursement (actual amount if known, estimated amount otherwise) and the portion(s) of the project for which the reimbursement will be made.

Grid United Texas is a wholly owned subsidiary of Grid United LLC, a Centaurus Capital LP backed developer of high voltage power lines. Centaurus Capital LP is the Houston-based family office of John and Laura Arnold with an established track record of developing and owning large infrastructure projects. Grid United Texas is equity financed

by Grid United LLC which, in turn, is equity financed by Centaurus Capital LP. This equity capital is supporting current project development activities to progress the project, including defining the commercial strategy and ultimate financial structure for the Proposed Project.

While the Proposed Project's commercialization strategy is still in development, Grid United Texas is confident the multiple project benefits outweigh the costs of Pecos West. The project will offer sizeable reliability, cost, and resiliency benefits to the ERCOT and the EPE systems.

Grid United Texas currently anticipates it will propose in an appropriate future regulatory proceeding one of or some combination of the following financing structures for the Proposed Project:

- market-based rate charges from wholesale market participants shipping power across the HVDC facilities between ERCOT and WECC;
- payments in exchange for reliability, inertia response, ancillary services, and other benefits of the Proposed Project; and
- cost-allocation for portions of the tie line cost based on reliability and resiliency benefits to both El Paso and ERCOT customers.

13. Estimated Costs: Provide cost estimates for each route of the proposed project using the following table. Provide a breakdown of "Other" costs by major cost category and amount. Provide the information for each route in an attachment to this application.

The preliminary estimated cost for the HVDC converter stations in proximity to the existing LCRA TSC Bakersfield Station (in ERCOT) and the selected EPE substation (in WECC) is approximately $350,000,000. The preliminary estimated LCRA TSC cost at the Bakersfield Station to interconnect with the HVDC converter station is approximately $10,000,000. The preliminary estimated EPE cost to interconnect with the HVDC converter station is approximately $55,000,000, including $20,000,000 for the physical connection at the EPE substation and $35,000,000 for AC network upgrades in the EPE system. There will be short AC lines (likely under 3 miles) on each side of the Proposed Project connecting the converter stations and the substations. The HVDC converter stations will be connected via an HVDC tie line extending approximately 250-300 miles between the end points. Grid United Texas has not yet completed a detailed routing analysis, environmental assessment, or interconnection upgrade facility study for the HVDC tie line facilities. Such analysis will be completed, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC.

14. Need for the Proposed Project:

For a standard application, describe the need for the construction and state how the proposed project will address the need. Describe the existing transmission system and conditions addressed by this application. For projects that are planned to accommodate load growth, provide historical load data and load projections for at least five years. For projects to accommodate load growth or to address reliability issues, provide a description of the steady state load flow analysis that justifies the project. For interconnection projects, provide any documentation from a transmission service customer, generator, transmission service provider, or other entity to establish that the proposed facilities are needed. For projects related to a Competitive Renewable Energy Zone, the foregoing requirements are not necessary; the applicant need only provide a specific reference to the pertinent portion(s) of an appropriate commission order specifying that the facilities are needed. For all projects, provide any documentation of the review and recommendation of a PURA §39.151 organization.

Describe the need for the construction and state how the proposed project will address the need. Describe the existing transmission system and conditions addressed by this application. For projects that are planned to accommodate load growth, provide historical load data and load projections for at least five years. For projects to

accommodate load growth or to address reliability issues, provide a description of the steady state load flow analysis that justifies the project.

The Proposed Project is a market-based solution providing reliability for the Texas grid for years to come. The Texas grid faces unique challenges in the form of surging demand for electricity, extreme weather and a rapidly evolving generation mix, that have resulted in volatile commodity prices and reliability concerns.

HVDC grid-to-grid connections, like the Proposed Project, are part of the solution to these challenges and provide benefits to: (1) all energy producers by opening up new markets for power, promoting production of the lowest cost, most competitive resources; (2) landowners and local communities with new investment; (3) ratepayers and consumers by providing increased reliability while keeping prices low; and (4) the broader electric grid by offering stability and ancillary services, thereby creating a more efficient and flexible transmission system.

As a critical connection between two independent grids, ERCOT and WECC, the Proposed Project will provide much needed reliability benefits, lower costs, and resiliency improvements that will assist both grids in rapidly recovering in the event of an outage.

A reliability report for the Proposed Project was prepared for Grid United Texas by Electric Power Engineers, Inc. (Electric Power), titled the *Pecos West HVDC Intertie Steady State Study Report*, dated May 9, 2022. The reliability report is attached to this Application as Attachment 6.

The reliability report determined that the Proposed Project offers key reliability benefits both for ERCOT and El Paso customers. Specifically, by providing between 2,300 and 2,600 MW of export / import capacity (in an expansion scenario) between EPE and ERCOT at the Bakersfield Station, the Proposed Project represents a key resource for both the ERCOT and El Paso grids in times of scarcity.

To quantify the ability of the Proposed Project to lower system costs, a Security Constrained Economic Dispatch (SCED) Model and report were completed by nFront Consulting LLC (nFront). The base case results of the model show significant annual production cost savings of approximately $26 million and $52 million to the EPE and ERCOT systems, respectively. A sensitivity case—modeling higher gas prices and renewable penetration in West Texas—showed annual production cost savings rising to approximately $64 million for EPE and $68 million for ERCOT. The report, titled *HVDC Bi-Pole El Paso Electric / ERCOT* and dated May 3, 2022, is attached to this Application as Attachment 7.

Finally, work is underway to quantify the myriad resiliency benefits the Proposed Project will bring to the EPE and ERCOT grids. For example, Grid United Texas is pursuing targeted studies with LCRA TSC to evaluate the ability of the Proposed Project to alleviate some of the Generic Transmission Constraints (GTC) and other reliability and congestion

issues that remain major challenges in ERCOT's West Texas region. Specifically, the latest Voltage Source Converter HVDC technology, to be utilized by the Proposed Project, will provide dynamic voltage response, significant grid hardening and resiliency benefits, including improved controllability of active and reactive power and power flow in weak grid areas, black-start capability, and voltage stability, among other key ancillary services.

For interconnection projects, provide any documentation from a transmission service customer, generator, transmission service provider, or other entity to establish that the proposed facilities are needed.

Grid United Texas has filed an interconnection request with EPE to interconnect. In addition, letters of support for the Proposed Project (included as Attachments 4 and 5 to this Application) have been provided by LCRA General Manager Phil Wilson, on behalf of LCRA and LCRA TSC, and by Kelly Tomblin, CEO of EPE, on behalf of EPE.

As Grid United Texas is initiating a multi-year regulatory process, the project is still early in its commercialization discussions with potential customers. As the project progresses in the development process, Grid United Texas expects to be able to offer clearer line-of-site on its commercial strategy.

For projects related to a Competitive Renewable Energy Zone, the foregoing requirements are not necessary; the applicant need only provide a specific reference to the pertinent portion(s) of an appropriate commission order specifying that the facilities are needed.

Although the Proposed Project is not specifically related to CREZ, as stated above and as detailed in the nFront Study (Attachment 7), the Proposed Project will provide export capability for constrained renewable solar and wind resources in the McCamey CREZ and surrounding areas into WECC.

For all projects, provide any documentation of the review and recommendation of a PURA § 39.151 organization.

As stated in response to Question No. 4, the Proposed Project will be presented to ERCOT's Regional Planning Group for review shortly after the filing of this Application.

15. Alternatives to Project:

For a standard application, describe alternatives to the construction of this project (not routing options). Include an analysis of distribution alternatives, upgrading voltage or bundling of conductors of existing facilities, adding transformers, and for utilities that have not unbundled, distributed generation as alternatives to the project. Explain how the project overcomes the insufficiencies of the other options that were considered.

Alternatives to the construction of this project (not routing options)

There are no existing grid-to-grid interconnections between ERCOT and WECC. As described in detail in the testimonies of Mr. Kris Zadlo and Mr. Ken Donohoo, filed in support of this Application, an HVDC interconnection between WECC and ERCOT provides market based benefits as well as reliability and resiliency benefits that cannot be achieved by any other traditional generation or transmission project. As such, there are no reasonable alternatives considered by Grid United Texas to the Proposed Project.

Distribution Alternatives

Distribution is not a comparable alternative to an HVDC interconnection between ERCOT and WECC.

Transmission Alternatives

Because of the existing regulatory scheme established by the Federal Power Act and the current non-plenary jurisdictional status of ERCOT at the FERC, traditional alternating current transmission interconnections are not a viable regulatory alternative to the HVDC interconnection of the Proposed Project.

Analysis of (for utilities that have not unbundled), distributed generation as alternatives to the project.

Not applicable.

Explain how the project overcomes the insufficiencies of the other options that were considered.

As discussed above, distribution, transmission, or distributed generation alternatives are not viable alternatives to the Proposed Project.

16. **Schematic or Diagram:**

For a standard application, provide a schematic or diagram of the applicant's transmission system in the proximate area of the project. Show the location and voltage of existing transmission lines and substations, and the location of the construction. Locate any taps, ties, meter points, or other facilities involving other utilities on the system schematic.

Grid United Texas does not own or operate AC transmission facilities in either ERCOT or WECC. Attachments 2 and 3 show the existing transmission infrastructure at the ERCOT and WECC interconnection locations of the Proposed Project.

17. **Routing Study:**

Provide a brief summary of the routing study that includes a description of the process of selecting the study area, identifying routing constraints, selecting potential line segments, and the selection of the routes. Provide a copy of the complete routing study conducted by the utility or consultant. State which route the applicant believes best addresses the requirements of PURA and P.U.C. Substantive Rules.

Not applicable. As Grid United Texas is initiating the first step in a multi-year regulatory process, it is in early stages of launching a detailed routing analysis and environmental assessment of the area extending approximately 250-300 miles between Bakersfield, Texas and the selected EPE station in El Paso. Such analysis will be performed, if applicable, following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC. A routing study and environmental assessment for the HVDC tie line facilities will be presented in a subsequent CCN application, if applicable, associated with the routing of such facilities.

18. **Public Meeting or Public Open House:**

Provide the date and location for each public meeting or public open house that was held in accordance with 16 TAC § 22.52. Provide a summary of each public meeting or public open house including the approximate number of attendants, and a copy of any survey provided to attendants and a summary of the responses received. For each public meeting or public open house provide a description of the method of notice, a copy of any notices, and the number of notices that were mailed and/or published.

Not applicable. Grid United Texas is committed to working cooperatively and collaboratively with landowners along the route ultimately selected. Without landowner support there would be no project. Thus, Grid United Texas will work to conduct easement negotiations in a manner that is fair to landowners and respectful of their private property rights. While Grid United Texas has begun meeting with key stakeholders to introduce the project and gather input, the first step of the regulatory process requires initial state and federal approvals before commencing with the land acquisition process.

This process will be formally launched following Commission approval of this Application and issuance of the necessary FERC order for the proposed interconnection between ERCOT and WECC. As applicable, Grid United Texas will hold one or more open house meetings in accordance with 16 TAC § 22.52 in conjunction with the routing study for the HVDC tie line facilities and submit information regarding such open house meetings to the Commission in conjunction with a subsequent CCN application, if applicable, regarding the routing of the HVDC tie line facilities if necessary.

19. **Routing Maps:**

Base maps should be a full scale (one inch = not more than one mile) highway map of the county or counties involved, or other maps of comparable scale denoting sufficient cultural and natural features to permit location of all routes in the field. Provide a map (or maps) showing the study area, routing constraints, and all routes or line segments that were considered prior to the selection of the routes. Identify the routes and any existing facilities to be interconnected or coordinated with the project. Identify any taps, ties, meter points, or other facilities involving other utilities on the routing map. Show all existing transmission facilities located in the study area. Include the locations of radio transmitters and other electronic installations, airstrips, irrigated pasture or cropland, parks and recreational areas, historical and archeological sites (subject to the instructions in Question 27), and any environmentally sensitive areas (subject to the instructions in Question 29).

Provide aerial photographs of the study area displaying the date that the photographs were taken or maps that show (1) the location of each route with each route segment identified, (2) the locations of all major public roads including, as a minimum, all federal and state roadways, (3) the locations of all known habitable structures or groups of habitable structures (see Question 19 below) on properties directly affected by any route, and (4) the boundaries (approximate or estimated according to best available information if required) of all properties directly affected by any route.

For each route, cross-reference each habitable structure (or group of habitable structures) and directly affected property identified on the maps or photographs with a list of corresponding landowner names and addresses and indicate which route segment affects each structure/group or property.

Not applicable. There are no routes presented in this Application.

20. Permits:

List any and all permits and/or approvals required by other governmental agencies for the construction of the proposed project. Indicate whether each permit has been obtained.

An order from the FERC for interconnection of the Proposed Project will be required. In accordance with PURA § 37.051(c-1), Grid United Texas will file an application for an order from the FERC for interconnection of the Proposed Project no sooner than 180 days from the filing of this Application.

21. Habitable structures:

For each route list all single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 300 feet of the centerline if the proposed project will be constructed for operation at 230kV or less, or within 500 feet of the centerline if the proposed project will be constructed for operation at greater than 230kV. Provide a general description of each habitable structure and its distance from the centerline of the route. In cities, towns or rural subdivisions, houses can be identified in groups. Provide the number of habitable structures in each group and list the distance from the centerline of the route to the closest and the farthest habitable structure in the group. Locate all listed habitable structures or groups of structures on the routing map.

Not applicable. There are no routes presented in this Application.

22. Electronic Installations:

For each route, list all commercial AM radio transmitters located within 10,000 feet of the center line of the route, and all FM radio transmitters, microwave relay stations, or other similar electronic installations located within 2,000 of the center line of the route. Provide a general description of each installation and its distance from the center line of the route. Locate all listed installations on a routing map.

Not applicable. There are no routes presented in this Application.

23. Airstrips:

For each route, list all known private airstrips within 10,000 feet of the center line of the project. List all airports registered with the Federal Aviation Administration (FAA) with at least one runway more than 3,200 feet in length that are located within 20,000 feet of the center line of any route. For each such airport, indicate whether any transmission structures will exceed a 100:1 horizontal slope (one foot in height for each 100 feet in distance) from the closest point of the closest runway. List all listed airports registered with the FAA having no runway more than 3,200 feet in length that are located within 10,000 feet of the center line of any route. For each such airport, indicate whether any transmission structures will exceed a 50:1 horizontal slope from the closest point of the closest runway. List all heliports located within 5,000 feet of the center line of any route. For each such heliport, indicate whether any transmission structures will exceed a 25:1 horizontal slope from the closest point of the closest landing and takeoff area of the heliport. Provide a general description of each listed private airstrip, registered airport, and heliport; and state the distance of each from the center line of each route. Locate and identify all listed airstrips, airports, and heliports on a routing map.

Not applicable. There are no routes presented in this Application.

24. Irrigation Systems:

For each route identify any pasture or cropland irrigated by traveling irrigation systems (rolling or pivot type) that will be traversed by the route. Provide a description of the irrigated land and state how it will be affected by each route (number and type of structures etc.). Locate any such irrigated pasture or cropland on a routing map.

Not applicable. There are no routes presented in this Application.

25. Notice:

Notice is to be provided in accordance with 16 TAC 22.52.

A. Provide a copy of the written direct notice to owners of directly affected land. Attach a list of the names and addresses of the owners of directly affected land receiving notice.

Not applicable. There are no routes presented in this Application.

B. Provide a copy of the written notice to utilities that are located within five miles of the routes.

There are no routes presented in this Application. A copy of the notice being provided to the electric utilities with facilities within five miles of the LCRA TSC

Bakersfield Station and the EPE Caliente and Newman stations is included as Attachment 8a. In addition to LCRA TSC and EPE, Grid United Texas is providing written notice of the filing of the Application to Oncor Electric Delivery Company, AEP Texas, Electric Transmission Texas, Texas-New Mexico Power Company, the City of Garland, and Wind Energy Transmission Texas, which own and operate transmission facilities in the area of the Bakersfield Station.

C. Provide a copy of the written notice to county and municipal authorities, and the Department of Defense Siting Clearinghouse. Notice to the DoD Siting Clearinghouse should be provided at the email address found at http://www.acq.osd.mil/dodsc/.

Grid United Texas is providing notice of the filing of the Application to:

- Pecos and El Paso Counties, the counties in which the proposed HVDC converter stations will be located;
- The City of El Paso, the only municipality within five miles of the proposed HVDC converter stations; and
- ERCOT (although ERCOT is neither a county or municipal authority, Grid United Texas is providing direct mailed written notice to it).

The notice provided to counties, municipalities, and ERCOT is included as Attachment 9a to this Application.

D. Provide a copy of the notice that is to be published in newspapers of general circulation in the counties in which the facilities are to be constructed. Attach a list of the newspapers that will publish the notice for this application. After the notice is published, provide the publisher's affidavits and tear sheets.

In conjunction with the filing of the Application, Grid United Texas proposes notice to ERCOT market participants via a Market Notice from ERCOT and publication by the Commission in the Texas Register. The proposed form of these notices is included as Attachment 10 to the Application. Except as noted above, Grid United is not proposing any other publication of notice, including in any newspapers of general circulation.

For a CREZ application, in addition to the requirements of 16 TAC § 22.52 the applicant shall, not less than twenty-one (21) days before the filing of the application, submit to the Commission staff a "generic" copy of each type of alternative published and written notice for review. Staff's comments, if any, regarding the alternative notices will be provided to the applicant not later than seven days after receipt by Staff of the alternative notices. Applicant may take into consideration any comments made by Commission staff before the notices are published or sent by mail.

Not applicable.

26. Parks and Recreation Areas:

For each route, list all parks and recreational areas owned by a governmental body or an organized group, club, or church and located within 1,000 feet of the center line of the route. Provide a general description of each area and its distance from the center line. Identify the owner of the park or recreational area (public agency, church, club, etc.). List the sources used to identify the parks and recreational areas. Locate the listed sites on a routing map.

Not applicable. There are no routes presented in this Application.

27. Historical and Archeological Sites:

For each route, list all historical and archeological sites known to be within 1,000 feet of the center line of the route. Include a description of each site and its distance from the center line. List the sources (national, state or local commission or societies) used to identify the sites. Locate all historical sites on a routing map. For the protection of the sites, archeological sites need not be shown on maps.

Not applicable. There are no routes presented in this Application.

28. Coastal Management Program:

For each route, indicate whether the route is located, either in whole or in part, within the coastal management program boundary as defined in 31 TAC §503.1. If any route is, either in whole or in part, within the coastal management program boundary, indicate whether any part of the route is seaward of the Coastal Facilities Designation Line as defined in 31 TAC §19.2(a)(21). Using the designations in 31 TAC §501.3(b), identify the type(s) of Coastal Natural Resource Area(s) impacted by any part of the route and/or facilities.

