



2020 RTP – Final Update

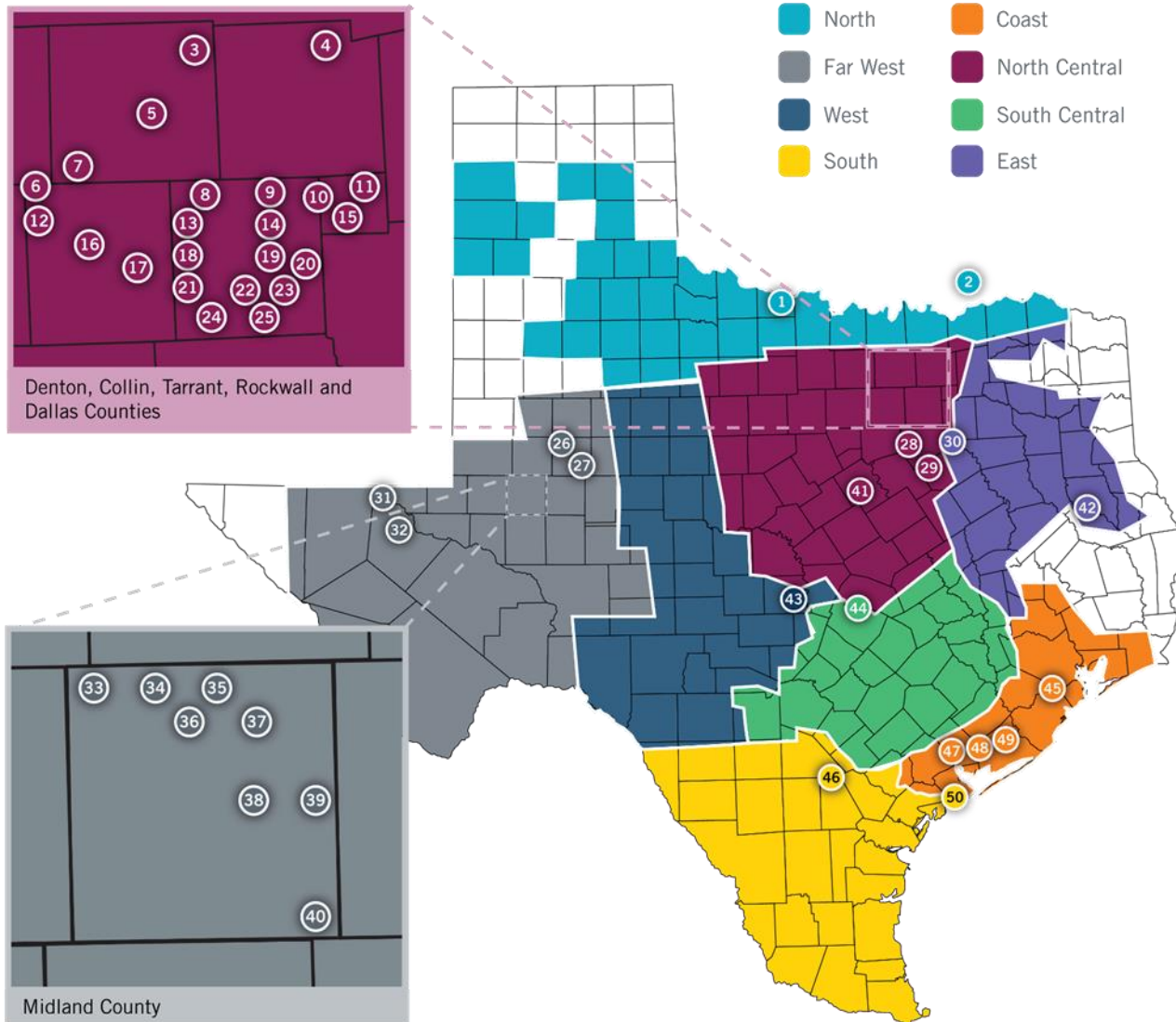
December 2020

Reliability and Sensitivity Analysis Review