The HVDC converter stations associated with the Proposed Project will not be located within the Coastal Management Program boundary, as defined in 31 TAC § 503.1.

29. Environmental Impact:

Provide copies of any and all environmental impact studies and/or assessments of the project. If no formal study was conducted for this project, explain how the routing and construction of this project will impact the environment. List the sources used to identify the existence or absence of sensitive environmental areas. Locate any environmentally sensitive areas on a routing map. In some instances, the location of the environmentally sensitive areas or the location of protected or endangered species should not be included on maps to ensure preservation of the areas or species. Within seven days after filing the application for the project, provide a copy of each environmental impact study and/or assessment to the Texas Parks and Wildlife Department (TPWD) for its review at the address below. Include with this application a copy of the letter of transmittal with which the studies/assessments were or will be sent to the TPWD.

Wildlife Habitat Assessment Program
Wildlife Division
Texas Parks and Wildlife Department
4200 Smith School Road
Austin, Texas 78744

The applicant shall file an affidavit confirming that the letter of transmittal and studies/assessments were sent to TPWD.

No formal environmental study has yet been conducted for the HVDC converter facilities associated with the Proposed Project, but Grid United Texas is working with POWER Engineers, Inc. (POWER) on early-stage routing and environmental assessment and detailed information responsive to this question will be provided with a subsequent CCN application filed by Grid United Texas, if necessary and applicable. POWER has performed an initial evaluation of the expected study area for the Proposed Project, and has determined that, if applicable, Grid United Texas will be able to present a subsequent CCN application (1) containing routes that satisfy all applicable regulatory requirements; (2) that will not present significant impacts to wetland resources, ecological resources, endangered and threatened species, or land use; (3) that will contain an adequate number of reasonably differentiated alternative routes identified for the Commission to conduct a proper evaluation; and (4) that will contain segments and routes identified in compliance with the Commission's policy of prudent avoidance.

30. Affidavit

Attach a sworn affidavit from a qualified individual authorized by the applicant to verify and affirm that, to the best of their knowledge, all information provided, statements made, and matters set forth in this application and attachments are true and correct.

A sworn affidavit is attached below.

AFFIDAVIT OF BEN SEMMES

STATE OF TEXAS §
§
COUNTY OF HARRIS §

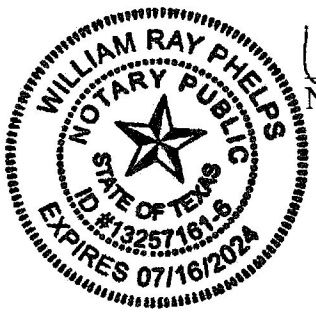
Before me, the undersigned authority, Ben Semmes, being first duly sworn, deposes and states:

"My name is Ben Semmes. I am Project Development Director for Grid United Texas LLC (Grid United Texas). I am over the age of twenty-one, and am competent to make the following affidavit:

On behalf of Grid United and in my capacity as Project Development Director, I am authorized to file and verify the CCN Application for Grid United. I am personally familiar with the documents filed with this application, and I have complied with all the requirements contained in the application; furthermore, all such statements made and matters set forth herein with respect to Grid United are true and correct."

Ben Semmes
Affiant

SUBSCRIBED AND SWORN TO BEFORE ME, a Notary Public in and for the State of Texas, this 5th day of July, 2022.



Notary Public

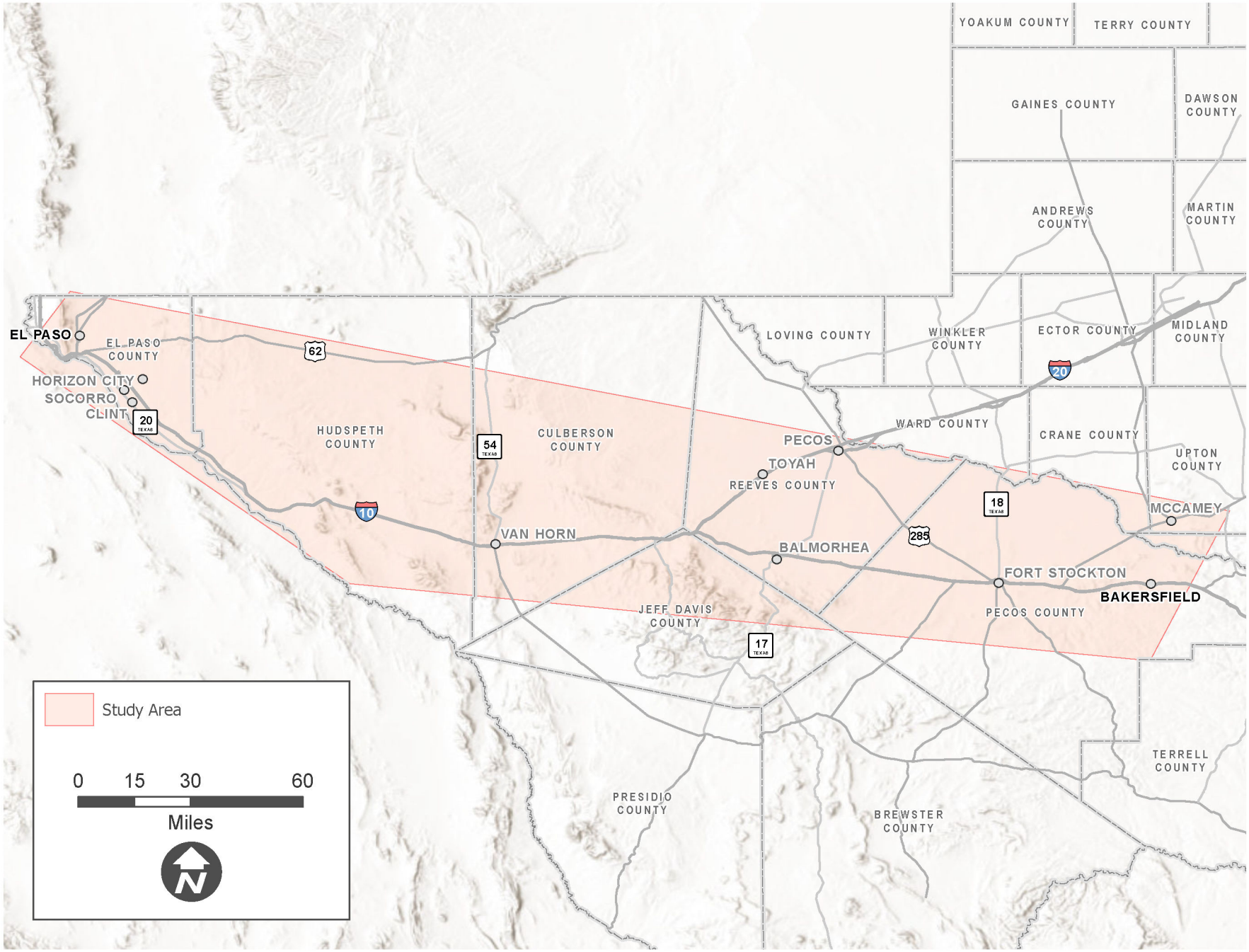
ATTACHMENTS TO THE APPLICATION

LIST OF ATTACHMENTS TO THE APPLICATION

1	CCN Study Area Map
2	Bakersfield Switching Station Area Map
3	EPE Caliente and Newman Stations Area Map
4	LCRA TSC Letter of Support
5	EPE Letter of Support
6	*Pecos West HVDC Intertie Steady State Study Report*
7	nFront Security Constrained Economic Dispatch (SCED) Model
8a	Notice – Utilities Application Packet*
8b	Notice – List of Utilities Served
9a	Notice – County, Municipal, and Other Gov't Authorities Application Packet*
9b	Notice – List of County, Municipal, and Other Gov't Officials Served
10	Notice – Proposed ERCOT Market and *Texas Register* Form
11	Notice – Office of Public Utility Counsel*
12	Proposed Standard Protective Order
*	Excluding the copy of this Application, which was provided as an enclosure under cover of the notice letter

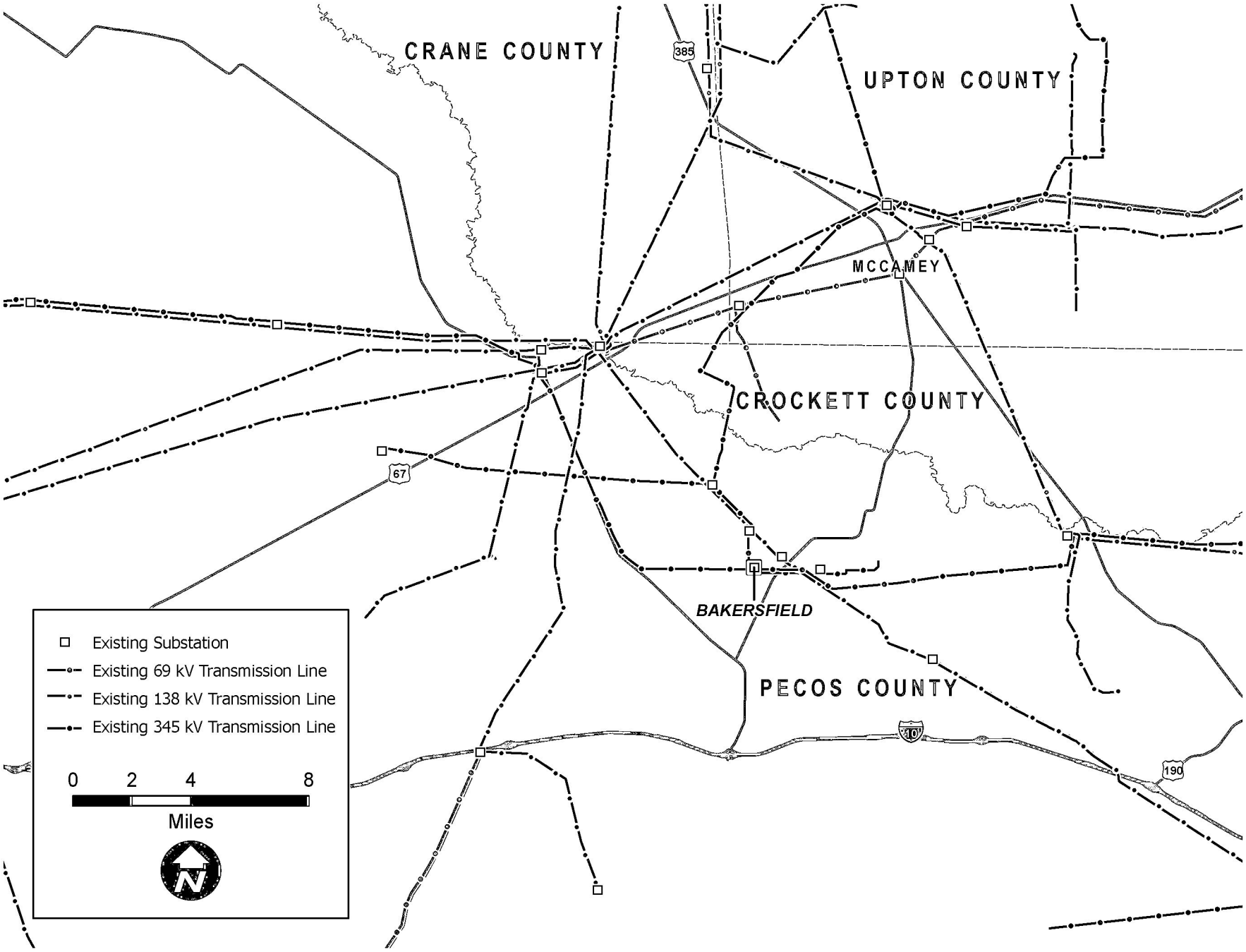
ATTACHMENT 1

CCN STUDY AREA MAP


YOAKUM COUNTY
TERRY COUNTY
GAINES COUNTY
DAWSON COUNTY
ANDREWS COUNTY
MARTIN COUNTY
LOVING COUNTY
WINKLER COUNTY
ECTOR COUNTY
MIDLAND COUNTY
EL PASO
EL PASO COUNTY
HORIZON CITY
SOCORRO
CLINT
HUDSPETH COUNTY
CULBERSON COUNTY
WARD COUNTY
CRANE COUNTY
UPTON COUNTY
PECOS
TOYAH
REEVES COUNTY
MCCAMEY
VAN HORN
BALMORHEA
FORT STOCKTON
BAKERSFIELD
PECOS COUNTY
JEFF DAVIS COUNTY
PRESIDIO COUNTY
BREWSTER COUNTY
TERRELL COUNTY
62
20
54
10
285
18
17
Study Area
0 15 30 60
Miles
N

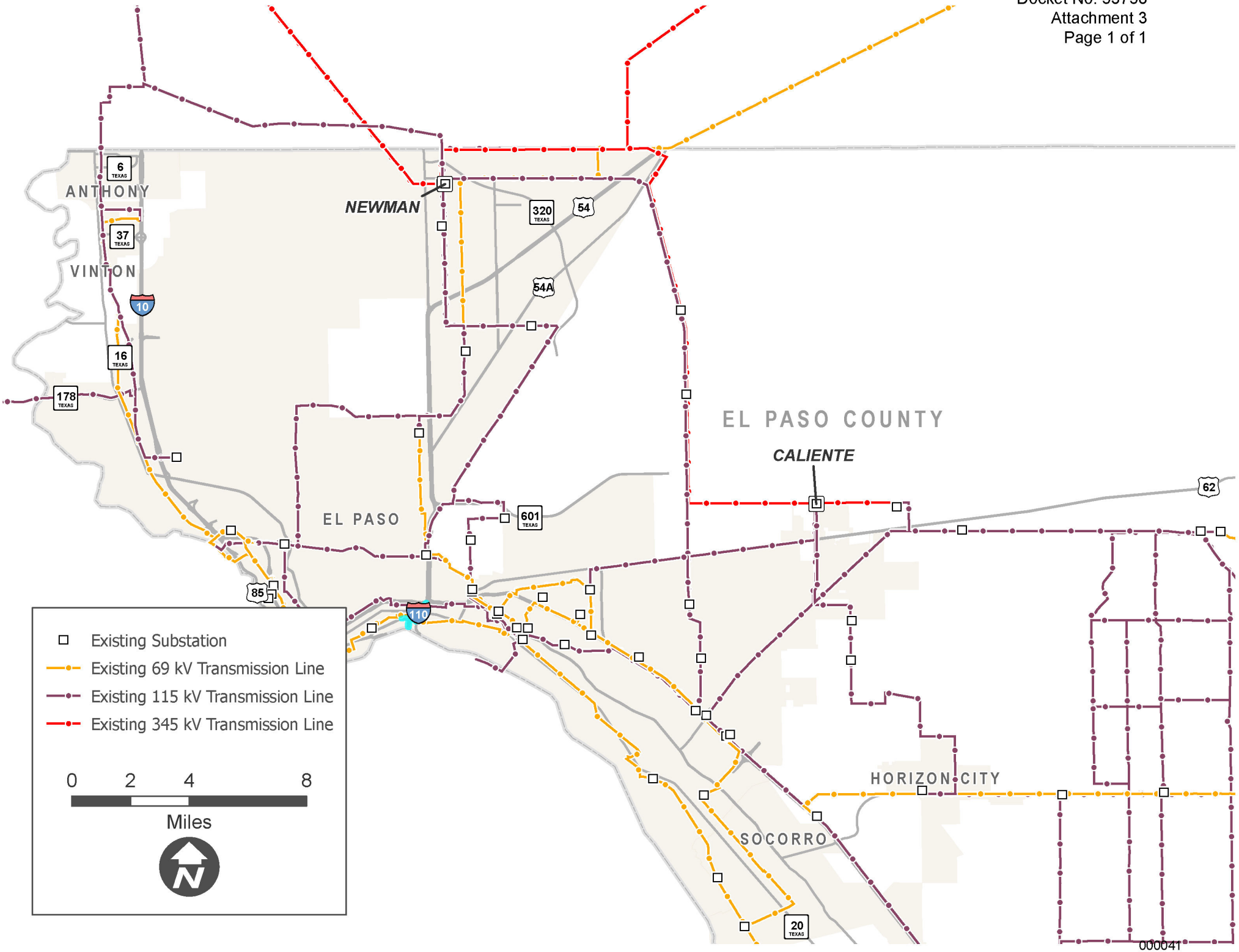
ATTACHMENT 2

BAKERSFIELD SWITCHING STATION AREA MAP


CRANE COUNTY
UPTON COUNTY
MCCAMEY
CROCKETT COUNTY
BAKERSFIELD
PECOS COUNTY
385
67
10
190
Existing Substation
Existing 69 kV Transmission Line
Existing 138 kV Transmission Line
Existing 345 kV Transmission Line
0 2 4 8
Miles
N

ATTACHMENT 3

EPE CALIENTE AND NEWMAN STATIONS AREA MAP


ANTHONY
VINTON
NEWMAN
EL PASO
EL PASO COUNTY
CALIENTE
HORIZON CITY
SOCORRO
6 TEXAS
37 TEXAS
16 TEXAS
178 TEXAS
320 TEXAS
54
54A
10
85
110
601 TEXAS
62
20 TEXAS
Existing Substation
Existing 69 kV Transmission Line
Existing 115 kV Transmission Line
Existing 345 kV Transmission Line
0 2 4 8
Miles
N

ATTACHMENT 4

LCRA TSC
LETTER OF SUPPORT

LCRA
ENERGY • WATER • COMMUNITY SERVICES

April 13, 2022

Michael Skelly
Chief Executive Officer
Grid United LLC
1717 West Loop South, Suite 1800
Houston, Texas 77027

Dear Michael:

Recently, our organizations have discussed Grid United's proposal to develop a new high voltage direct current transmission line to interconnect the Western Electricity Coordinating Council (WECC) to the Electric Reliability Council of Texas (ERCOT) grid. On the ERCOT side, the project is proposed to interconnect at LCRA Transmission Services Corporation's (LCRA TSC's) Bakersfield Substation. LCRA appreciates Grid United's efforts to develop innovative solutions to help bring Texas' abundant renewable energy to market in areas of the country that lack the same access to these resources. I am glad to hear that work is progressing and you are anticipating the project will result in significant benefits to the people of Texas and electric consumers beyond our borders.

I understand you will soon be making regulatory filings at the Public Utility Commission of Texas for review and approval of the new interconnection. Please know that LCRA fully supports your project to the extent that it is a significant net exporter of our state's abundant renewable energy. Additionally, LCRA TSC stands ready and willing to interconnect the project safely and reliably, should the Public Utility Commission of Texas approve the proposed connection at the Bakersfield Substation.