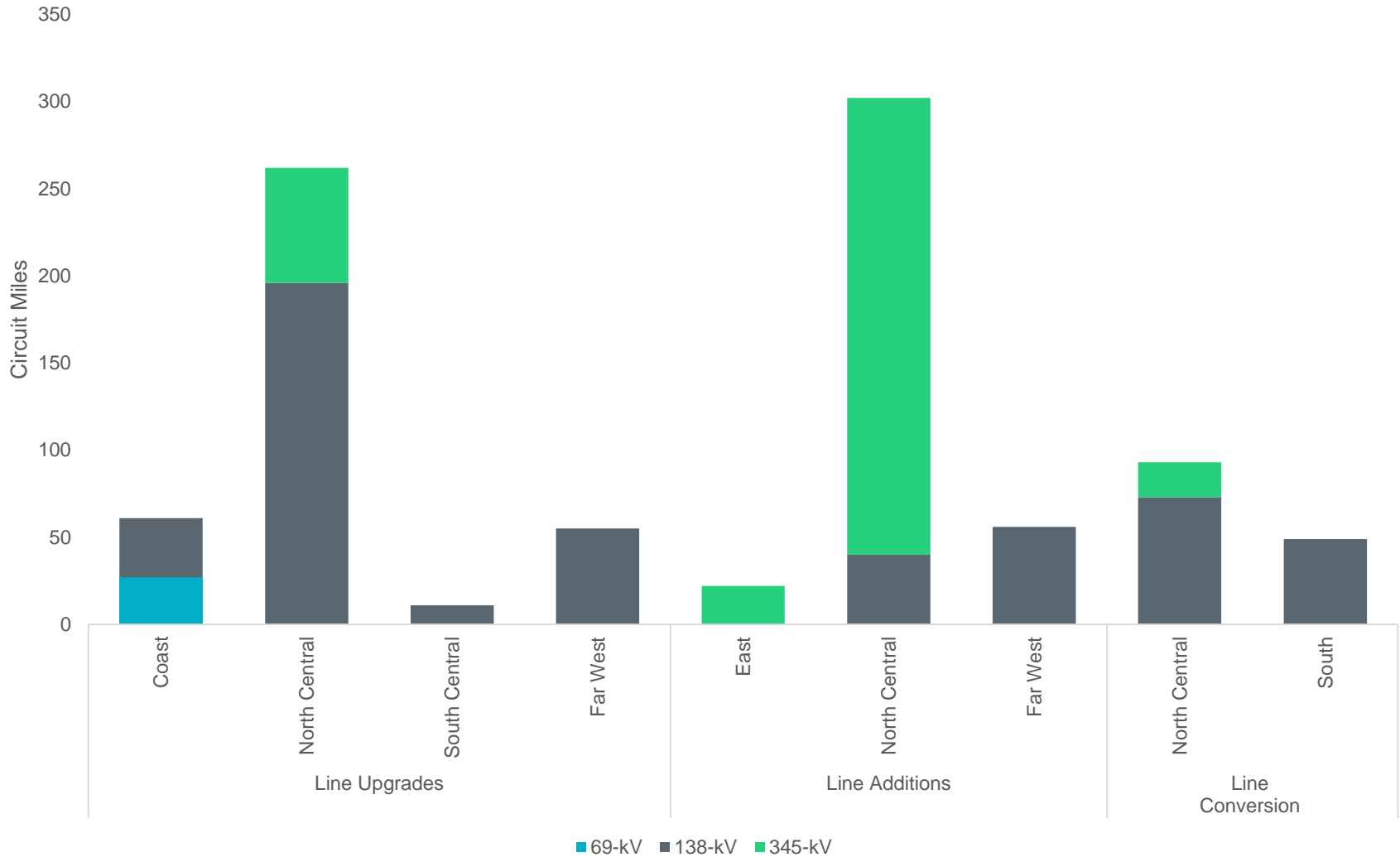
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Supervisor, Transmission Planning Assessment

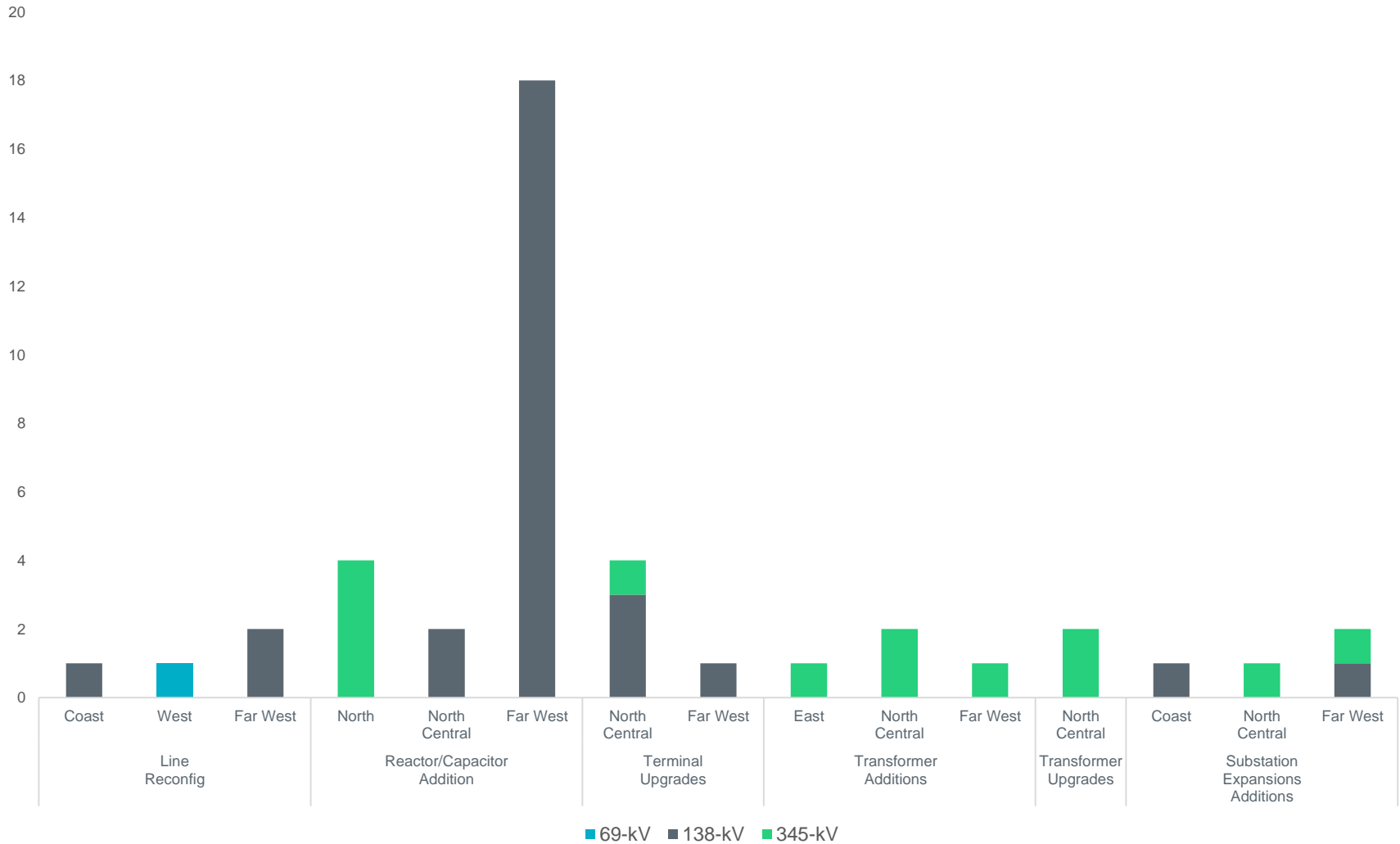
2020 RTP Reliability Project Locations



Line Upgrades, Additions, and Conversions



Other Upgrades and Additions



Noteworthy 2020 RTP Reliability Projects

- Dallas-Fort Worth import project in Wise and Tarrant Counties* (Project Index: 2020-NC11)
- Midland area transmission improvement in Midland County* (Project Index: 2020-FW12)
- Nacogdoches Southeast to Herty North Switch to Lufkin Switch 345-kV loop in Angelina and Nacogdoches Counties** (Project Index: 2020-E1)
- Venus Switch to Navarro 345-kV line upgrade in Ellis and Navarro Counties (Project Index: 2020-NC15)

* This project is a placeholder project for reliability issues identified in 2020 RTP. ERCOT and TPs will continue the analysis of the area after the conclusion of the 2020 RTP.

** This project is a placeholder project for the Oncor “Nacogdoches Southeast Switch – Redland Switch – Lufkin Switch 345 kV Loop” project that is currently under Regional Planning Group (RPG) review

Noteworthy 2020 RTP projects cont'd

- Venus Switch 345/138-kV transformer addition in Ellis County (Project Index: 2020-NC17)
- West Denton 345/138-kV transformer addition in Denton County* (Project Index: 2020-NC21)
- Eagle Mountain 345/138-kV transformer upgrades in Tarrant County (Project Index: 2020-NC13)
- Liggett to Hackberry 138-kV to 345-kV line conversion in Dallas County* (Project Index: 2020-NC24)

* This project is a placeholder project for reliability issues identified in 2020 RTP. ERCOT and TPs will continue the analysis of the area after the conclusion of the 2020 RTP.

High Renewable Output Sensitivity Analysis

- With renewable curtailment utilized, both the high renewable output sensitivity analysis under summer peak load condition and light load condition do not need additional reliability projects
- With renewable curtailment not utilized
 - Local transmission enhancements were utilized to facilitate the export of local renewable generation in the high renewable output summer peak sensitivity study
 - Both regional and local transmission enhancements were utilized to facilitate renewable export in the high renewable light load sensitivity study
 - Since redispatch is a valid mitigation action, the identified transmission improvements cannot be considered reliability-driven, but can serve as candidate projects for future economic analysis

WFW No Wind No Solar Sensitivity

- The purpose of this sensitivity is to provide understanding of potential system impacts under the assumed extreme system conditions rather than recommend specific projects
- Key takeaways:
 - Some transmission solutions identified in the “ERCOT Delaware Basin Load Integration Study”, including new 345-kV right ways, were found to be able to facilitate import into the study region
 - Some transmission solutions identified by the 2020 Long Term System Assessment (LTSA) were also found to be able to facilitate import into the study region
 - Some local transmission enhancements were found to be helpful to alleviate non-import related local issues