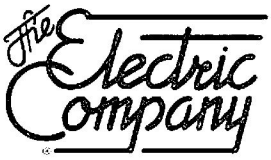
I wish you and your team all the best, and please don't hesitate to contact me at 512-578-3562 if I can be of any help.

Sincerely,

Phil Wilson
General Manager

ATTACHMENT 5

EPE LETTER OF SUPPORT



El Paso Electric

P.O. Box 982
El Paso, Texas
79960-0982
(915) 543-5711

June 29, 2022

Michael Skelly
CEO
Grid United LLC
1717 West Loop South, Suite 1800
Houston, TX 77027

Dear Michael:

Recently, our organizations have discussed Grid United's proposal to develop a new high voltage direct current transmission line to interconnect the Western Electricity Coordinating Council (WECC) to the Electric Reliability Council of Texas (ERCOT) grid. You have stated that your desire to interconnect your project to the transmission system of El Paso Electric Company (EPE).

I understand that you will soon be making regulatory filings at the Public Utility Commission of Texas for review and approval of your project. Please know that EPE support your efforts to build infrastructure solutions to broaden access to renewable energy resources between ERCOT and WECC. Should you receive approval for your project by the Public Utility Commission of Texas, EPE will look forward to receiving from you a request for a wires-to-wires interconnection to the EPE transmission system.

Best Regards,

Kelly Tomblin

Kelly Tomblin
El Paso Electric Company
President & CEO

ATTACHMENT 6

PECOS WEST HVDC INTERTIE STEADY STATE STUDY REPORT

A Native Copy of this document that allows access to embedded Excel Spreadsheets will be provided to Central Records via Flash Drive

PECOS WEST HVDC INTERTIE
STEADY STATE STUDY REPORT

GRID UNITED

MAY 9, 2022

ELECTRIC POWER ENGINEERS
ENERGY ENGINEERING EXPERTS
GENERATION | TRANSMISSION | DISTRIBUTION

Electric Power Engineers, Inc. is a Texas Registered Engineering Firm F-3386

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Document Revisions

NO.	Revision	Date	PRD	CHK	APV
0	Report issued to Grid United LLC	05/09/2022	MDBA	RB	KD

Executive Summary

Grid United requested interconnection for the proposed 1500 MW (with possible expansion to 3000 MW) HVDC Intertie to be connected either at Bakersfield 345 kV Station or at Solstice 345 kV Station, respectively in Pecos County, Texas. Bakersfield and Solstice HVDC facilities have an expected commercial operation date of Q2 2028. Electric Power Engineers LLC (EPE) performed a steady state contingency and transfer analysis to determine the reliability impacts of interconnecting the HVDC facilities each separately and independently to the proposed Points of Interconnections (POIs) on the ERCOT transmission system.

For the purpose of this analysis, EPE first performed a steady state contingency analysis in TARA using the 2028 Summer Peak and 2025 High Wind Low Load (HWLL) cases to identify the pre-existing thermal limitations overloading prior to the addition of the proposed HVDC project(s), each separately and independently. There were several pre-existing thermal overloads were identified under both single and multiple contingency conditions. The pre-existing thermal overloads are mainly triggered by system and other generation projects dispatch conditions prior to interconnection of the proposed HVDC project(s) at the POI(s) under study. Further, EPE evaluated extreme event multiple contingency conditions which includes P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) combinations. These conditions are very unlikely to happen in the real-time operations, which could reduce the number of the pre-existing thermal overloads identified under these extreme contingency conditions.

After obtaining the pre-existing thermal overloads, EPE performed the transmission analysis to identify thermal and voltage violations triggered by addition of the new HVDC interconnection project(s) from two POI(s) within the study area, each separately and independently up to 3,000 MW. The study results revealed several thermal and voltage violations under both single and multiple contingency conditions when interconnecting to the evaluated POIs. The proposed HVDC interconnection project(s) may not be able to import or export up to the full 3,000 MW capacity without addition of transmission upgrades which could resolve the identified thermal and voltage violations.

Based upon the 2028 Summer Peak base case steady state study transfer analysis, interconnection at LCRA TSC Bakersfield provides for up to 2,600 to 2,300 MW of import/export capability under P1 and P2.1 contingency conditions. Interconnection at AEP Solstice provided less import/export capability of up to 1,300 to 1,000 MW under P1 and P2.1 contingency conditions.

Below table summarizes first positive Import and Export capacity that may be available from the POIs under study, each separately and independently under different contingency conditions.

It should also be noted that several non-converge contingencies were also identified as part of this analysis. EPE performed the DC Screening analysis to identify the transfer limit associated with the each limiting element and limiting contingency. The details of the non-converged contingencies along with their DC transfer limits is provided in the **Appendix D**.

Introduction

Grid United requested Electric Power Engineers, LLC (EPE) to perform a transmission analysis for following projects located in Texas and falling within the service territory of Electrical Reliability council of Texas (ERCOT).

Project Name	Location	MW Size	ISO	Potential Work Start Date	Project COD
Bakersfield HVDC Interconnection	Pecos County, TX	Up to 3,000 MW	ERCOT	April 2022	Q2 2028
Solstice HVDC Interconnection	Pecos County, TX	Up to 3,000 MW	ERCOT	April 2022	Q2 2028

EPE performed a steady state contingency and transfer analysis to determine the reliability impacts of interconnecting the HVDC facility, each separately and independently to the proposed Points of Interconnections (POIs) on the ERCOT transmission system.

Study Assumptions

Study Cases

EPE performed steady state contingency and transfer analysis on the following cases which were posted to the ERCOT MIS on February 24th, 2022:

- ERCOT 21SSWG U2 2028 Summer Peak
- ERCOT 21SSWG U2 2025 High Wind Low Load (HWLL)

Study Scenarios

The following four scenarios were considered for this steady state analysis as shown below in **Table 1**.

Table 1: Study Scenarios

Scenario	HVDC Flow	Study Case	New Project Dispatch	Study Area Conventional Generation Dispatch	Study Area Wind Generation Dispatch	Study Area Solar Generation Dispatch	Study Area Storage Dispatch
1	ERCOT Import	Summer Peak	0 MW to 3,000 MW	Base*	Base*	Base*	Base*
2	ERCOT Export	Summer Peak	0 MW to (-)3,000 MW	Base*	Base*	Base*	Base*
3	ERCOT Import	HWLL	0 MW To 3,000 MW	Base*	Base*	Base*	0%
4	ERCOT Export	HWLL	0 MW to (-)3,000 MW	Base*	Base*	Base*	(-)100%

*Base indicates no change to the base SSWG case dispatch for the specific resource type.

The wind solar and conventional generators as listed in **Table 2** were considered the study area generation.

Study Area

The study area was defined as the transmission facilities in the following counties: Brewster, Coke, Coleman, Concho, Crane, Crockett, Culberson, Ector, Edwards, Gillespie, Glasscock, Irion, Jeff Davis, Kerr, Kimble, Loving, Mason, McCulloch, Menard, Midland, Pecos, Presidio, Reagan, Reeves, Runnels, Schleicher, Sterling, Sutton, Terrel, Tom Green, Upton, Val Verde, Ward, and Winkler. The study area counties are depicted below in **Figure 1**. EPE studied contingencies and monitored for transmission constraints in the study area.

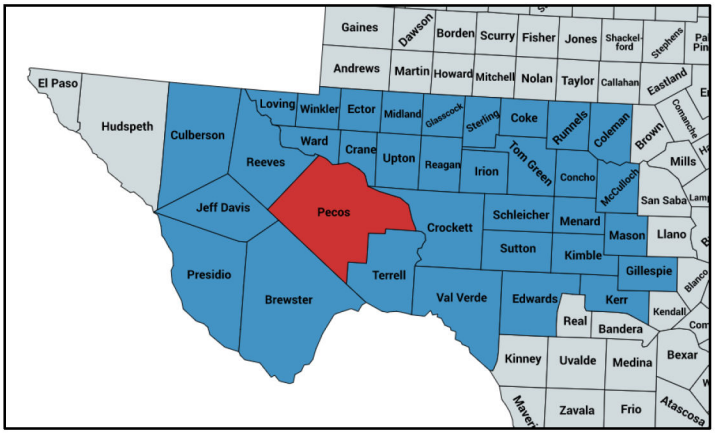


Figure 1: Study Area for the HVDC Interconnection

Contingencies

EPE studied the following contingency categories in and connected to the study area:

- Normal system conditions (N-0)
- N-1 conditions (P1, P2.1)
- Bus Fault Internal Breaker Fault Breaker Failure and Relay Failure conditions (P2.2, P2.3, P4, and P5)
- N-G-1 (P3) conditions (G-1 + N-1)
- ERCOT2 (G-1 + ERCOT1)
- N-A-1 (ERCOT3) conditions (A-1 + N-1/ERCOT1)
- N-1-1 conditions (P6)
- Common Structure conditions (P7)
- P1 + ERCOT1 (P7)
- ERCOT1(P7) + ERCOT1(P7)

Study Criteria

Thermal

- The N-0 loading of transmission elements should be less than 100% of Rate A.
- The post-contingency loading of transmission elements should be less than 100% of Rate B.

Voltage

- Monitored all buses 69 kV and above in the study area.
- Under N-0 condition the bus voltages should be between 0.95 p.u. and 1.05 p.u.
- Under post-contingency conditions the bus voltages should be between 0.92 p.u. and 1.05 p.u.
- Bus voltages shall not deviate beyond 8% on non-radial load buses.

Modeling Changes

- According to ERCOT's March 2022 Generator Interconnection Status (GIS) report all generation meeting ERCOT Planning Guide Section 6.9(1) was added within the study area for both the 2028 Summer Peak and 2025 HWLL cases if it was missing from the cases.
- As appropriate real power output for generators outside of the study area were reduced to offset the generation addition at the proposed POIs.
- Applied the relevant 21SSWG U2 Off-Cycle Updates to all study cases.
- Turned Off the 7.4 MW Barilla Solar II facility in the 2025 Summer Peak case as it is cancelled.
- Adjusted the MW capacity of the West of Pecos Solar facility to match the ERCOT's March 2022 Generator Interconnection Status (GIS) report to all study cases.
- Adjusted the MW capacity of the Fowler Ranch Solar facility to match the ERCOT's March 2022 Generator Interconnection Status (GIS) report to all study cases.
- Adjusted the MW capacity of the Lacy Creek Wind facility to match the ERCOT's March 2022 Generator Interconnection Status (GIS) report to all study cases.
- Turned on the White Mesa 2 Wind (21INR0521) generating facility in the 2025 High Wind Low Load case.
- Turned off the Kontiki 1 Wind (19INR0099a) generating facility in all study cases as it is inactive as per the ERCOT's March 2022 Generator Interconnection Status (GIS) report.
- Turned off the Kontiki 2 Wind (19INR0099b) generating facility in all study cases as it is inactive as per the ERCOT's March 2022 Generator Interconnection Status (GIS) report.
- Turned off the Taygete II Solar (21INR0233) generating facility in all study cases as it is inactive as per the ERCOT's March 2022 Generator Interconnection Status (GIS) report.
- Added the 202.31 MW BRP Hydra BESS facility to all study cases.
- Adjusted the MW capacity of the Crossett BESS facility to match the ERCOT's March 2022 Generator Interconnection Status (GIS) report to all study cases.
- Adjusted the MW capacity of the Swoose II BESS facility to match the ERCOT's March 2022 Generator Interconnection Status (GIS) report to all study cases.
- Disabled the Laredo VFT and added a generator to represent the power flows on the VFT.
- EPE performed several transfer analyses to identify the appropriate reactive power limits associated with the HVDC project(s). Based on several tests, EPE identified below Qmax and Qmin limits for the each HVDC project.
    - Bakersfield HVDC Interconnection – Qmax: 2,500 MVAr and Qmin: -1,000 MVAr
    - Solstice HVDC Interconnection – Qmax: 2,500 MVAr and Qmin: -2,500 MVAr

Table 2: Study Area Generation Dispatch Levels

Bus	Name	ID	Summer Pgen (MW) (Base Case Dispatch)	Summer Pmax (MW)	HWLL Pgen (MW) (Base Case Dispatch)	HWLL Pmax (MW)	Generator Status
130331	Orion NWP Indian Mesa Wind Farm	W1	27.08	91.80	67.12	91.80	Existing
130831	King Mt. Wind Ranch	W1	23.51	79.70	58.28	79.70	Existing
130731			23.51	79.70	58.28	79.70	

Bus	Name	ID	Summer Pgen (MW) (Base Case Dispatch)	Summer Pmax (MW)	HWLL Pgen (MW) (Base Case Dispatch)	HWLL Pmax (MW)	Generator Status
130931			11.94	40.50	29.61	40.50	
130631			23.51	79.70	58.28	79.70	
131031	Indian Mesa Wind Farm I & II (Desert Sky 1-2)	W1	19.40	65.79	48.11	65.79	Existing
131035		W3	7.05	23.90	17.48	23.90	
131032		W2	19.408	65.79	48.11	65.79	
131034		W4	4.33	14.70	10.75	14.70	
130431	FPL Energy Pecos Wind (Woodward Mt.) 1-2	W1	27.11	91.90	67.20	91.90	Existing
130531			25.37	86.00	62.88	86.00	
131141	Forest Creek 1	W1	36.63	124.20	90.82	124.20	Existing
131142	Sand Bluff 1	W2	26.55	90.00	65.81	90.00	Existing
131455	Sherbino Mesa Wind Farm 2	W1	38.94	132.00	96.52	132.00	Existing
131851	Notrees-1	W1	27.31	92.60	67.71	92.60	Existing
131851		W2	17.7	60.00	43.87	60.00	
180751	Capricorn Ridge Wind Project 1	W1	68.35	231.70	169.42	231.70	Existing
181351	Goat Wind	W1	23.6	80.00	58.50	80.00	Existing
181351	Goat Wind - phase 2	W2	20.53	69.60	50.89	69.60	Existing
180756	Capricorn Ridge Wind Project 3	W1	59.26	200.90	146.90	200.90	Existing
180753	Capricorn Ridge Wind Project 2	W1	44.10	149.50	109.31	149.50	Existing
180758	Capricorn Ridge IV	W1	35.84	121.50	88.84	121.50	Existing
181251	Langford Wind Power	W1	47.18	159.96	116.96	159.96	Existing
181751	FERMI	W1	35.96	121.90	89.13	121.90	Existing
181752		W2	8.08	27.40	20.03	27.40	
181651	Barilla Solar	S1	17.6	22.00	0	22.00	Existing
182201	Wilson Ranch	W1	58.85	199.50	145.87	199.50	Existing
170200	Bryan Solar	S1	7.99	9.99	0	9.99	Existing
132211	Rattlesnake W 1	W1	30.75	104.26	76.23	104.26	Existing
132212		W2	30.38	103.00	75.31	103.00	
132481	RIGGINS	S1	120.00	150.00	0	150.00	Existing
132831	LASSO (SolaireHolman)	S1	40.00	50.00	0	50.00	Existing
132991	Niels Bohr (BearKat Wind A)	W1	57.99	196.60	143.75	196.60	Existing
132431	West Texas Solar	S1	88.16	110.20	0	110.20	Existing
132436	SIRIUS_UNIT2	S2	39.28	49.10	0	49.10	Existing
132332	RE Roserock Solar	S1	63.04	78.80	0	78.80	Existing
132333		S2	63.04	78.80	0	78.80	
132781	CASL_GAP (Castle Gap Solar)	S1	144.00	180.00	0	180.00	Existing
132941	SPTX12B (CED Upton Solar)	S1	126.00	157.50	0	157.50	Existing
132731	East Pecos Solar	S1	96.88	121.10	0	121.10	Existing
182052	RTS 1 Wind	W1	47.20	160.00	116.99	160.00	Existing
132631	HICKMAN (Santa Rita Wind)	W1	44.98	152.50	111.51	152.50	Existing
132681		W2	43.51	147.50	107.85	147.50	
133841	Waymark Solar	S1	145.60	182.00	0	182.00	Existing
180758	BlueBell Solar	S1	24.00	30.00	0	30.00	Existing
182303	Phoebe Solar	S1	100.11	125.14	0	125.14	Existing

Bus	Name	ID	Summer Pgen (MW) (Base Case Dispatch)	Summer Pmax (MW)	HWLL Pgen (MW) (Base Case Dispatch)	HWLL Pmax (MW)	Generator Status
182305		S2	102.44	128.05	0	128.05	
133341	West of Pecos Solar	S1	80.00	101.00	0	101.00	Existing
134751	Fowler Ranch	S1	120.00	152.50	0	152.50	Existing
134091	Oberon Solar	S1	144.00	180.00	0	180.00	Existing
134591	Queen Solar Phase I	S1	82.00	102.50	0	102.50	Existing
134592		S2	82.00	102.50	0	102.50	
133992	Ranchero Wind	W1	44.25	150.00	109.68	150.00	Existing
133995		W2	44.25	150.00	109.68	150.00	
134593	Queen Solar Phase II	S3	78.00	97.50	0	97.50	Existing
134594		S4	86.00	107.50	0	107.50	
182501	Rambler Solar	S1	160.00	200.00	0	200.00	Existing
134291	Oxy Solar	S1	13.44	16.80	0	16.80	Existing
134901	Greasewood Solar	S1	99.68	124.60	0	124.60	Existing
134902		S2	104.32	130.40	0	130.40	
183071	BlueBell Solar II	S2	80.00	100.00	0	100.00	Existing
183072		S2	12.00	15.00	0	15.00	
182651	RTS 2 Wind	W1	26.52	89.90	65.73	89.90	Existing
182652		W2	26.52	89.90	65.73	89.90	
182721	Aviator Wind	W1	53.13	180.12	131.70	180.12	Existing
182723		W2	42.96	145.64	106.49	145.64	
182725		W3	58.78	199.26	145.70	199.26	
134241	Taygete Solar	S1	100.72	125.90	0	125.90	Existing
134243		S2	103.12	128.90	0	128.90	
134491	High Lonesome Wind	W1	13.57	46.00	33.64	46.00	Existing
134492		W1	15.34	52.00	38.02	52.00	
134493		W2	36.13	122.50	89.57	122.50	
134494		W3	37.642	127.60	93.30	127.60	
134495		W4	29.97	101.60	74.29	101.60	
134851	High Lonesome Wind Phase II	W1	7.46	25.30	18.50	25.30	Existing
134852			7.46	25.30	18.50	25.30	
135321	RE Maplewood 2a Solar	S1	177.60	222.00	0	222.00	Existing
135322	RE Maplewood 2b Solar	S2	22.40	28.00	0	28.00	Existing
182351	Oveja Wind	W1	44.60	151.20	110.56	151.20	Existing
182352		W2	44.60	151.20	110.56	151.20	
183172	Galloway Solar	S1	205.60	257.00	0	257.00	Existing
135011	Titan Solar	S1	109.44	136.80	0	136.80	Existing
135012		S2	104.88	131.10	0	131.10	
135111	Aragorn Solar	S1	148.00	185.00	0	185.00	Existing
182151	Emerald Grove Solar	S1	86.40	108.00	0	108.00	Proposed
133041	Harald (BearKat Wind B)	W2	47.81	162.10	118.53	162.10	Proposed
170441	Cactus Flats Wind	W1	43.77	148.40	108.51	148.40	Proposed
180751	Capricorn Ridge	W1	68.35	231.70	169.42	231.70	Proposed
180753			44.10	149.50	109.31	149.50	
180756	Capricorn Ridge	W1	59.26	200.90	146.90	200.90	Proposed
180758			35.84	121.50	88.84	121.50	
131031	Desert Sky Wind	W1	19.40	65.79	48.11	65.79	Proposed
131032		W2	19.40	65.79	48.11	65.79	
131034		W4	4.33	14.70	10.75	14.70	
131035		W3	7.05	23.90	17.48	23.90	