Economic Analysis Review

John Bernecker

Manager, Transmission Planning Assessment

2020 RTP Economic Analysis

- Full details of ERCOT's economic analysis will be included in the 2020 RTP report
- New format for communicating economic analysis results
 - Document replaces spreadsheet
 - Includes more details on options tested and other analysis
- Full final 2020 RTP economic cases will be posted to the MIS Certified Area for TSPs

Key Takeaways

- Accelerating the in-service date for the RPG-approved Pelican to Whitepoint 138-kV line upgrade to 2022 met the economic planning criteria
- A placeholder project to resolve congestion in the Bearkat area is included in the final 2025 economic case
 - Related to the Midland area transmission improvement project identified in reliability analysis
 - ERCOT, Oncor, and WETT are continuing to evaluate options to address the economic and reliability needs identified in 2020 RTP economic analysis
- Analysis of several study areas did not result in projects that met the economic planning criteria for 2022, but had more production cost savings in 2025
 - No project recommendations at this time
 - Specific options identified for reevaluation in future economic analysis

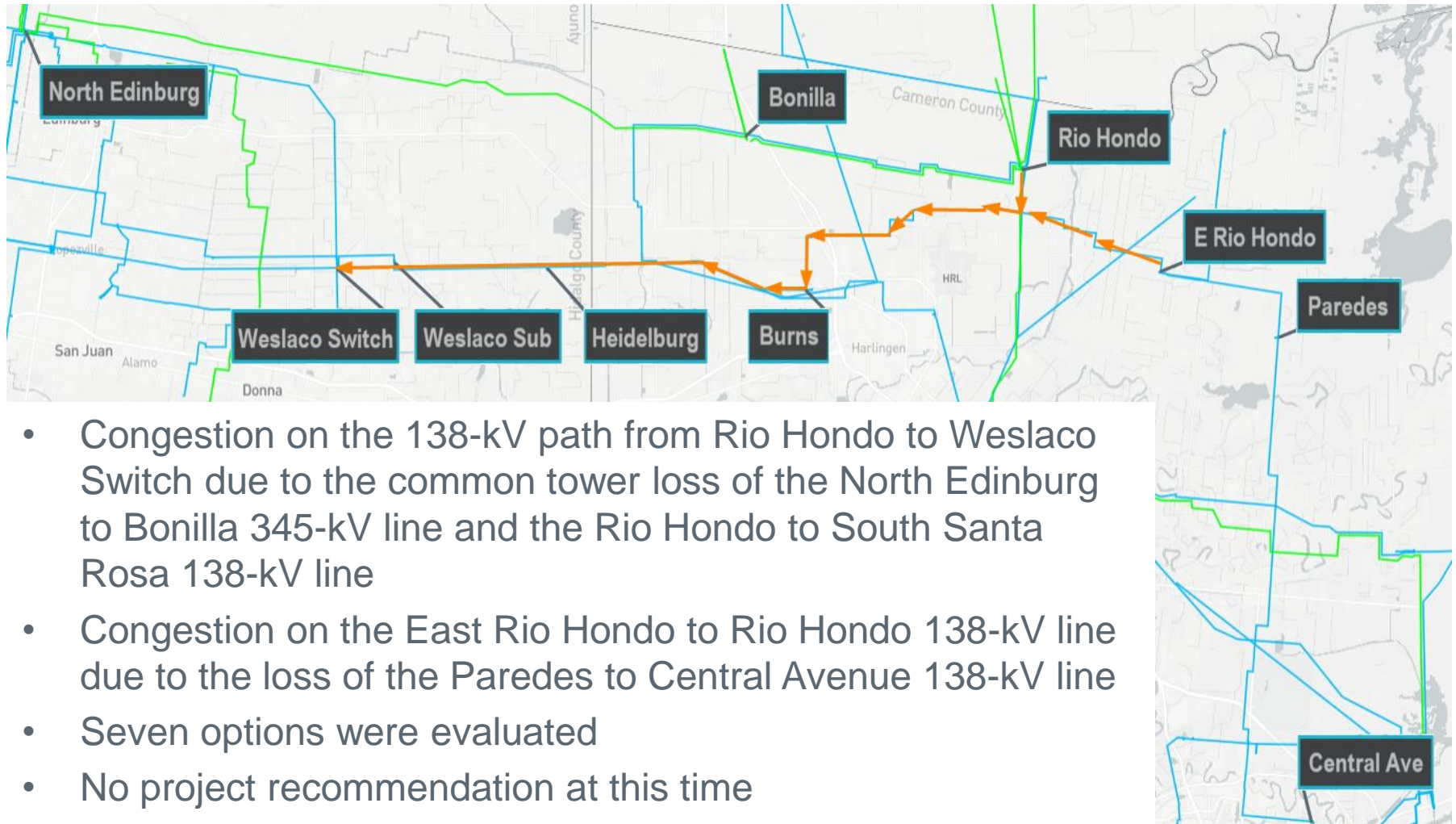
Top Constraints (2022 + 2025)