Bus	Name	ID	Summer Pgen (MW) (Base Case Dispatch)	Summer Pmax (MW)	HWLL Pgen (MW) (Base Case Dispatch)	HWLL Pmax (MW)	Generator Status
133441	Lacy Creek wind	W1	42.03	151.30	104.20	151.30	Proposed
133491		W2	44.25	150.00	109.68	150.00	
130331	Indian Mesa	W1	27.08	91.80	67.12	91.80	Proposed
130431	PECOS WIND 1 (WOODWARD)	W1	27.11	91.90	67.20	91.90	Proposed
130531	PECOS WIND 2 (WOODWARD)	W1	25.37	86.00	62.88	86.00	Proposed
182601	Norton Solar	S1	100.00	125.00	0	125.00	Proposed
131455	Sherbino II Wind repower	W1	38.94	132.00	96.52	132.00	Proposed
134652	White Mesa Wind	W1	44.92	152.30	110.04	152.30	Proposed
134654	White Mesa 2 Wind	W2	4.10	13.90	10.04	13.90	Proposed (Turned on and dispatched in HWLL Case)
134654		W3	54.07	183.30	132.44	183.30	
134655		W4	5.48	18.60	13.44	18.60	
134655		W5	39.08	132.50	95.74	132.50	
182771	Maverick Creek Wind West	W1	59.47	201.60	147.41	201.60	Proposed
182772		W2	3.27	11.10	8.12	11.10	
182773		W3	9.91	33.60	24.57	33.60	
182774		W4	6.54	22.20	16.23	22.20	
182780	Maverick Creek Wind East	W1	21.06	71.40	52.21	71.40	Proposed
182781		W2	9.82	33.30	24.35	33.30	
183121		W7	6.49	22.00	16.09	22.00	
183122		W8	5.90	20.00	14.62	20.00	
183123		W9	22.65	76.80	56.16	76.80	
183221	Galloway 2 Solar	S1	88.00	110.00	0	110.00	Proposed
183351	Concho Valley Solar	S1	127.84	159.80	0	159.80	Proposed
130328	Odessa-Ector Unit 2 (Block 2) Uprate Repower	Gas	206.00	206.00	58.9806	217.00	Proposed
135581	Queen BESS	BT	Offline	51.06	0	± 51.06	Proposed
132944	SP TX-12B BESS	BT	Offline	25.12	0	± 25.12	Proposed
135571	High Lonesome BESS	BT	Offline	51.06	0	± 51.06	Proposed
135481	Crossett Power Batt 1	BT	Offline	103.00	0	± 103.00	Proposed
135482	Crossett Power Batt 2	BT	Offline	100.00	0	± 100.00	Proposed
135491	Flower Valley II Batt	BT	Offline	100.98	0	± 100.98	Proposed
135461	Swoose II	BT	Offline	100.98	0	± 100.98	Proposed
60016	BRP Hydra BESS	BT	Offline	202.31	0	± 202.31	Proposed (Added and dispatched in HWLL Case)
135591	BRP Pavo BESS	BT	Offline	176.85	0	± 176.85	Proposed

Pre-Existing Thermal Overloads

EPE performed a steady state contingency analysis in TARA using the study cases to identify the pre-existing thermal limitations overloading prior to the addition of the proposed HVDC project(s), each separately and independently.

Below **Table 2** and **Table 3** represent summary of the pre-existing thermal violations for both HVDC import and export scenarios, respectively. The detailed results of pre-existing thermal overloads which could most limit the import and export capability for HVDC interconnection project(s) under study, can be found for each contingency category in **Appendix A.** Contingency descriptions for all contingencies noted in this report can be found in **Pre-Existing Thermal** Overloads: Import Scenario


Bakersfield_Export_Pre-Existing.xlsx


Solstice_Export_Pre-Existing.xlsx

Appendix B. Further, the thermal overloads identified under the single contingency conditions (N-1) are highlighted in gray.

It is to be noted that below pre-existing thermal overloads are mainly triggered by system and other generation projects dispatch conditions prior to interconnection of the proposed HVDC project at the POI(s) under study. Further, EPE evaluated extreme event multiple outage contingencies which includes P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) combinations. These conditions are very unlikely to happen in the real-time operations, which could reduce the number of the pre-existing thermal overloads identified under these extreme contingency conditions.

Table 3: Pre-Existing Thermal Overloads – ERCOT Import

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
Bakersfield Interconnection	Blue Acres to South Midland line ckt 1	138	123.16	--	121.5	--
	Sand Lake Switch to Cedarvale Sub TNP line ckt 1	138	122.67	113.59	149.48	133.41
	Sand Lake Switch to Cedarvale Sub TNP line ckt 2	138	122.67	113.59	149.48	133.41
	Wink Sub to Wink TNP line ckt 2	138	115.44	108.67	127.29	116.03
	Coalson Draw POI to Cottonwood TNP line ckt 1	138	112.63	104	118.54	104.82
	Cedarvale Sub TNP to Cedarvale Customer Substation line ckt 1	138	105.17	104.76	119.51	104.44
	Sand Lake Switch Autotransformer #2	345/138	103.96	--	118.24	107.73
	Sand Lake Switch Autotransformer #1	345/138	103.78	--	118.04	107.55
	Flat Top TNP to Pig Creek line ckt 1	138	103.32	--	157.18	113.72
	Wolfbone Tap TNP to Wolfbone TNP line ckt 1	138	100.52	--	120.95	--
	Airport TNP to Leon Creek TNP line ckt 1	138	--	102.43	118.76	133.1
	Dewey Lake Tap to Polecat Creek Switch line ckt 1	138	--	111.77	--	112.33
	Longshore Switch to Consavvy_5 line ckt 1	345	--	101.45	--	122.83

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	Barilla Draw TNP to Flat Top TNP line ckt 1	138	--	--	151.8	108.96
	Scharbauer POI to Turnbaugh Corner Switch line ckt 1	138	--	--	149.16	--
	Holt Switch to Turnbaugh Corner Switch line ckt 1	138	--	--	148.51	101.54
	General Tire Switch to Southwestern Portland Tap line ckt 1	138	--	--	144.39	102.87
	Odessa EHV Switch to Yarbrough Sub line ckt 1	138	--	--	141.2	103.39
	Scharbauer POI to Notrees Southeast POI line ckt 1	138	--	--	141.1	--
	Southwestern Portland Tap to Edwards Tap line ckt 1	138	--	--	140.79	101.86
	Notrees Southeast POI to Blockline Pod line ckt 1	138	--	--	139.91	--
	Saddleback TNP to Barilla Draw TNP line ckt 1	138	--	--	138.99	--
	Blockline Pod to Amburguey_8 line ckt 1	138	--	--	136.5	--
	Judkins to Edwards Tap line ckt 1	138	--	--	133.38	--
	Yucca Drive Switch to Amburguey_8 line ckt 1	138	--	--	132.68	--
	Odessa EHV Switch Autotransformer #2	345/138	--	--	131.89	119.74
	Sandhlta2_T8 to Pecos Trails Pod line ckt 1	138	--	--	131.61	--
	Sandhlta2_T8 to Yarbrough Sub line ckt 1	138	--	--	131.5	--
	Monahans Tap 2 to Pecos Trails Pod line ckt 1	138	--	--	128.82	--
	Judkins to Sandhills Tap line ckt 1	138	--	--	126.19	--
	Rexall to General Tire Switch line ckt 1	138	--	--	122.94	--
	Odessa EHV Switch to Trigas Odessa Tap line ckt 1	138	--	--	121.78	--
	Wolf Switching Station to Monahans Tap 2 line ckt 1	138	--	--	116.93	--
	Cedarvale Sub TNP to Mivida TNP line ckt 1	138	--	--	115.75	100.48
	Midessa South Switch Autotransformer #1	345/138	--	--	114.58	108.15
	Salt Draw Tap TNP to Saddleback TNP line ckt 1	138	--	--	113.57	--
	Tombstone to Lynx line ckt 1	138	--	--	113.05	117.41
	Fort Stockton Plant to Tombstone line ckt 1	138	--	--	113	117.35

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	Moss Switch to Shin Oak Pod line ckt 1	138	--	--	111.4	--
	IH 20 TNP to Salt Draw Tap TNP line ckt 1	138	--	--	110.05	--
	Odessa EHV Switch to Big Three Odessa Tap line ckt 1	138	--	--	108.25	118.35
	Big Three Odessa Tap to Odessa Southwest line ckt 1	138	--	--	108.25	118.36
	Mivida TNP to Fishhook Switching Station line ckt 1	138	--	--	107.12	100.45
	Alpine to Bronco line ckt 1	138	--	--	106.64	--
	Nscrane_8 to Arco line ckt 1	138	--	--	105.26	--
	Cedarvale Sub TNP to TNP Bonesprings Tap line ckt 1	138	--	--	105.12	--
	Yucca Drive Switch to Shin Oak Pod line ckt 1	138	--	--	103.13	--
	TNP Bonesprings Tap to Fishhook Switching Station line ckt 1	138	--	--	102.06	--
	Rio Pecos to Crane LCRA line ckt 1	138	--	--	101.44	--
	Odessa to Trigas Odessa Tap line ckt 1	138	--	--	101.41	--
	Midessa South Switch to Consavvy_5 line ckt 1	345	--	--	--	129.2
	Odessa North to Odessa line ckt 1	138	--	--	--	120.52
	Moss Switch to Odessa Southwest line ckt 1	138	--	--	--	113.6
	Midessa South Switch to Odessa EHV Switch line ckt 1	345	--	--	--	109.33
	Barstow Northwest to Sand Lake Switch line ckt 1	138	--	--	--	102.61
Solstice Interconnection	Blue Acres to South Midland line ckt 1	138	123.18	--	121.49	--
	Sand Lake Switch to Cedarvale Sub TNP line ckt 1	138	119.97	110.7	147.72	131.75
	Sand Lake Switch to Cedarvale Sub TNP line ckt 2	138	119.97	110.7	147.72	131.75
	Wink Sub to Wink TNP line ckt 2	138	114.2	107.91	124.68	113.82
	Coalson Draw POI to Cottonwood TNP line ckt 1	138	113.9	104.51	111.58	104.93
	Flat Top TNP to Pig Creek line ckt 1	138	105.2	--	147.78	130.35
	Sand Lake Switch Autotransformer #2	345/138	103.88	--	119.56	109.03
	Sand Lake Switch Autotransformer #1	345/138	103.7	--	119.37	108.85
	Cedarvale Sub TNP to Cedarvale Customer Substation line ckt 1	138	103.66	102.96	105.92	106.09

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	Barilla Draw TNP to Flat Top TNP line ckt 1	138	100.74	--	143.52	127.5
	Airport TNP to Leon Creek TNP line ckt 1	138	--	105.39	123.4	168.44
	Dewey Lake Tap to Polecat Creek Switch line ckt 1	138	--	111.45	--	112.13
	Longshore Switch to Consavvy_5 line ckt 1	345	--	101.49	--	122.92
	Scharbauer POI to Turnbaugh Corner Switch line ckt 1	138	--	--	137.57	139.35
	Holt Switch to Turnbaugh Corner Switch line ckt 1	138	--	--	136.57	141.53
	General Tire Switch to Southwestern Portland Tap line ckt 1	138	--	--	134.52	152.96
	Saddleback TNP to Barilla Draw TNP line ckt 1	138	--	--	132.4	117.8
	Southwestern Portland Tap to Edwards Tap line ckt 1	138	--	--	131.48	151.87
	Odessa EHV Switch to Yarbrough Sub line ckt 1	138	--	--	130.95	161.43
	Scharbauer POI to Notrees Southeast POI line ckt 1	138	--	--	130.19	131.79
	Notrees Southeast POI to Blockline Pod line ckt 1	138	--	--	129.05	130.69
	Odessa EHV Switch Autotransformer #2	345/138	--	--	126.45	121.35
	Blockline Pod to Amburguey_8 line ckt 1	138	--	--	126.34	128.06
	Judkins to Edwards Tap line ckt 1	138	--	--	124.59	145.5
	Yucca Drive Switch to Amburguey_8 line ckt 1	138	--	--	123.31	127.06
	Sandhlta2_T8 to Yarbrough Sub line ckt 1	138	--	--	122.81	156.6
	Sandhlta2_T8 to Pecos Trails Pod line ckt 1	138	--	--	122.68	156.49
	Odessa EHV Switch to Trigas Odessa Tap line ckt 1	138	--	--	120.85	--
	Monahans Tap 2 to Pecos Trails Pod line ckt 1	138	--	--	120.77	154.51
	Judkins to Sandhills Tap line ckt 1	138	--	--	118.06	139.44
	Tombstone to Lynx line ckt 1	138	--	--	116.83	149.57
	Fort Stockton Plant to Tombstone line ckt 1	138	--	--	116.67	149.5
	Rexall to General Tire Switch line ckt 1	138	--	--	114.91	130.35
	Midessa South Switch Autotransformer #1	345/138	--	--	113.89	105.44

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	Cedarvale Sub TNP to Mivida TNP line ckt 1	138	--	--	112.78	100.45
	Wolf Switching Station to Monahans Tap 2 line ckt 1	138	--	--	112.34	151.65
	Alpine to Bronco line ckt 1	69	--	--	109.87	--
	Salt Draw Tap TNP to Saddleback TNP line ckt 1	138	--	--	109.23	--
	Odessa EHV Switch to Big Three Odessa Tap line ckt 1	138	--	--	106.95	127.97
	Big Three Odessa Tap to Odessa Southwest line ckt 1	138	--	--	106.93	127.98
	Moss Switch to Shin Oak Pod line ckt 1	138	--	--	106.87	125.28
	IH 20 TNP to Salt Draw Tap TNP line ckt 1	138	--	--	105.96	--
	Nscrane_8 to Arco line ckt 1	138	--	--	105.17	--
	Mivida TNP to Fishhook Switching Station line ckt 1	138	--	--	104.35	--
	Fort Stockton Plant to Leon Creek TNP line ckt 1	138	--	--	104.16	--
	Cedarvale Sub TNP to TNP Bonesprings Tap line ckt 1	138	--	--	102.4	--
	Odessa to Trigas Odessa Tap line ckt 1	138	--	--	100.64	--
	Rio Pecos to Crane LCRA line ckt 1	138	--	--	100.24	--
	Odessa North to Odessa line ckt 1	138	--	--	--	130.56
	Midessa South Switch to Consavvy_5 line ckt 1	345	--	--	--	129.32
	Sandhills Tap to Wolf Switching Station line ckt 1	138	--	--	--	124.42
	Moss Switch to Odessa Southwest line ckt 1	138	--	--	--	123.21
	Yucca Drive Switch to Shin Oak Pod line ckt 1	138	--	--	--	118.51
	Midessa South Switch to Odessa EHV Switch line ckt 1	345	--	--	--	109.44
	Rio Pecos to Lynx line ckt 1	138	--	--	--	107
	Barstow Northwest to Sand Lake Switch line ckt 1	138	--	--	--	101.72

Table 4: Pre-Existing Thermal Overloads – ERCOT Export

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
Bakersfield Interconnection	Blue Acres to South Midland line ckt 1	138	123.16	--	121.5	--
	Sand Lake Switch to Cedarvale Sub TNP line ckt 1	138	122.67	121.86	149.48	148.58
	Sand Lake Switch to Cedarvale Sub TNP line ckt 2	138	122.67	121.86	149.48	148.58
	Wink Sub to Wink TNP line ckt 2	138	115.44	114.58	127.29	123.71
	Coalson Draw POI to Cottonwood TNP line ckt 1	138	112.63	103.94	118.54	104.82
	Cedarvale Sub TNP to Cedarvale Customer Substation line ckt 1	138	105.17	105.3	119.51	104.76
	Sand Lake Switch Autotransformer #2	345/138	103.96	--	118.24	--
	Sand Lake Switch Autotransformer #1	345/138	103.78	--	118.04	--
	Flat Top TNP to Pig Creek line ckt 1	138	103.32	--	157.18	119.62
	Wolfbone Tap TNP to Wolfbone TNP line ckt 1	138	100.52	--	120.95	--
	Dewey Lake Tap to Polecat Creek Switch line ckt 1	138	--	127.36	--	127.29
	Longshore Switch to Consavvy_5 line ckt 1	345	--	118.8	--	147.28
	Rocky Road to East Stiles line ckt 1	138	--	106.21	--	108.85
	Midessa South Switch to Consavvy_5 line ckt 1	345	--	105.28	--	158.54
	Rocky Road to Stiles line ckt 1	138	--	102.88	--	105.5
	Dewey Lake Tap to Meyersdrw_P8 line ckt 1	138	--	101.7	--	101.57
	Crmwd 7 Tap to Meyersdrw_P8 line ckt 1	138	--	101.62	--	101.49
	Spraberry Switch to Crmwd 7 Tap line ckt 1	138	--	100.71	--	100.57
	Airport TNP to Leon Creek TNP line ckt 1	138	--	100.7	118.76	131.32
	General Tire Switch to Southwestern Portland Tap line ckt 1	138	--	100.49	144.39	128.38
	Odessa EHV Switch to Yarbrough Sub line ckt 1	138	--	100.47	141.2	132.16
	Barilla Draw TNP to Flat Top TNP line ckt 1	138	--	--	151.8	--
	Scharbauer POI to Turnbaugh Corner Switch line ckt 1	138	--	--	149.16	118.52
	Holt Switch to Turnbaugh Corner Switch line ckt 1	138	--	--	148.51	120.68