Overview of Areas Studied

- Lower Rio Grande Valley
- Comanche Switch Area
- Bearkat Area / Stanton Loop
- Kendall Area
- San Antonio Import / West Texas Export
- Yellow Jacket Area
- Pelican to Whitepoint 138-kV Line
- Dallas-Fort Worth Area
- Laredo Area

Lower Rio Grande Valley



- Congestion on the 138-kV path from Rio Hondo to Weslaco Switch due to the common tower loss of the North Edinburg to Bonilla 345-kV line and the Rio Hondo to South Santa Rosa 138-kV line
- Congestion on the East Rio Hondo to Rio Hondo 138-kV line due to the loss of the Paredes to Central Avenue 138-kV line
- Seven options were evaluated
- No project recommendation at this time

Lower Rio Grande Valley

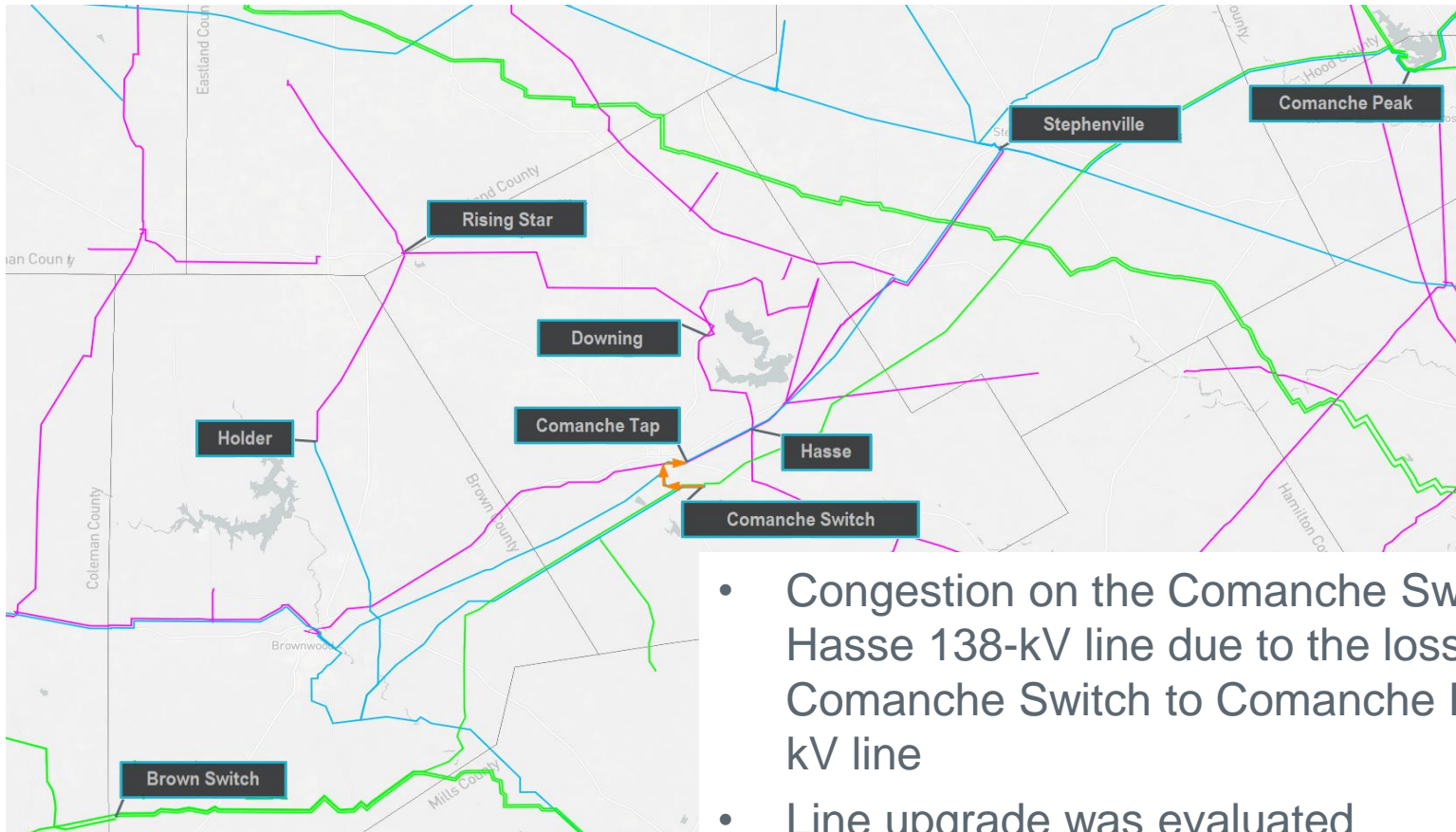
Option	Description	Savings / Capital Cost (Levelized %)
1	Upgrade the 138-kV lines from Rio Hondo to Burns to Heidelberg to Weslaco Sub to Weslaco Switch	6.3
2	Upgrade the 138-kV line from East Rio Hondo to Rio Hondo	12.4
3	Combine Options 1 and 2	11.4 ^a
4	Loop the 345-kV line from Palmito to Stewart Rd into La Palma	5.2
5	Build a new 138-kV line from East Rio Hondo to Laureles	13.9 ^b
6	Build a new 138-kV line from East Rio Hondo to Kelvin to Harlingen Switch	N/A ^c
7	Convert the East Rio Hondo to Rio Hondo 138-kV line to 345 kV, add a new 345/138-kV transformer at East Rio Hondo, build a new Laureles 345-kV station, and build a new 345-kV line form East Rio Hondo to Laureles	N/A ^c

a: Will be reevaluated in future economic analysis.

b: Did not meet economic criteria for 2022, but had more production cost savings in 2025. Not recommended at this time, but will be reevaluated in future economic analysis.

c: Full capital cost estimate was not requested.

Comanche Switch Area



- Congestion on the Comanche Switch to Hasse 138-kV line due to the loss of the Comanche Switch to Comanche Peak 345-kV line
- Line upgrade was evaluated
- Levelized Savings / Capital Cost was 12.4%
- Will be reevaluated in future economic analysis

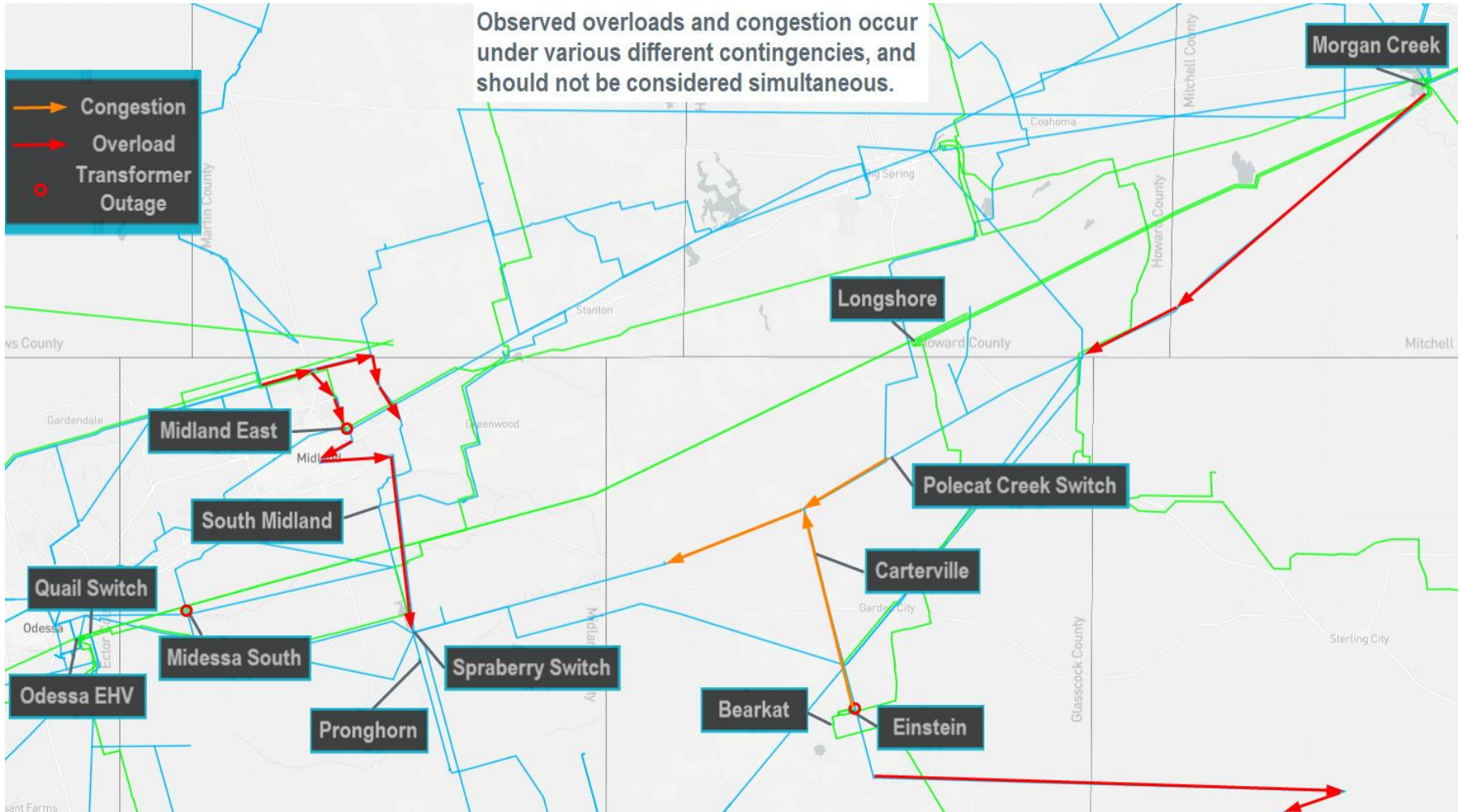
Bearkat Area / Stanton Loop

- 2020 RTP reliability analysis indicates the need for additional 345/138-kV transformer capacity along the Stanton Loop near Midland
 - Multiple X-1+N-1 criteria violations
 - Most significant first level transformer outage is at Einstein
- 2020 RTP economic analysis shows congestion on:
 - Polecat Creek Switch to Meyers Drive 138-kV line under the loss of the Morgan Creek to Quail Switch and Longshore to Odessa EHV 345-kV double circuit line
 - Einstein to Carterville 138-kV line under the loss of the Bearkat to Longshore 345-kV line

Bearkat Area / Stanton Loop

Observed overloads and congestion occur under various different contingencies, and should not be considered simultaneous.

- Congestion
- Overload
- Transformer Outage



Bearkat Area / Stanton Loop

- A placeholder economic project is included in the final 2025 economic case in addition to the reliability placeholder, “Midland Area Transmission Improvement”