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	Scharbauer POI to Notrees Southeast POI line ckt 1	138	--	--	141.1	111.17
	Southwestern Portland Tap to Edwards Tap line ckt 1	138	--	--	140.79	127.31
	Notrees Southeast POI to Blockline Pod line ckt 1	138	--	--	139.91	110.08
	Saddleback TNP to Barilla Draw TNP line ckt 1	138	--	--	138.99	--
	Blockline Pod to Amburguey_8 line ckt 1	138	--	--	136.5	107.51
	Judkins to Edwards Tap line ckt 1	138	--	--	133.38	120.98
	Yucca Drive Switch to Amburguey_8 line ckt 1	138	--	--	132.68	106.54
	Odessa EHV Switch Autotransformer #2	345/138	--	--	131.89	109.19
	Sandhlta2_T8 to Pecos Trails Pod line ckt 1	138	--	--	131.61	127.7
	Sandhlta2_T8 to Yarbrough Sub line ckt 1	138	--	--	131.5	127.84
	Monahans Tap 2 to Pecos Trails Pod line ckt 1	138	--	--	128.82	125.79
	Judkins to Sandhills Tap line ckt 1	138	--	--	126.19	115.01
	Rexall to General Tire Switch line ckt 1	138	--	--	122.94	109.88
	Odessa EHV Switch to Trigas Odessa Tap line ckt 1	138	--	--	121.78	--
	Wolf Switching Station to Monahans Tap 2 line ckt 1	138	--	--	116.93	122.95
	Cedarvale Sub TNP to Mivida TNP line ckt 1	138	--	--	115.75	106.69
	Midessa South Switch Autotransformer #1	345/138	--	--	114.58	130.59
	Salt Draw Tap TNP to Saddleback TNP line ckt 1	138	--	--	113.57	--
	Tombstone to Lynx line ckt 1	138	--	--	113.05	113.69
	Fort Stockton Plant to Tombstone line ckt 1	138	--	--	113	113.62
	Moss Switch to Shin Oak Pod line ckt 1	138	--	--	111.4	105.66
	IH 20 TNP to Salt Draw Tap TNP line ckt 1	138	--	--	110.05	--
	Odessa EHV Switch to Big Three Odessa Tap line ckt 1	138	--	--	108.25	--
	Big Three Odessa Tap to Odessa Southwest line ckt 1	138	--	--	108.25	--
	Mivida TNP to Fishhook Switching Station line ckt 1	138	--	--	107.12	112.93
	Alpine to Bronco line ckt 1	69	--	--	106.64	--

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	Nscrane_8 to Arco line ckt 1	138	--	--	105.26	--
	Cedarvale Sub TNP to TNP Bonesprings Tap line ckt 1	138	--	--	105.12	106.74
	Yucca Drive Switch to Shin Oak Pod line ckt 1	138	--	--	103.13	--
	TNP Bonesprings Tap to Fishhook Switching Station line ckt 1	138	--	--	102.06	109.09
	Rio Pecos to Crane LCRA line ckt 1	138	--	--	101.44	--
	Odessa to Trigas Odessa Tap line ckt 1	138	--	--	101.41	--
	Midessa South Switch to Odessa EHV Switch line ckt 1	345	--	--	--	135.52
	Quail Switch to Consavvy_5 line ckt 1	345	--	--	--	118.58
	Quail Switch to Odessa EHV Switch line ckt 1	345	--	--	--	118.47
	Sand Lake Switch Autotransformer #2	345/138	--	--	--	113.63
	Sand Lake Switch Autotransformer #1	345/138	--	--	--	113.44
	Consavvy_5 to Longshore Switch line ckt 1	345	--	--	--	104.5
	Odessa North to Odessa line ckt 1	138	--	--	--	104.08
	Barstow Northwest to Sand Lake Switch line ckt 1	138	--	--	--	103.29
Solstice Interconnection	Blue Acres to South Midland line ckt 1	138	123.18	--	121.49	--
	Sand Lake Switch to Cedarvale Sub TNP line ckt 1	138	119.97	117.92	147.72	146.48
	Sand Lake Switch to Cedarvale Sub TNP line ckt 2	138	119.97	117.92	147.72	146.48
	Wink Sub to Wink TNP line ckt 2	138	114.2	113.67	124.68	121
	Coalson Draw POI to Cottonwood TNP line ckt 1	138	113.9	104.19	111.58	104.91
	Flat Top TNP to Pig Creek line ckt 1	138	105.2	--	147.78	120.8
	Sand Lake Switch Autotransformer #2	345/138	103.88	--	119.56	--
	Sand Lake Switch Autotransformer #1	345/138	103.7	--	119.37	--
	Cedarvale Sub TNP to Cedarvale Customer Substation line ckt 1	138	103.66	103.37	105.92	104.52
	Dewey Lake Tap to Polecat Creek Switch line ckt 1	138	--	126.95	--	126.97
	Longshore Switch to Consavvy_5 line ckt 1	345	--	118.81	--	147.53

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	Rocky Road to East Stiles line ckt 1	138	--	106.09	--	109
	Midessa South Switch to Consavvy_5 line ckt 1	345	--	105.3	--	158.41
	Airport TNP to Leon Creek TNP line ckt 1	138	--	103.05	123.4	158.21
	Rocky Road to Stiles line ckt 1	138	--	102.77	--	105.65
	Dewey Lake Tap to Meyersdrw_P8 line ckt 1	138	--	101.41	--	101.29
	Crmwd 7 Tap to Meyersdrw_P8 line ckt 1	138	--	101.32	--	101.21
	Spraberry Switch to Crmwd 7 Tap line ckt 1	138	--	100.41	--	100.3
	Barilla Draw TNP to Flat Top TNP line ckt 1	138	--	--	143.52	--
	Scharbauer POI to Turnbaugh Corner Switch line ckt 1	138	--	--	137.57	119.16
	Holt Switch to Turnbaugh Corner Switch line ckt 1	138	--	--	136.57	121.31
	General Tire Switch to Southwestern Portland Tap line ckt 1	138	--	--	134.52	142.27
	Saddleback TNP to Barilla Draw TNP line ckt 1	138	--	--	132.4	--
	Southwestern Portland Tap to Edwards Tap line ckt 1	138	--	--	131.48	141.15
	Odessa EHV Switch to Yarbrough Sub line ckt 1	138	--	--	130.95	148.51
	Scharbauer POI to Notrees Southeast POI line ckt 1	138	--	--	130.19	111.92
	Notrees Southeast POI to Blockline Pod line ckt 1	138	--	--	129.05	110.84
	Blockline Pod to Amburguey_8 line ckt 1	138	--	--	126.34	108.31
	Judkins to Edwards Tap line ckt 1	138	--	--	124.59	134.68
	Yucca Drive Switch to Amburguey_8 line ckt 1	138	--	--	123.31	107.36
	Sandhlta2_T8 to Yarbrough Sub line ckt 1	138	--	--	122.81	143.87
	Sandhlta2_T8 to Pecos Trails Pod line ckt 1	138	--	--	122.68	143.77
	Odessa EHV Switch to Trigas Odessa Tap line ckt 1	138	--	--	120.85	--
	Monahans Tap 2 to Pecos Trails Pod line ckt 1	138	--	--	120.77	141.7
	Odessa EHV Switch Autotransformer #2	345/138	--	--	120.4	111.68
	Judkins to Sandhills Tap line ckt 1	138	--	--	118.06	128.51
	Tombstone to Lynx line ckt 1	138	--	--	116.83	140.84

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	Fort Stockton Plant to Tombstone line ckt 1	138	--	--	116.67	140.75
	Rexall to General Tire Switch line ckt 1	138	--	--	114.91	121.43
	Midessa South Switch Autotransformer #1	345/138	--	--	113.89	126.33
	Cedarvale Sub TNP to Mivida TNP line ckt 1	138	--	--	112.78	102.13
	Wolf Switching Station to Monahans Tap 2 line ckt 1	138	--	--	112.34	138.71
	Alpine to Bronco line ckt 1	69	--	--	109.87	--
	Salt Draw Tap TNP to Saddleback TNP line ckt 1	138	--	--	109.23	--
	Odessa EHV Switch to Big Three Odessa Tap line ckt 1	138	--	--	106.95	140.78
	Big Three Odessa Tap to Odessa Southwest line ckt 1	138	--	--	106.93	140.8
	Moss Switch to Shin Oak Pod line ckt 1	138	--	--	106.87	106.31
	IH 20 TNP to Salt Draw Tap TNP line ckt 1	138	--	--	105.96	--
	Nscrane_8 to Arco line ckt 1	138	--	--	105.17	--
	Mivida TNP to Fishhook Switching Station line ckt 1	138	--	--	104.35	108.48
	Fort Stockton Plant to Leon Creek TNP line ckt 1	138	--	--	104.16	--
	Cedarvale Sub TNP to TNP Bonesprings Tap line ckt 1	138	--	--	102.4	102.45
	Odessa to Trigas Odessa Tap line ckt 1	138	--	--	100.64	--
	Rio Pecos to Crane LCRA line ckt 1	138	--	--	100.24	--
	Odessa North to Odessa line ckt 1	138	--	--	--	144.79
	Moss Switch to Odessa Southwest line ckt 1	138	--	--	--	135.76
	Midessa South Switch to Odessa EHV Switch line ckt 1	345	--	--	--	135.5
	Quail Switch to Consavvy_5 line ckt 1	345	--	--	--	118.69
	Quail Switch to Odessa EHV Switch line ckt 1	345	--	--	--	118.56
	Sand Lake Switch Autotransformer #2	345/138	--	--	--	115.17
	Sand Lake Switch Autotransformer #1	345/138	--	--	--	114.98
	Sandhills Tap to Wolf Switching Station line ckt 1	138	--	--	--	113.33
	Midland East to Midland County Northwest Switch line ckt 1	345	--	--	--	105.24

Point of Interconnection	Pre-Existing Thermal Overloads	Voltage (kV)	2028 SUM Single Contingency Condition Worst Loading (%)	2025 HWLL Single Contingency Condition Worst Loading (%)	2028 SUM Multiple Contingency Condition Worst Loading (%)	2025 HWLL Multiple Contingency Condition Worst Loading (%)
	TNP Bonesprings Tap to Fishhook Switching Station line ckt 1	138	--	--	--	104.83
	Consavvy_5 to Longshore Switch line ckt 1	345	--	--	--	104.74
	Rio Pecos to Lynx line ckt 1	138	--	--	--	103.19
	Riverview Sub to Gas Pad line ckt 1	138	--	--	--	103.08
	Rio Pecos to Oxy Tap Switch line ckt 1	138	--	--	--	102.58
	Rio Pecos to North Mccamey line ckt 1	138	--	--	--	101.83
	Barstow Northwest to Sand Lake Switch line ckt 1	138	--	--	--	101.77
	North Mccamey to Oxy Tap Switch line ckt 1	138	--	--	--	101.47

Transfer Analysis Study Results

EPE performed a transmission analysis to identify thermal and voltage violations triggered by addition of the new HVDC interconnection project(s) from two POI(s) within the study area, each separately and independently up to 3,000 MW. **Table 4** summarizes first positive Import and Export capacity that may be available from the POIs under study, each separately and independently under different contingency conditions. The complete list of transfer limits which could result in the curtailment of all study area generation, including HVDC interconnection facilities, can be found in Appendix C.

25HWLL_Contingency Definitions_Bakersfile

28SUM_Contingency Definitions_Solstice.xls

Table 5: First Available Positive Import/Export Potential

Contingency Condition	Bakersfield				Solstice			
	SUM (MW)		HWLL (MW)		SUM (MW)		HWLL (MW)	
	Import	Export	Import	Export	Import	Export	Import	Export
N-1 (P1, P2.1)	2,648	2,369	417	783	1,300	1,037	180	659
P2.2, P2.3, P4, P5	328	1,859	948	116	1,229	1,024	352	1,685
P3/N-G-1	111	1,795	417	408	517	751	180	626
ERCOT3/N-A-1	1,178	1,961	1,763	399	265	273	330	1,600
ERCOT2/ (G-1 + ERCOT1)	111	1,795	1,830	408	517	751	845	16
P6/N-1-1	108	1,975	855	410	516	780	845	2,259
P7	108	1,975	1,830	410	516	836	845	61
P1 + ERCOT1 (P7)	203	295	609	8	61	24	166	100
ERCOT1(P7) + ERCOT1(P7)	226	257	79	225	471	78	286	6

Bakersfield HVDC Interconnection: Import Scenario
Summer Peak and High Wind Low Load Results

For the base case study area generation dispatch scenario, the following sections describe in detail the most limiting thermal overloads for the HVDC interconnection in each study case for the applicable contingency categories.

N-1 Results

Under the N-1 contingency conditions, steady state study revealed:

- For the outage of the Sand Lake Switch 345/138 kV Autotransformer #1, the Sand Lake Switch 345/138 kV Autotransformer #2 experienced a thermal overload when the Bakersfield HVDC import capacity exceeded 417.3 MW in the 2025 High Wind Low Load case.

Bus Fault, Internal Breaker Fault, Breaker Failure and Relay Failure Results

Under Bus Fault, Internal Breaker Fault, Breaker Failure and Relay Failure conditions, steady state results revealed:

- For bus fault on the 345 kV bus at Sand Lake Switch station, Barilla Draw TNP to Saddleback TNP 138 kV line experienced a thermal overload when the Bakersfield HVDC import capacity exceeded 327.9 MW in the 2028 Summer Peak case.

P3/N-G-1 Results

Under N-G-1 contingency conditions, steady state results revealed:

- For the outage of the White Mesa Wind Unit #2 and the Sand Lake Switch to Solstice 345 kV double circuit line, the Flat Top TNP to Barilla Draw TNP 138 kV line experienced a thermal overload when the Bakersfield HVDC import capacity exceeded 110.7 MW in the 2028 Summer Peak case.

ERCOT3/N-A-1 Results

Under N-A-1 contingency conditions, steady state results revealed:

- For the outage of the Sand Lake Switch 345/138 kV Autotransformer #2 and the Sand Lake Switch to Solstice 345 kV double circuit line, the Barilla Draw TNP to Saddleback TNP 138 kV line experienced a thermal overload when the Bakersfield HVDC import capacity exceeded 1178.3 MW in the 2028 Summer Peak case.

ERCOT2/ (G-1 + ERCOT1) Results

Under ERCOT2 contingency conditions, steady state results revealed:

- For the outage of the White Mesa Wind Unit #2 and the Sand Lake Switch to Solstice 345 kV double circuit line, the Flat Top TNP to Barilla Draw TNP 138 kV line experienced a thermal overload when the Bakersfield HVDC import capacity exceeded 110.7 MW in the 2028 Summer Peak case.

P6/N-1-1 Results

Under N-1-1 contingency conditions, steady state results revealed:

- For the loss of the Sand Lake Switch to Solstice 345 kV double circuit line, the Flat Top TNP to Barilla Draw TNP 138 kV line experienced a thermal overload when the Bakersfield HVDC import capacity exceeded 108 MW in the 2028 Summer Peak case.

Common Structure conditions (P7) Results

Under P7 contingency conditions, steady state results revealed:

- For the outage of the Sand Lake Switch to Solstice 345 kV double circuit line, the Flat Top TNP to Barilla Draw TNP 138 kV line experienced a thermal overload when the Bakersfield HVDC import capacity exceeded 108 MW in the 2028 Summer Peak case.

P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) Results

Under P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) contingency conditions, steady state results revealed:

- For the outage of the Moss EHV Switch to Odessa to Wolf Switching Station 345 kV line and Sand Lake Switch to Solstice 345 kV double circuit line, the Barilla Draw TNP to Saddleback TNP 138 kV line experienced a thermal overload when the Bakersfield HVDC import capacity exceeded 79 MW in the 2025 High Wind Low Load case.

Bakersfield HVDC Interconnection: Export Scenario

Summer Peak and High Wind Low Load Results

For the base case study area generation dispatch scenario, the following sections describe in detail the most limiting thermal overloads for the HVDC interconnection in each study case for the applicable contingency categories.

N-1 Results

Under the N-1 contingency conditions, steady state study revealed:

- For the outage of the Midessa South Switch to Consavyy_5 345 kV line, the Consavyy_5 to Quail Switch 345 kV line experienced a thermal overload when the Bakersfield HVDC export capacity exceeded 782.5 MW in the 2025 High Wind Low Load case.

Bus Fault, Internal Breaker Fault, Breaker Failure and Relay Failure Results

Under Bus Fault, Internal Breaker Fault, Breaker Failure and Relay Failure conditions, steady state results revealed:

- For breaker failure on the 345 kV bus at Morgan Creek SES station, Longshore Switch to Consavvy_5 345 kV line experienced a thermal overload when the Bakersfield HVDC export capacity exceeded 115.7 MW in the 2025 High Wind Low Load case.

P3/N-G-1 Results

Under N-G-1 contingency conditions, steady state results revealed:

- For the outage of the High Lonesome BESS unit and the Bakersfield to Cedar Cayon 345 kV double circuit line, the Midessa South Switch to Odessa EHV Switch 345 kV line experienced a thermal overload when the Bakersfield HVDC export capacity exceeded 408.4 MW in the 2025 High Wind Low Load case.

ERCOT3/N-A-1 Results

Under N-A-1 contingency conditions, steady state results revealed:

- For the outage of the North McCamey 345/138 kV Autotransformer #1 and the Bakersfield to Cedar Cayon 345 kV double circuit line, the Midessa South Switch to Odessa EHV Switch 345 kV

line experienced a thermal overload when the Bakersfield HVDC export capacity exceeded 398.7 MW in the 2025 High Wind Low Load case.

ERCOT2/ (G-1 + ERCOT1) Results

Under ERCOT2 contingency conditions, steady state results revealed:

- For the outage of the High Lonesome BESS unit and the Bakersfield to Cedar Cayon 345 kV double circuit line, the Midessa South Switch to Odessa EHV Switch 345 kV line experienced a thermal overload when the Bakersfield HVDC export capacity exceeded 408.4 MW in the 2025 High Wind Low Load case.

P6/N-1-1 Results

Under N-1-1 contingency conditions, steady state results revealed:

- For the loss of the Bakersfield to Cedar Cayon 345 kV double circuit line, the Midessa South Switch to Odessa EHV Switch 345 kV line experienced a thermal overload when the export HVDC import capacity exceeded 409.7 MW in the 2025 High Wind Low Load case.

Common Structure conditions (P7) Results

Under P7 contingency conditions, steady state results revealed:

- For the outage of the Bakersfield to Cedar Cayon 345 kV double circuit line, the Midessa South Switch to Odessa EHV Switch 345 kV line experienced a thermal overload when the Bakersfield HVDC export capacity exceeded 409.7 MW in the 2025 High Wind Low Load case.

P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) Results

Under P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) contingency conditions, steady state results revealed:

- For the outage of the King Mountain Switch to Odessa 345 kV line and Bakersfield to Cedar Cayon 345 kV double circuit line, the Rocky Road to Stiles 138 kV line experienced a thermal overload when the Bakersfield HVDC export capacity exceeded 7.6 MW in the 2025 High Wind Low Load case.

Solstice HVDC Interconnection: Import Scenario

Summer Peak and High Wind Low Load Results

For the base case study area generation dispatch scenario, the following sections describe in detail the most limiting thermal overloads for the HVDC interconnection in each study case for the applicable contingency categories.

N-1 Results

Under the N-1 contingency conditions, steady state study revealed:

- For the outage of the Sand Lake Switch 345/138 kV Autotransformer #1, the Sand Lake Switch 345/138 kV Autotransformer #2 experienced a thermal overload when the Solstice HVDC import capacity exceeded 179.8 MW in the 2025 High Wind Low Load case.

Bus Fault, Internal Breaker Fault, Breaker Failure and Relay Failure Results

Under Bus Fault, Internal Breaker Fault, Breaker Failure and Relay Failure conditions, steady state results revealed:

- For bus fault on the 345 kV bus at Sand Lake Switch station, the Pig Creek to Flat Top TNP 138 kV line experienced a thermal overload when the Solstice HVDC import capacity exceeded 352 MW in the 2025 High Wind Low Load case.

P3/N-G-1 Results

Under N-G-1 contingency conditions, steady state results revealed:

- For the outage of the High Lonesome BESS unit and the Sand Lake Switch 345/138 kV Autotransformer #1, the Sand Lake Switch 345/138 kV Autotransformer #2 experienced a thermal overload when the Solstice HVDC import capacity exceeded 179.8 MW in the 2025 High Wind Low Load case.

ERCOT3/N-A-1 Results

Under N-A-1 contingency conditions, steady state results revealed:

- For the outage of the Solstice 345/138 kV Autotransformer #1 and the Sand Lake Switch to Solstice 345 kV double circuit line, the Solstice 345/138 kV Autotransformer #2 experienced a thermal overload when the Solstice HVDC import capacity exceeded 265.2 MW in the 2028 Summer Peak case.

ERCOT2/ (G-1 + ERCOT1) Results

Under ERCOT2 contingency conditions, steady state results revealed:

- For the outage of the White Mesa Wind Unit #2 and the Sand Lake Switch to Solstice 345 kV double circuit line, the Barilla Draw TNP to Saddleback TNP 138 kV line experienced a thermal overload when the Solstice HVDC import capacity exceeded 517 MW in the 2028 Summer Peak case.

P6/N-1-1 Results

Under N-1-1 contingency conditions, steady state results revealed:

- For the loss of the Sand Lake Switch to Solstice 345 kV double circuit line, the Barilla Draw TNP to Saddleback TNP 138 kV line experienced a thermal overload when the Solstice HVDC import capacity exceeded 515.6 MW in the 2028 Summer Peak case.

Common Structure conditions (P7) Results

Under P7 contingency conditions, steady state results revealed:

- For the outage of the Sand Lake Switch to Solstice 345 kV double circuit line, the Barilla Draw TNP to Saddleback TNP 138 kV line experienced a thermal overload when the Solstice HVDC import capacity exceeded 515.6 MW in the 2028 Summer Peak case.

P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) Results

Under P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) contingency conditions, steady state results revealed:

- For the outage of the Musquiz to Pig Creek 138 kV line and Sand Lake Switch to Solstice 345 kV double circuit line, Salt Draw Tap TNP to IH 20 TNP 138 kV line experienced a thermal overload when the Solstice HVDC import capacity exceeded 61.2 MW in the 2028 Summer Peak case.

Solstice HVDC Interconnection: Export Scenario
Summer Peak and High Wind Low Load Results

For the base case study area generation dispatch scenario, the following sections describe in detail the most limiting thermal overloads for the HVDC interconnection in each study case for the applicable contingency categories.

N-1 Results

Under the N-1 contingency conditions, steady state study revealed:

- For the outage of the Midessa South Switch to Consavyy_5 345 kV line, the Consavyy_5 to Quail Switch 345 kV line experienced a thermal overload when the Solstice HVDC export capacity exceeded 659.1 MW in the 2025 High Wind Low Load case.

Bus Fault, Internal Breaker Fault, Breaker Failure and Relay Failure Results

Under Bus Fault, Internal Breaker Fault, Breaker Failure and Relay Failure conditions, steady state results revealed:

- For breaker failure on the 345 kV bus at Solstice station, the Bakersfield to Solstice 345 kV line experienced a thermal overload when the Solstice HVDC export capacity exceeded 1023.6 MW in the 2028 Summer Peak case.

P3/N-G-1 Results

Under N-G-1 contingency conditions, steady state results revealed:

- For the outage of the White Mesa Wind Unit #2 and the Quail Switch to Odessa EHV Switch 345 kV line, the Midessa South Switch to Odessa EHV Switch 345 kV line experienced a thermal overload when the Solstice HVDC export capacity exceeded 626.1 MW in the 2025 High Wind Low Load case.

ERCOT3/N-A-1 Results

Under N-A-1 contingency conditions, steady state results revealed:

- For the outage of the Solstice 345/138 kV Autotransformer #1 and the Solstice to Bakersfield 345 kV double circuit line, the Solstice 345/138 kV Autotransformer #2 experienced a thermal overload when the Solstice HVDC export capacity exceeded 273.1 MW in the 2028 Summer Peak case.

ERCOT2/ (G-1 + ERCOT1) Results

Under ERCOT2 contingency conditions, steady state results revealed:

- For the outage of the White Mesa Wind Unit #3 and the Moss EHV Switch to Odessa to Wolf Switching Station 345 kV line, the General Tire Switch to Southwestern Portland Tap kV line experienced a thermal overload when the Solstice HVDC export capacity exceeded 16.1 MW in the 2025 High Wind Low Load case.

P6/N-1-1 Results

Under N-1-1 contingency conditions, steady state results revealed:

- For the loss of the Sand Lake Switch to Solstice 345 kV double circuit line, the Bakersfield to Solstice 345 kV line experienced a thermal overload when the Solstice HVDC export capacity exceeded 779.9 MW in the 2028 Summer Peak case.

Common Structure conditions (P7) Results

Under P7 contingency conditions, steady state results revealed:

- For the outage of the Moss EHV Switch to Odessa to Wolf Switching Station 345 kV line, the Odessa EHV Switch to Yarbrough Sub 138 kV line experienced a thermal overload when the Solstice HVDC export capacity exceeded 60.6 MW in the 2025 High Wind Low Load case.

P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) Results

Under P1 + ERCOT1(P7) and ERCOT1(P7) + ERCOT1(P7) contingency conditions, steady state results revealed:

- For the outage of the Moss EHV Switch to Odessa to Wolf Switching Station 345 kV line and Twelvemile to Cedar Canyon to Noelke 345 kV line, the Odessa to Odessa North 138 kV line experienced a thermal overload when the Solstice HVDC export capacity exceeded 5.7 MW in the 2025 High Wind Low Load case.

Below **Table 6** and **Table 7** summarize the available import capacity under single and multiple contingency conditions respectively from the investigated POIs, each separately and independently; whereas **Table 8** and **Table 9** summarize the available export capacity under single and contingency conditions respectively from the POIs under study.

Table 6: Thermal Overloads - ERCOT Import – Single Contingency Conditions (N-1)

Point of Interconnection	Limiting Transmission Element	Single Limiting Contingency SUM	Single Limiting Contingency HWLL	Voltage (kV)	2028 SUM Single Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Single Contingency Condition Lowest Transfer Limit (MW)
Bakersfield Interconnection	Flat Top TNP to Barilla Draw TNP line ckt 1	P7	P7	138	108	2,338
	Barilla Draw TNP to Saddleback TNP line ckt 1	P7	--	138	1,328	--
	Nevill Road Switch to North Mccamey line ckt 1	P7	P7	345	1,816	1,830
	Bakersfield to Nevill Road Switch line ckt 1	P7	P7	345	2,200	1,830
	Solstice to Sand Lake Switch line ckt 1	P1	--	345	2,648	--
	Solstice to Sand Lake Switch line ckt 2	P1	--	345	2,660	--
	Bakersfield to Solstice line ckt 2	P7	P7	345	2,758	2,744
	Bakersfield to Solstice line ckt 1	P7	P7	345	2,766	2,751
	Sand Lake Switch Autotransformer #2	--	P1	345/138	--	417
	Sand Lake Switch Autotransformer #1	--	P1	345/138	--	440
	Pig Creek to Flat Top TNP line ckt 1	--	P7	138	--	1,902
	North Mccamey to Crossover line ckt 1	--	P7	138	--	2,710
	Crossover to Palouse line ckt 1	--	P7	138	--	2,911
	Palouse to Wolfcamp line ckt 1	--	P7	138	--	2,911
	Wolfcamp to Santa Rita line ckt 1	--	P7	138	--	2,973
Solstice Interconnection	Barilla Draw TNP to Saddleback TNP line ckt 1	P7	P7	138	516	1,535

Point of Interconnection	Limiting Transmission Element	Single Limiting Contingency SUM	Single Limiting Contingency HWLL	Voltage (kV)	2028 SUM Single Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Single Contingency Condition Lowest Transfer Limit (MW)
	Solstice to Sand Lake Switch line ckt 1	P1	P1	345	1,300	1,690
	Solstice to Sand Lake Switch line ckt 2	P1	P1	345	1,305	1,695
	Saddleback TNP to Salt Draw Tap TNP line ckt 1	P7	P7	138	1,728	2,642
	Salt Draw Tap TNP to IH 20 TNP line ckt 1	P7	P7	138	1,883	2,802
	Sand Lake Switch Autotransformer #2	P7	P1	345/138	1,938	180
	Sand Lake Switch Autotransformer #1	P7	P1	345/138	1,965	191
	Solstice to Pig Creek line ckt 1	P7	P7	138	2,266	2,650
	Pig Creek to Flat Top TNP line ckt 1	--	P7	138	--	845
	Flat Top TNP to Barilla Draw TNP line ckt 1	--	P7	138	--	1,030
	Solstice Autotransformer #2	--	P7	345/138	--	2,189
	Solstice Autotransformer #1	--	P7	345/138	--	2,196

Table 7: Thermal Overloads - ERCOT Import – Multiple Contingency Conditions

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
Bakersfield Interconnection	Flat Top TNP to Barilla Draw TNP line ckt 1	P6/N-1-1	P7+P7	138	108	804
	Barilla Draw TNP to Saddleback TNP line ckt 1	P2-P6-LLA	P7+P7	138	328	79
	Nevill Road Switch to North Mccamey line ckt 1	P7+P7	P7+P7	345	561	397
	Bakersfield to Nevill Road Switch line ckt 1	P7+P7	P7+P7	345	750	399
	Solstice to Sand Lake Switch line ckt 1	P1+P7	P1+P7	345	746	1,357
	Solstice to Sand Lake Switch line ckt 2	P1+P7	P1+P7	345	760	1,371
	Bakersfield to Solstice line ckt 2	P6/N-1-1	P1+P7	345	841	827
	Bakersfield to Solstice line ckt 1	P6/N-1-1	P1+P7	345	843	835
	Sand Lake Switch Autotransformer #2	P7+P7	N-G-1	345/138	2,452	417
	Sand Lake Switch Autotransformer #1	P7+P7	N-G-1	345/138	2,490	440
	Pig Creek to Flat Top TNP line ckt 1	--	P7+P7	138	--	323
	North Mccamey to Crossover line ckt 1	P1+P7	P1+P7	138	2,051	1,765
	Crossover to Palouse line ckt 1	P1+P7	P1+P7	138	2,454	1,905
	Palouse to Wolfcamp line ckt 1	P1+P7	P1+P7	138	2,457	1,907

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
	Wolfcamp to Santa Rita line ckt 1	P1+P7	P1+P7	138	2,551	1,949
	Odessa Ehv Switch to Trigas Odessa Tap line ckt 1	P1+P7	--	138	982	--
	Owls to Big Lake line ckt 1	--	P1+P7	138	--	2,092
	Salt Draw Tap TNP to IH 20 TNP line ckt 1	P1+P7	P1+P7	138	203	2,343
	Rio Pecos to Crane LCRA line ckt 1	P7+P7	P7+P7	138	226	2,498
	Airport TNP to Leon Creek TNP line ckt 1	P1+P7	--	138	1,143	--
	Motorman to Crane East (LCRA) line ckt 1	P1+P7	--	138	1,331	--
	King Mountain Switch to Odessa Ehv Switch line ckt 1	P7+P7	P7+P7	345	1,384	1,674
	Crane East (LCRA) to Upton line ckt 1	P1+P7	P1+P7	138	1,414	2,898
	Upton to Benedum line ckt 1	P1+P7	--	138	1,578	--
	Solstice to Pig Creek line ckt 1	P1+P7	P1+P7	138	1,682	2,096
	North Mccamey to King Mountain Switch line ckt 1	P7+P7	P7+P7	345	1,901	1,676
	Arco to Pleasant Farms line ckt 1	P1+P7	--	138	2,014	--
	Castillo to Crane LCRA line ckt 1	P1+P7	--	138	2,036	--
	Nscrane_8 to Arco line ckt 1	P1+P7	P1+P7	138	2,084	2,834
	North Mccamey Autotransformer #1	P1+P7	ERCOT3/ N-A-1	345/138	2,117	2,546
	North Mccamey to Rio Pecos line ckt 1	P1+P7	P1+P7	138	2,204	2,248
	North Mccamey to Oxy Tap Switch line ckt 1	P1+P7	P1+P7	138	2,206	2,272
	Oxy Tap Switch to Rio Pecos line ckt 1	P1+P7	P1+P7	138	2,228	2,205
	North Mccamey Autotransformer #2	P1+P7	ERCOT3/ N-A-1	345/138	2,373	2,767
	Trigas Odessa Tap to Odessa line ckt 1	P1+P7	--	138	2,429	--
	Rio Pecos to Lynx line ckt 1	P1+P7	P1+P7	138	2,796	2,398
	Tarbush TNP to Pig Creek line ckt 1	P1+P7	P1+P7	138	2,886	2,081
	Fort Stockton Plant to Leon Creek TNP line ckt 1	P1+P7	--	138	2,984	--
	Solstice Autotransformer #2	P1+P7	ERCOT3/ N-A-1	345/138	2,990	2,443
	Solstice Autotransformer #1	P1+P7	ERCOT3/ N-A-1	345/138	2,995	2,445
	Saddleback TNP to Salt Draw Tap TNP line ckt 1	--	P1+P7	138	--	2,147
	Santa Rita to Owls line ckt 1	--	P1+P7	138	--	2,154
Solstice Interconnection	Barilla Draw TNP to Saddleback TNP line ckt 1	ERCOT3/N-A-1	P1+P7	138	440	**166**
	Solstice to Sand Lake Switch line ckt 1	P1+P7	P1+P7	345	471	789
	Solstice to Sand Lake Switch line ckt 2	P1+P7	P1+P7	345	477	796
	Saddleback TNP to Salt Draw Tap TNP line ckt 1	P2-P6-LLA	P7+P7	138	1,287	286
	Salt Draw Tap TNP to IH 20 TNP line ckt 1	P1+P7	P7+P7	138	**61**	504
	Sand Lake Switch Autotransformer #2	P7+P7	N-G-1	345/138	1,436	180
	Sand Lake Switch Autotransformer #1	P7+P7	N-G-1	345/138	1,459	191

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
	Solstice to Pig Creek line ckt 1	P7+P7	P7+P7	138	1,122	1,408
	Pig Creek to Flat Top TNP line ckt 1	--	P2-P6-LLA	138	--	352
	Flat Top TNP to Barilla Draw TNP line ckt 1	--	P2-P6-LLA	138	--	546
	Solstice Autotransformer #2	ERCOT3/ N-A-1	ERCOT3/ N-A-1	345/138	265	330
	Solstice Autotransformer #1	ERCOT3/ N-A-1	ERCOT3/ N-A-1	345/138	267	331
	North Mccamey to Crossover line ckt 1	--	P7+P7	138	--	2,227
	Odessa Ehv Switch to Trigas Odessa Tap line ckt 1	P1+P7	--	138	1,140	--
	Pig Creek to Musquiz line ckt 1	P1+P7	P7+P7	138	1,531	2,193
	Motorman to Crane East (LCRA) line ckt 1	P1+P7	--	138	1,623	--
	Fort Stockton Switch to Ellenburger line ckt 1	P7+P7	P7+P7	138	1,625	1,990
	Nevill Road Switch to North Mccamey line ckt 1	P7+P7	P7+P7	345	1,673	1,704
	Crane East (LCRA) to Upton line ckt 1	P1+P7	--	138	1,696	--
	Rio Pecos to Crane LCRA line ckt 1	P7+P7	--	138	1,772	--
	Solstice to Fort Stockton Switch line ckt 1	P7+P7	P7+P7	138	1,850	2,200
	Ellenburger to Athey line ckt 1	P7+P7	P7+P7	138	1,872	2,213
	Upton to Benedum line ckt 1	P1+P7	--	138	1,939	--
	Bakersfield to Nevill Road Switch line ckt 1	P7+P7	P7+P7	345	1,969	1,706
	Tarbush TNP to Pig Creek line ckt 1	P1+P7	P1+P7	138	1,999	1,397
	King Mountain Switch to Odessa Ehv Switch line ckt 1	P7+P7	P7+P7	345	2,217	2,800
	Sand Lake Switch to Cedarvale Sub TNP line ckt 1	P7+P7	P7+P7	138	2,399	2,889
	Sand Lake Switch to Cedarvale Sub TNP line ckt 2	P7+P7	P7+P7	138	2,399	2,889
	Arco to Pleasant Farms line ckt 1	P1+P7	--	138	2,550	--
	Cedarvale Sub TNP to Mivida TNP line ckt 1	P6/N-1-1	P6/N-1-1	138	2,575	2,990
	Solstice to Bakersfield line ckt 2	P1+P7	P1+P7	345	2,643	2,912
	Solstice to Bakersfield line ckt 1	P1+P7	P1+P7	345	2,644	2,913
	Gas Pad to Riverview Sub line ckt 1	P1+P7	--	138	2,721	--
	Trigas Odessa Tap to Odessa line ckt 1	P1+P7	--	138	2,776	--
	Cedarvale Sub TNP to TNP Bonesprings Tap line ckt 1	P6/N-1-1	--	138	2,782	--
	TNP Bonesprings Tap to Fishhook Switching Station line ckt 1	P1+P7	--	138	2,890	--
	Mivida TNP to Fishhook Switching Station line ckt 1	P1+P7	--	138	2,920	--
	Fort Stockton Plant to Leon Creek TNP line ckt 1	--	P1+P7	138	--	1,093
	Solstice to Solstice line ckt 1	--	P1+P7	138	--	2,017