 - Add a second 345/138-kV transformer at the new station
 - Loop the South Midland to Pronghorn 138-kV line into the new station
 - Build a new 345-kV line from Bearkat to the new station (~30 miles)
- Resulted in approximately \$22M of production cost savings in 2025, corresponding to an approximate breakeven cost of \$164M
- No final project recommendation at this time
- ERCOT, Oncor, and WETT are continuing to evaluate options to address the economic and reliability needs identified in 2020 RTP economic analysis
- Future RPG submittal(s) expected

Kendall Area



- Congestion on the Kendall to Bergheim 345-kV line, and several 138-kV lines in the Kendall area due to the loss of the Kendall to Cagnon transfer path
- Congestion on the Bergheim 345/138-kV transformer due to the loss of the Zorn to Hays Energy 345-kV double circuit line

Kendall Area

- Option 1: reroute one of the Big Hill to Kendall 345-kV lines to bypass Kendall and go directly to Cagnon
 - Resulted in ~\$0.5M in production cost savings
 - Bergheim 345/138-kV transformer remained highly congested
 - Congestion on the Kendall area 138-kV lines was largely reduced
- Option 2: upgrade the Bergheim 345/138-kV transformer
 - Levelized Savings / Capital Cost was 11.4%
 - Benefit was limited due to a significant increase in congestion on 138-kV lines downstream from the Bergheim 345/138-kV transformer
 - LCRA plans to upgrade nearby lines for reliability reasons
 - Will be reevaluated in future economic analysis