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
	Solstice to Fort Stockton Plant line ckt 1	--	P1+P7	138	--	2,094
	Palouse to Wolfcamp line ckt 1	--	P7+P7	138	--	2,423
	Crossover to Palouse line ckt 1	--	P7+P7	138	--	2,423
	Wolfcamp to Santa Rita line ckt 1	--	P7+P7	138	--	2,444
	Owls to Big Lake line ckt 1	--	P7+P7	138	--	2,594
	Santa Rita to Owls line ckt 1	--	P7+P7	138	--	2,647
	North Mccamey to King Mountain Switch line ckt 1	--	P7+P7	345	--	2,800

Table 8: Thermal Overloads - ERCOT Export – Single Contingency Conditions (N-1)

Point of Interconnection	Limiting Transmission Element	Single Limiting Contingency SUM	Single Limiting Contingency HWLL	Voltage (kV)	2028 SUM Single Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Single Contingency Condition Lowest Transfer Limit (MW)
Bakersfield Interconnection	Longshore Switch to Consavvy_5 line ckt 1	P7	--	345	**1,975**	--
	Nevill Road Switch to Bakersfield line ckt 1	P7	--	345	2,029	--
	North Mccamey to Nevill Road Switch line ckt 1	P7	--	345	2,294	--
	Consavvy_5 to Midessa South Switch line ckt 1	P1	--	345	2,369	--
	Quail Switch to Odessa EHV Switch line ckt 1	P1	P1	345	2,565	789
	Midessa South Switch to Odessa EHV Switch line ckt 1	--	P7	345	--	**410**
	Falcon Seaboard to Midland East line ckt 1	--	P7	345	--	552
	Consavvy_5 to Quail Switch line ckt 1	--	P1	345	--	783
	Longshore Switch to Consavvy_5 line ckt 1	--	P1	345	--	1,062
	Midessa South Switch Autotransformer #1	--	P7	345/138	--	1,414
	Cedar Cayon to Bakersfield line ckt 1	--	P1	345	--	1,475
	Cedar Cayon to Bakersfield line ckt 2	--	P1	345	--	1,475
	Noelke to Twlevemile line ckt 1	--	P1	345	--	2,034
	Noelke to Cedar Cayon line ckt 2	--	P1	345	--	2,034
	Twlevemile to Cedar Cayon line ckt 1	--	P1	345	--	2,034
	Schneeman Draw to Noelke line ckt 1	--	P1	345	--	2,477
	Schneeman Draw to Noelke line ckt 2	--	P1	345	--	2,477

Solstice Interconnection	Turnbaugh Corner Switch to Scharbauer Poi line ckt 1	P7	P7	138	**836**	651
	Holt Switch to Turnbaugh Corner Switch line ckt 1	P7	P7	138	879	555
	General Tire Switch to Southwestern Portland Tap line ckt 1	P7	--	138	914	--
	Wink Sub to Wink TNP line ckt 2	P7	P7	138	966	2,236
	Airport TNP to Leon Creek TNP line ckt 1	P7	P1	138	1,034	1,642
	Bakersfield to Solstice line ckt 2	P1	P1	345	1,037	875
	Bakersfield to Solstice line ckt 1	P1	P1	345	1,039	878
	Southwestern Portland Tap to Edwards Tap line ckt 1	P7	P7	138	1,070	106
	Lynx to Tombstone line ckt 1	P7	P7	138	1,136	163
	Tombstone to Fort Stockton Plant line ckt 1	P7	P7	138	1,156	167
	Scharbauer Poi to Notrees Southeast Poi line ckt 1	P7	P7	138	1,164	957
	Notrees Southeast Poi to Blockline Pod line ckt 1	P7	P7	138	1,214	1,005
	Odessa EHV Switch to Yarbrough Sub line ckt 1	P7	P7	138	1,325	**61**
	Blockline Pod to Amburguey_8 line ckt 1	P7	P7	138	1,339	1,109
	Edwards Tap to Judkins line ckt 1	P7	P7	138	1,417	407
	Amburguey_8 to Yucca Drive Switch line ckt 1	P7	P7	138	1,469	1,167
	Polecat Creek Switch to Dewey Lake Tap line ckt 1	P7	--	138	1,612	--
	Yarbrough Sub to Sandhlta2_T8 line ckt 1	P7	P7	138	1,655	219
	Sandhlta2_T8 to Pecos Trails Pod line ckt 1	P7	P7	138	1,662	225
	Judkins to Sandhills Tap line ckt 1	P7	P7	138	1,735	678
	Pecos Trails Pod to Monahans Tap 2 line ckt 1	P7	P7	138	1,735	317
	Longshore Switch to Consavvy_5 line ckt 1	P7	--	345	1,899	--
	Consavvy_5 to Midessa South Switch line ckt 1	P1	--	345	1,970	--
	Wink Sub to Wink TNP line ckt 1	P1	P1	138	2,025	1,995
	Monahans Tap 2 to Wolf Switching Station line ckt 1	P7	P7	138	2,115	442
	Quail Switch to Odessa EHV Switch line ckt 1	P1	P1	345	2,131	664
	Moss Switch to Shin Oak Pod line ckt 1	P7	P7	138	2,186	1,149
	Falcon Seaboard to Midland East line ckt 1	P7	P7	345	2,246	436
	Shin Oak Pod to Yucca Drive Switch line ckt 1	P7	P7	138	2,579	1,427
	Consavvy_5 to Quail Switch line ckt 1	--	P1	345	--	659
	Midessa South Switch to Odessa EHV Switch line ckt 1	--	P1	345	--	697
	Solstice to Solstice line ckt 1	--	P1	138	--	776
	Odessa to Odessa North line ckt 1	--	P7	138	--	803
	Fort Stockton Plant to Solstice line ckt 1	--	P1	138	--	853

	Longshore Switch to Consavvy_5 line ckt 1	--	P1	345	--	871
	Big Three Odessa Tap to Odessa Southwest line ckt 1	--	P7	138	--	1,039
	Odessa EHV Switch to Big Three Odessa Tap line ckt 1	--	P7	138	--	1,040
	Midessa South Switch Autotransformer #1	--	P7	345/138	--	1,132
	Odessa Southwest to Moss Switch line ckt 1	--	P7	138	--	1,303
	Sandhills Tap to Wolf Switching Station line ckt 1	--	P7	138	--	1,347
	Cedar Cayon to Bakersfield line ckt 1	--	P1	345	--	1,600
	Cedar Cayon to Bakersfield line ckt 2	--	P1	345	--	1,600

Table 9: Thermal Overloads - ERCOT Export – Multiple Contingency Conditions

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
Bakersfield Interconnection	Longshore Switch to Consavvy_5 line ckt 1	P1+P7	P2-P6-LLA	345	1,314	116
	Nevill Road Switch to Bakersfield line ckt 1	P7+P7	--	345	1,446	--
	North Mccamey to Nevill Road Switch line ckt 1	P7+P7	--	345	1,696	--
	Consavvy_5 to Midessa South Switch line ckt 1	P1+P7	P2-P6-LLA	345	761	1,127
	Quail Switch to Odessa EHV Switch line ckt 1	P1+P7	P2-P6-LLA	345	1,409	854
	Midessa South Switch to Odessa EHV Switch line ckt 1	P1+P7	P7+P7	345	1,513	372
	Falcon Seaboard to Midland East line ckt 1	P2-P6-NLLA	P2-P6-NLLA	345	1,859	457
	Consavvy_5 to Quail Switch line ckt 1	--	P2-P6-LLA	345	--	849
	Longshore Switch to Consavvy_5 line ckt 1	P1+P7	P2-P6-NLLA	345	2,086	1,224
	Midessa South Switch Autotransformer #1	P7+P7	P1+P7	345/138	1,555	87
	Cedar Cayon to Bakersfield line ckt 1	P6/N-1-1	P1+P7	345	2,290	1,033
	Cedar Cayon to Bakersfield line ckt 2	P2-P6-NLLA	P1+P7	345	2,290	1,033
	Noelke to Twlevemile line ckt 1	P6/N-1-1	P1+P7	345	2,482	1,577
	Noelke to Cedar Cayon line ckt 2	P6/N-1-1	P1+P7	345	2,482	1,577
	Twlevemile to Cedar Cayon line ckt 1	P6/N-1-1	P1+P7	345	2,483	1,577
	Schneeman Draw to Noelke line ckt 1	P6/N-1-1	P6/N-1-1	345	2,601	1,958
	Schneeman Draw to Noelke line ckt 2	P6/N-1-1	P6/N-1-1	345	2,601	1,958
	Turnbaugh Corner Switch to Scharbauer Poi line ckt 1	P7+P7	--	138	257	--

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
	Holt Switch to Turnbaugh Corner Switch line ckt 1	P7+P7	--	138	313	--
	Scharbauer Poi to Notrees Southeast Poi line ckt 1	P7+P7	--	138	636	--
	Notrees Southeast Poi to Blockline Pod line ckt 1	P7+P7	--	138	692	--
	Blockline Pod to Amburguey_8 line ckt 1	P7+P7	--	138	830	--
	Odessa EHV Switch to Yarbrough Sub line ckt 1	P7+P7	--	138	922	--
	Amburguey_8 to Yucca Drive Switch line ckt 1	P7+P7	P7+P7	138	980	1,060
	Wink Sub to Wink TNP line ckt 2	P1+P7	--	138	1,202	--
	Yarbrough Sub to Sandhlta2_T8 line ckt 1	P7+P7	--	138	1,278	--
	Sandhlta2_T8 to Pecos Trails Pod line ckt 1	P7+P7	--	138	1,285	--
	East Stiles to Rocky Road line ckt 1	P1+P7	--	138	1,291	--
	Pecos Trails Pod to Monahans Tap 2 line ckt 1	P7+P7	--	138	1,389	--
	Rocky Road to Stiles line ckt 1	P1+P7	P1+P7	138	1,500	8
	Twin Buttes to Hargrove line ckt 1	P1+P7	P1+P7	138	1,762	30
	Hargrove to Pumpjack line ckt 1	P1+P7	P1+P7	138	1,766	34
	Pumpjack to Jerry line ckt 1	P1+P7	P1+P7	138	1,790	62
	Monahans Tap 2 to Wolf Switching Station line ckt 1	P7+P7	--	138	1,814	--
	Polecat Creek Switch to Dewey Lake Tap line ckt 1	P1+P7	--	138	1,885	--
	Jerry to Russek Street line ckt 1	P1+P7	--	138	1,896	--
	Odessa EHV Switch to Big Three Odessa Tap line ckt 1	P1+P7	P1+P7	138	2,362	491
	Big Three Odessa Tap to Odessa Southwest line ckt 1	P1+P7	P1+P7	138	2,363	491
	Odessa to Odessa North line ckt 1	--	P1+P7	138	--	192
	Midland East to Midland County Northwest Switch line ckt 1	--	P2-P6-NLLA	345	--	314
	Odessa Southwest to Moss Switch line ckt 1	--	P1+P7	138	--	892
	Airport TNP to Leon Creek TNP line ckt 1	--	P1+P7	138	--	1,664
	Fort Stockton Plant to Solstice line ckt 1	--	P6/N-1-1	138	--	1,744
	Midessa South Switch to Jack Rabbit line ckt 1	--	P1+P7	138	--	2,091
	Solstice to Solstice line ckt 1	--	P6/N-1-1	138	--	2,257
Solstice Interconnection	Turnbaugh Corner Switch to Scharbauer Poi line ckt 1	P1+P7	ERCOT2	138	229	610
	Holt Switch to Turnbaugh Corner Switch line ckt 1	P1+P7	ERCOT2	138	269	515

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
	General Tire Switch to Southwestern Portland Tap line ckt 1	P1+P7	ERCOT2	138	262	16
	Wink Sub to Wink TNP line ckt 2	P1+P7	P1+P7	138	399	298
	Airport TNP to Leon Creek TNP line ckt 1	P1+P7	--	138	232	--
	Bakersfield to Solstice line ckt 2	P1+P7	ERCOT2	345	296	1,397
	Bakersfield to Solstice line ckt 1	P1+P7	ERCOT2	345	298	1,400
	Southwestern Portland Tap to Edwards Tap line ckt 1	P1+P7	ERCOT2	138	382	70
	Lynx to Tombstone line ckt 1	P1+P7	ERCOT2	138	593	157
	Tombstone to Fort Stockton Plant line ckt 1	P1+P7	ERCOT2	138	597	161
	Scharbauer Poi to Notrees Southeast Poi line ckt 1	P1+P7	ERCOT2	138	495	916
	Notrees Southeast Poi to Blockline Pod line ckt 1	P1+P7	ERCOT2	138	535	963
	Odessa EHV Switch to Yarbrough Sub line ckt 1	P1+P7	ERCOT2	138	582	24
	Blockline Pod to Amburguey_8 line ckt 1	P1+P7	ERCOT2	138	634	1,067
	Edwards Tap to Judkins line ckt 1	P1+P7	ERCOT2	138	655	374
	Amburguey_8 to Yucca Drive Switch line ckt 1	P1+P7	ERCOT2	138	738	1,105
	Polecat Creek Switch to Dewey Lake Tap line ckt 1	P2-P6-LLA	--	138	1,293	--
	Yarbrough Sub to Sandhlta2_T8 line ckt 1	P1+P7	ERCOT2	138	845	188
	Sandhlta2_T8 to Pecos Trails Pod line ckt 1	P1+P7	ERCOT2	138	850	193
	Judkins to Sandhills Tap line ckt 1	P1+P7	ERCOT2	138	906	636
	Pecos Trails Pod to Monahans Tap 2 line ckt 1	P1+P7	ERCOT2	138	909	280
	Longshore Switch to Consavvy_5 line ckt 1	P1+P7	--	345	1,271	--
	Consavvy_5 to Midessa South Switch line ckt 1	P1+P7	--	345	741	--
	Wink Sub to Wink TNP line ckt 1	--	--	138	--	--
	Monahans Tap 2 to Wolf Switching Station line ckt 1	P1+P7	ERCOT2	138	1,208	406
	Quail Switch to Odessa EHV Switch line ckt 1	P1+P7	N-G-1	345	1,394	1,190
	Moss Switch to Shin Oak Pod line ckt 1	P1+P7	ERCOT2	138	1,298	1,089
	Falcon Seaboard to Midland East line ckt 1	P2-P6-NLLA	P1+P7	345	1,359	1,282
	Shin Oak Pod to Yucca Drive Switch line ckt 1	P1+P7	ERCOT2	138	1,595	1,390
	Consavvy_5 to Quail Switch line ckt 1	--	N-G-1	345	--	1,186

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
	Midessa South Switch to Odessa EHV Switch line ckt 1	P1+P7	N-G-1	345	1,482	626
	Solstice to Solstice line ckt 1	--	--	138	--	--
	Odessa to Odessa North line ckt 1	P7+P7	ERCOT2	138	83	775
	Fort Stockton Plant to Solstice line ckt 1	--	--	138	--	--
	Longshore Switch to Consavvy_5 line ckt 1	--	--	345	--	--
	Big Three Odessa Tap to Odessa Southwest line ckt 1	P1+P7	ERCOT2	138	1,426	1,008
	Odessa EHV Switch to Big Three Odessa Tap line ckt 1	P1+P7	ERCOT2	138	1,426	1,008
	Midessa South Switch Autotransformer #1	P7+P7	ERCOT2	345/138	1,522	1,068
	Odessa Southwest to Moss Switch line ckt 1	P7+P7	ERCOT2	138	137	1,265
	Sandhills Tap to Wolf Switching Station line ckt 1	P7+P7	ERCOT2	138	78	1,312
	Cedar Cayon to Bakersfield line ckt 1	--	ERCOT3/ N-A-1	345	--	1,600
	Cedar Cayon to Bakersfield line ckt 2	--	ERCOT3/ N-A-1	345	--	1,600
	Odessa EHV Switch Autotransformer #2	P1+P7	P1+P7	345/138	24	156
	Solstice Autotransformer #2	ERCOT3/N-A-1	--	138/345	273	--
	Solstice Autotransformer #1	ERCOT3/N-A-1	--	138/345	275	--
	Rio Pecos to Lynx line ckt 1	P7+P7	P2-P6-LLA	138	353	1,685
	Tarbush TNP to Pig Creek line ckt 1	P1+P7	--	138	742	--
	Fishhook Switching Station to Mivida TNP line ckt 1	P7+P7	P6/N-1-1	138	802	2,259
	Fishhook Switching Station to TNP Bonesprings Tap line ckt 1	P7+P7	--	138	856	--
	Mivida TNP to Cedarvale Sub TNP line ckt 1	P7+P7	--	138	887	--
	TNP Bonesprings Tap to Cedarvale Sub TNP line ckt 1	P7+P7	--	138	890	--
	Rexall to General Tire Switch line ckt 1	P1+P7	P1+P7	138	931	201
	Odessa EHV Switch to Trigas Odessa Tap line ckt 1	P1+P7	--	138	1,004	--
	Riverview Sub to Gas Pad line ckt 1	P7+P7	--	138	1,043	--
	Ellenburger to Fort Stockton Switch line ckt 1	P7+P7	--	138	1,074	--
	East Stiles to Rocky Road line ckt 1	P1+P7	--	138	1,441	--
	Rocky Road to Stiles line ckt 1	P7+P7	--	138	1,943	--
	Quarry Field Switch Autotransformer #1	ERCOT3/N-A-1	ERCOT3/ N-A-1	345/138	2,404	1,746

Point of Interconnection	Limiting Transmission Element	Multiple Limiting Contingency SUM	Multiple Limiting Contingency HWLL	Voltage (kV)	2028 SUM Multiple Contingency Condition Lowest Transfer Limit (MW)	2025 HWLL Multiple Contingency Condition Lowest Transfer Limit (MW)
	Quarry Field Switch Autotransformer #2	ERCOT3/N-A-1	ERCOT3/ N-A-1	345/138	2,405	1,746
	Odessa EHV Switch to Rexall line ckt 1	P7+P7	--	138	2,510	--
	Leon Creek TNP to Fort Stockton Plant line ckt 1	--	P1+P7	138	--	100
	Midland East to Midland County Northwest Switch line ckt 1	--	P1+P7	345	--	1,275
	Twlevemile to Cedar Cayon line ckt 1	--	N-G-1	345	--	2,114
	Noelke to Twlevemile line ckt 1	--	N-G-1	345	--	2,114
	Noelke to Cedar Cayon line ckt 2	--	N-G-1	345	--	2,115

Voltage Violations Study Results

EPE also identified several voltage violations under both single and multiple contingency condition for both POI(s) under study, due to the interconnection of the large size of the project. Both low and high voltage violation were observed depending upon the system and generation dispatch conditions. Addition of the reactive support devices could help to bring the voltage limits within the permissible range. However, it should be noted that a detailed stability analysis is recommended to identify the voltage stability limit for the import and/or export capabilities under the various system conditions.