San Antonio Import / West Texas Export

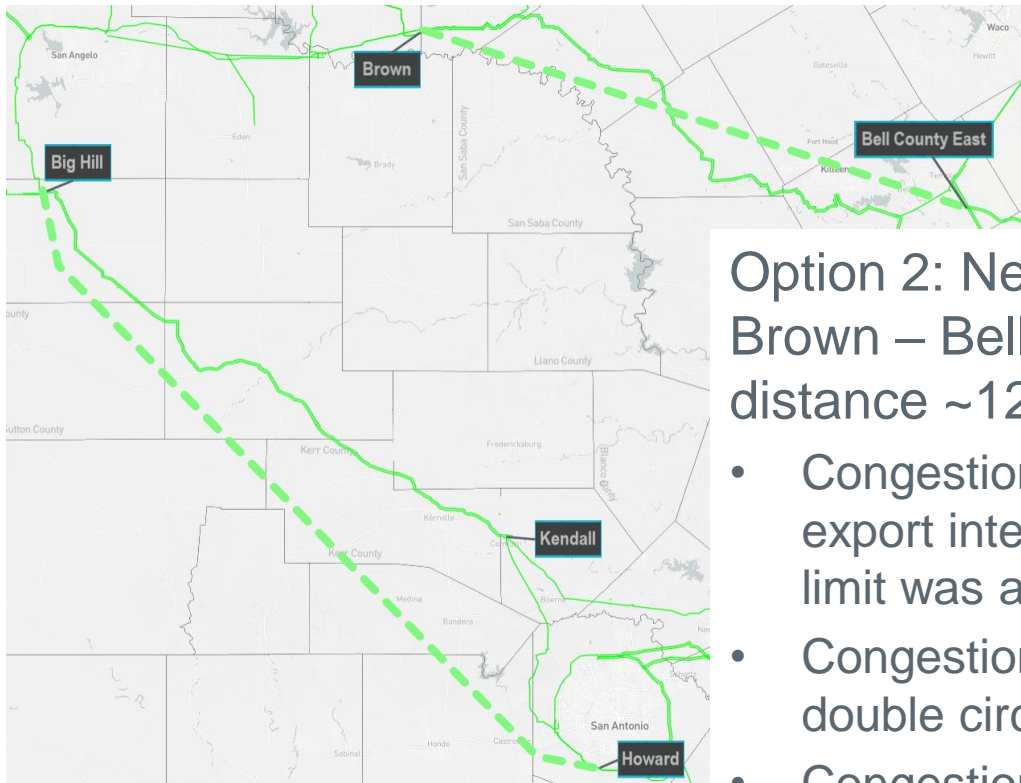


Option 1: New 345-kV double circuit from Big Hill – Howard (straight-line distance ~170 miles)

- Congestion decreased on the West Texas export interface (a 1 GW increase in the transfer limit was assumed)
- Kendall area 138-kV congestion was resolved
- Congestion was reduced on the Bergheim 345/138-kV transformer
- Congestion on paths into Houston increased

Preliminary Production Cost Savings (\$M)	Approximate Breakeven Cost (\$M)
43	326

West Texas Export



Option 2: New 345-kV double-circuit from Brown – Bell County East (straight-line distance ~120 miles)

- Congestion decreased on the West Texas export interface (a 1 GW increase in the transfer limit was assumed)
- Congestion on the Killeen to Salado 345-kV double circuit was resolved
- Congestion on paths into Houston increased

Option	Preliminary Production Cost Savings (\$M)	Approximate Breakeven Cost (\$M)
2	31	235
1 + 2*	65	492

*2 GW increase in West Texas export transfer limit assumed

Yellow Jacket Area

- Congestion on the Yellow Jacket to Treadwell 138-kV line under the contingency loss of the Big Hill to Kendall 345-kV double circuit line
- A line upgrade was evaluated
 - Increased congestion on the Yellow Jacket to Fort Mason 138-kV line
 - Caused new congestion on the nearby 69-kV network, including the Yellow Jacket to Hext 69-kV line
 - Resulted in negligible production cost savings, so no capital cost estimate was requested
- Other options for congestion in the Yellow Jacket area may be considered in future economic analysis

Pelican to Whitepoint 138-kV Line

- Upgrade of the 138-kV line from Pelican to Whitepoint by 2024 was included in the RPG-approved AEP Corpus North Shore Project
- Congestion was observed in the 2022 economic case
- Moving the in-service date for the line upgrade to 2022 met the economic planning criteria
- The line upgrade resulted in \$3.9M in production cost savings in 2022

Dallas-Fort Worth Area

- Congestion on the Alliance to Hicks Switch 345-kV line under the contingency loss of the Roanoke Switch to Hicks Switch 345-kV line observed in the 2022 economic case
 - Congestion not observed in the 2025 economic case due to the inclusion of the placeholder reliability project, “Dallas-Fort Worth Import Project”
 - Reliability projects have a significant impact on congestion in the area, including on the West TNP to TI TNP 138-kV line and the Roanoke Switch to Lewisville Switch 345-kV line
 - ERCOT will continue evaluating the current placeholder project and other options

Dallas-Fort Worth Area

- Congestion on the West TNP to TI TNP 138-kV line under the contingency loss of the Carrollton Northwest to Lewisville Switch 345-kV double circuit line observed in both the 2022 and 2025 economic cases
 - Congestion has also been experienced in real-time operations (related to planned outages)
- Line upgrade was evaluated
 - Economic planning criteria not met for 2022
 - Will be reevaluated in future economic planning studies

Study Year	Production Cost Savings (Nominal \$M)
2022	-0.8
2025	3.7

Laredo Area

- Congestion on the Las Cruces to Laredo VFT North 138-kV line under the contingency loss of the Fowlerton to Lobo 345-kV line
- Option 1: Reconfigure the Holcomb to North Laredo 138-kV line relative to the North Laredo phase shifting transformer
 - Did not result in production cost savings
 - Increased congestion on the 138/69-kV transformer at Bruni Sub

Laredo Area

- Option 2: Upgrade the 138-kV line from Laredo VFT North to Las Cruces to Milo (~2.7 miles)
 - Increased congestion on the 138-kV line from Milo to Mines Road
- Option 3: Upgrade the 138-kV line from Laredo VFT North to Las Cruces to Milo to Mines Road (~5.2 miles)
 - Production cost savings in 2025 were lower than in 2022
- No project recommendation at this time
 - A new path may be necessary to fully relieve the congestion

2020 RTP Report Posting

- 2020 RTP report and final reliability cases will be posted by December 31, 2020
- Public version of the report will be posted to a new location (<http://www.ercot.com/gridinfo/planning>)

Questions / Comments

- Please send questions and/or comments to:
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