The complete list of voltage violations can be found in **Appendix E**.

Conclusion

A steady state contingency and transfer analysis were performed to determine the reliability impacts of interconnecting the HVDC facility at Bakersfield and Solstice 345 kV substations, each separately and independently on the ERCOT transmission system.

The results of the power flow analysis identified several contingent constraints and system constraints that require mitigation. Details for all thermal and voltage violations are included in the **Appendix C** and **Appendix E**.

Based on the results of the study, it has determined that the proposed HVDC interconnection project(s) may not be able to import or export up to the full 3,000 MW capacity without addition of transmission upgrades which could resolve the identified thermal and voltage violations. Further, it is recommended to perform a detailed stability analysis to identify the voltage stability limit for the import and/or export capabilities under the various system conditions.

Appendix A
Worst Thermal Overload Results

Pre-Existing Thermal Overloads: Import Scenario


Bakersfield_Import_Pre-Existing.xlsx


Solstice_Import_Pre-Existing.xlsx

Pre-Existing Thermal Overloads: Import Scenario


Bakersfield_Export_Pre-Existing.xlsx


Solstice_Export_Pre-Existing.xlsx

Appendix B
Contingency Descriptions

Contingency Descriptions for the 2028 Summer Peak Case


28SUM_Contingency Definitions_Bakersfilec


28SUM_Contingency Definitions_Solstice.xls

Contingency Descriptions for the 2025 High Wind Low Load Case


25HWLL_Contingency Definitions_Bakersfilec


28SUM_Contingency Definitions_Solstice.xls

Appendix C
Complete List of Transfer Limits Results

HVDC Interconnection: Import Scenario


Bakersfield_Import_Transfer Limits.xlsx


Solstice_Import_Transfer Limits.xlsx

HVDC Interconnection: Export Scenario


Bakersfield_Export_Transfer Limits.xlsx


Solstice_Export_Transfer Limits.xlsx

Appendix D
Non-Converged Contingencies and DC Limits

HVDC Interconnection: Import Scenario

Non Convg_DC Results_Bakersfield_Im

Non-Convg_DC Results_Solstice_Impo

HVDC Interconnection: Export Scenario

Non Convg_DC Results_Bakersfield_Ex

Non Convg_DC Results_Solstice_Expo

Appendix E
Voltage Violations

HVDC Interconnection: Import Scenario

Bakersfield_Import_Voltage Violations.xlsx

Solstice_Import_Voltage Violation.xlsx

HVDC Interconnection: Export Scenario

Bakersfield_Export_Voltage Violations.xlsx

Solstice_Export_Voltage Violations.xlsx

ATTACHMENT 7

nFRONT SECURITY CONSTRAINED ECONOMIC DISPATCH (SCED) MODEL

HVDC Bi-Pole El Paso Electric - ERCOT

Grid United LLC

May 3, 2022

nFRONT CONSULTING LLC
Power Industry Planners • Analysts • Advisors

Agenda

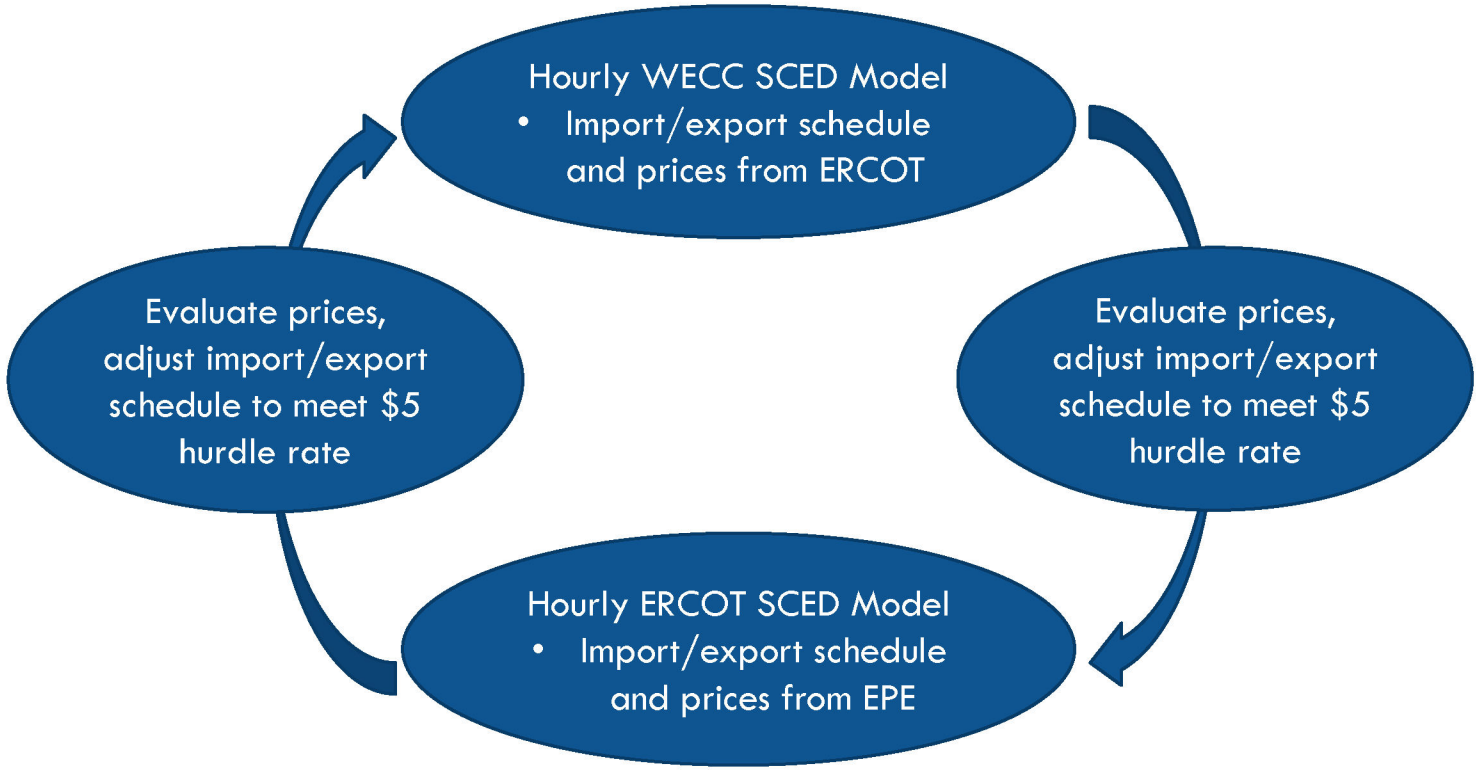
- Methodology
- Results
  - Binding constraints
  - Capacity Factors
  - Annual Production Cost Summary
- ERCOT Assumptions
  - Queue
  - Demand
- EPE Assumptions
  - Queue
  - Demand

Methodology

- nFront performed Security Constrained Economic Dispatch ("SCED") on the ERCOT system and EPE-WECC system.
- Grid United's HVDC tie was modeled for up to 1,500 MW bidirectional transfer between Bakersfield 345 kV (ERCOT) and Caliente 345 kV (EPE), performed for a single 2027 Case year.
- The Transfer required price differential greater than $5 from ERCOT and EPE to allow Import/Export.
- Iterative analysis to determine Import and Export without violating required minimum price limit.

Methodology

- WECC and ERCOT modeled independently with import/export schedules on the tie passed back and forth between them
- Modeled in a "status quo" world: WECC balancing authorities schedule and coordinate subject to OATT hurdle rates. Limited zero-cost inter-BA transfer capability available during dispatch to simulate CAISO-EIM participation
- Objective: maximize total benefit of the tie subject to $5 hurdle rate out of both ERCOT and EPE



Limitations

- Modeled the HVDC tie as a transactional wheel (a hurdle), not as a fixed/sunk cost
  - If modeled as a fixed sunk cost, results would improve, e.g. more production cost savings
- No losses were assumed across the HVDC tie
- Not an evaluation of interconnection/transmission service availability
  - No AC power flow evaluating voltage, credible double continencies, etc. (only DC power flow for N-0 and N-1)
  - No stability, short circuit, harmonics, EMTP, etc.
- Did not seek to optimize the size or interconnection location of the tie
- Additional benefits to reliability not considered, e.g., reduced LOLE to both ERCOT and EPE, ability to transact operating reserves, etc.
- Changes to large scale transmission, Carbon costs in either market that would impact MEC or ERCOT West GTC increases would have material impact on results presented.

Results

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Annual Production Cost

- Both ERCOT and El Paso Electric see reductions in annual production cost (APC)
- Majority of flows are out of ERCOT and into EPE

Direction	MWh
EPE to ERCOT	344,920
ERCOT to EPE	1,539,419

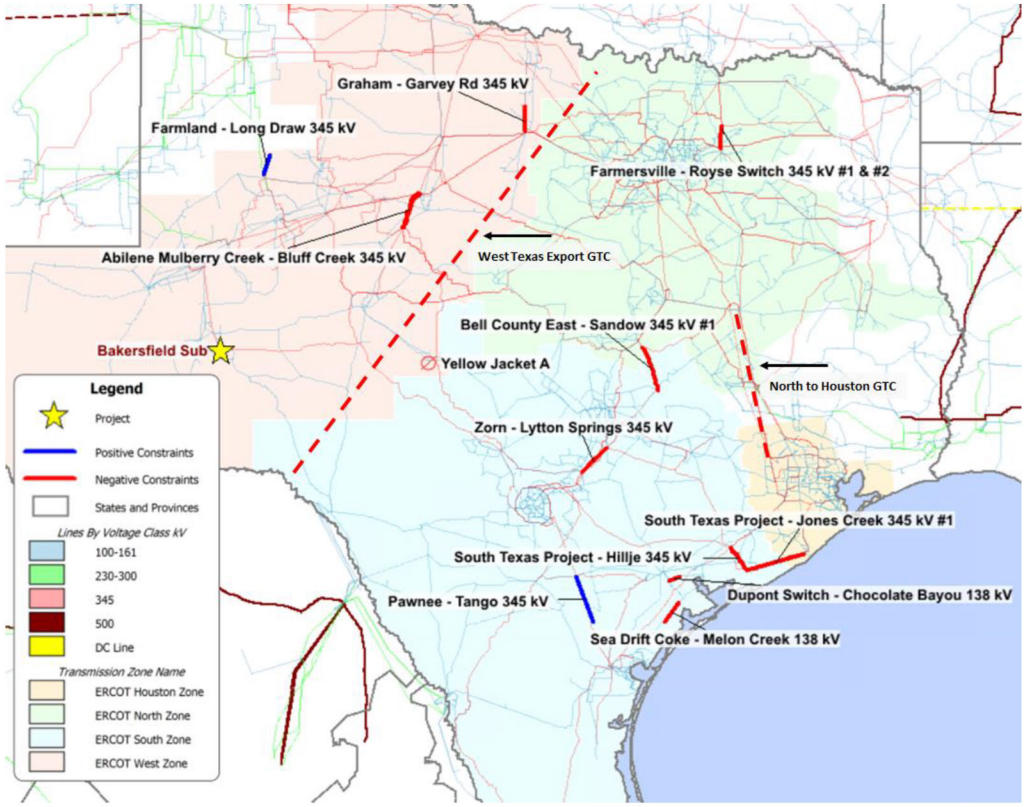
El Paso Electric	
Base Case Annual Production Cost (no HVDC)	$225,426,878
Change Case Annual Production Cost (with HVDC)	$180,575,521
Gross APC Savings	**$44,851,357**
Revenue from Exported Energy	$3,639,936
Cost of Imported Energy	($16,263,212)
ERCOT Export Charge (Imported Energy)	($7,697,097)
EPE Through & Out Charge (Exported Energy)	$1,724,600
Net Savings	**$26,255,584**

ERCOT	
Base Case Annual Production Cost (no HVDC)	$5,187,796,311
Change Case Annual Production Cost (with HVDC)	$5,154,597,118
Gross APC Savings	**$33,199,193**
Cost of Imported Energy	($3,639,936)
Revenue from Exported Energy (to generators)	$16,263,212
EPE Through & Out Charge (Imported Energy)	($1,724,600)
ERCOT Export Charge (Exported Energy)	$7,697,097
Net Savings	**$51,794,966**

ERCOT – Constraints

- HVDC exports from ERCOT reduce congestion on the West Export Generic Transmission Constraint.

Top Constraints Impacting Node LMP ($/MWh)					
Positive: Increase in LMP					
Negative: Decrease in LMP					
Rank	**Constraint**	**Pool From**	**Pool To**	**Base**	**Change**
1	West Texas Export	N/A	N/A	($3.26)	($2.85)
2	North to Houston GTC	N/A	N/A	($0.40)	($0.40)
3	South Texas Project - Hillje 345 kV	ERCOT-S	ERCOT-S	($0.05)	($0.05)
4	Zorn - Lytton Springs 345 kV	ERCOT-S	ERCOT-S	($0.04)	($0.03)
5	Farmland - Long Draw 345 kV	ERCOT-W	ERCOT-N	$0.07	$0.08
6	Pawnee - Tango 345 kV	ERCOT-S	ERCOT-S	$0.06	$0.06
7	Sea Drift Coke - Melon Creek 138 kV	ERCOT-S	ERCOT-S	($0.03)	($0.03)
8	South Texas Project - Jones Creek 345 kV #1	ERCOT-H	ERCOT-S	($0.02)	($0.02)
9	Yellow Jacket Phase Shifter	ERCOT-W	ERCOT-W	($0.02)	($0.01)
10	Farmersville - Royse Switch 345 kV #2	ERCOT-N	ERCOT-N	($0.01)	($0.01)
11	Farmersville - Royse Switch 345 kV #1	ERCOT-N	ERCOT-N	($0.01)	($0.01)
12	Dupont Switch - Chocolate Bayou 138 kV	ERCOT-S	ERCOT-S	($0.01)	($0.01)
13	Graham - Garvey Rd 345 kV	ERCOT-W	ERCOT-W	($0.00)	($0.00)
14	Abilene Mulberry Creek - Bluff Creek 345 kV	ERCOT-W	ERCOT-W	($0.01)	($0.01)
15	Bell County East - Sandow 345 kV #1	ERCOT-S	ERCOT-N	($0.00)	($0.00)



ERCOT – Thermal/Renewable, Prices

- New HVDC exports from ERCOT reduce ERCOT renewable curtailment by over 700,000 MWh, increase thermal output by over 400,000 MWh, and have a minimal impact on hub-level LMP

Technology	Base Curtailment (MWh)	Change Curtailment (MWh)	Reduction (MWh)
Wind	3,518,215	2,966,480	551,735
Solar	2,168,789	2,001,369	167,420

Simple Average LMP Changes			
Hub	Base Case	Change Case	Increase/(Decrease)
HB_WEST	$24.84	$25.10	$0.26
HB_NORTH	$28.45	$28.35	($0.10)
HB_HOUSTON	$30.58	$30.51	($0.07)
HB_SOUTH	$29.02	$28.95	($0.07)

Region	Base Thermal Generation (MWh)	Change Thermal Generation (MWh)	Increase/(Decrease)
Total ERCOT	276,074,963	276,507,341	432,378
West Zone	11,230,761	11,413,074	182,313

EPE – Constraints

- Addition and utilization of the HVDC tie has a minimal impact on transmission constraints affecting the EPE system

Top Constraints Impacting Node LMP ($/MWh)					
Positive: Increase in LMP					
Negative: Decrease in LMP					
Rank	**Constraint**	**Pool From**	**Pool To**	**Base**	**Change**
1	Newman 345/115kV Xfmr	EPE BA	EPEBA	$0.12	$0.13
2	Path 47 Interface	PNMBA	EPEBA	$0.00	$0.00
3	Hidalgo - Greenlee 345kV	EPE BA	TEPCBA	$0.00	$0.00
4	Bernardo - Belen 115kV	WACMBA	PNMBA	$0.00	$0.00
5	Four Corners - Arroyo 345kV	APSBA	PNMBA	$0.00	$0.00
6	TOT 4A	PACEBA	WACMBA	$0.00	$0.00

EPE Thermal fleet

- Minimal changes to EPE's thermal generation fleet utilization thermal fleet between the base and change cases
- Montana Power Station does not show a historical per-unit breakdown
- Must Run units included in model for system reliability

Generator	Historical CF	Base Case CF	Change Case CF	Increase/(Decrease)	Retirement Date
Copper Unit 1	5.94%	2.07%	1.25%	(0.8%)	
Luna Combined Cycle	61.56%	62.31%	61.02%	(1.3%)	
Milagro Cogen A	0.00%	0.00%	0.00%	0.0%	3/1/2016
Milagro Cogen B	0.00%	0.00%	0.00%	0.0%	3/1/2016
Montana GT1	26.21%	10.31%	8.42%	(1.9%)	
Montana GT2	26.21%	9.84%	8.15%	(1.7%)	
Montana GT3	26.21%	8.41%	6.84%	(1.6%)	
* Montana GT4	26.21%	28.43%	26.94%	(1.5%)	
Newman Unit 1	37.97%	0.00%	0.00%	0.0%	1/1/2023
Newman Unit 2	37.97%	0.00%	0.00%	0.0%	1/1/2023
Newman Unit 3	37.97%	0.00%	0.00%	0.0%	1/1/2023
Newman GT6		8.93%	8.74%	(0.2%)	
Newman CC1	46.31%	0.00%	0.00%	0.0%	12/1/2026
* Newman CC5	46.31%	54.65%	53.33%	(1.3%)	
Rio Grande Unit 7	28.36%	0.00%	0.00%	0.0%	12/1/2023
* Rio Grande Unit 8	28.36%	24.75%	24.74%	(0.0%)	
* Rio Grande Unit 9	34.54%	31.63%	30.15%	(1.5%)	
*** Must Run**					

Assumptions

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