



Item 9: 2018 Transmission Planning Report

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Board of Directors Meeting

ERCOT Public

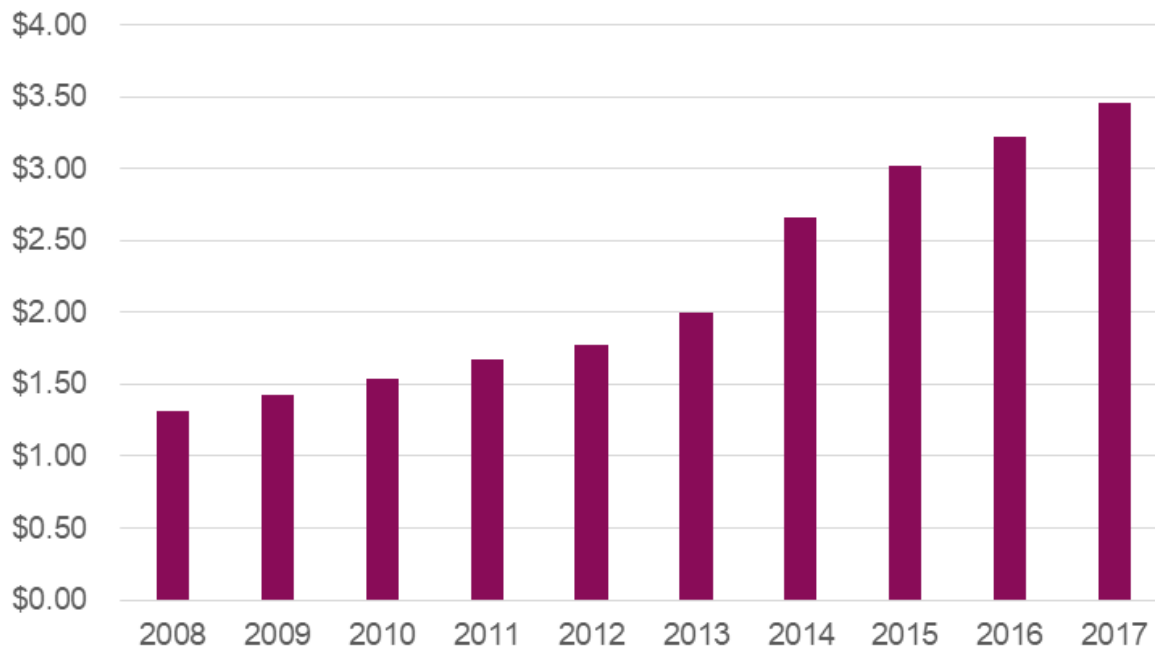
February 12, 2019

Today's Discussion

- Transmission Costs
- Planned Projects and Projected Constraints

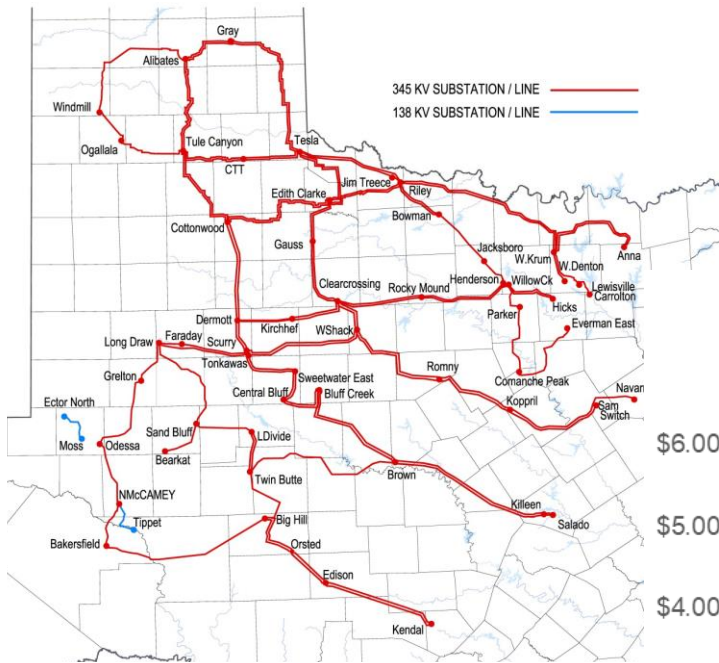
Why are transmission costs increasing?

ERCOT Annual Transmission Cost of Service
(\$ Billion)

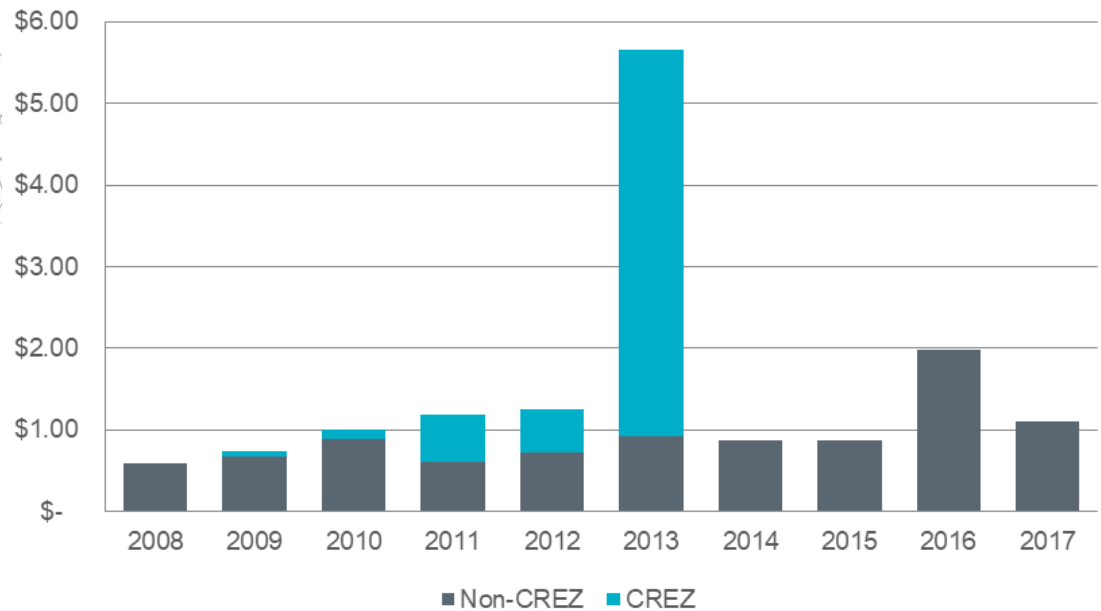


1. Competitive Renewable Energy Zone (CREZ) Project
2. Natural load growth
3. Far West load growth

CREZ Project

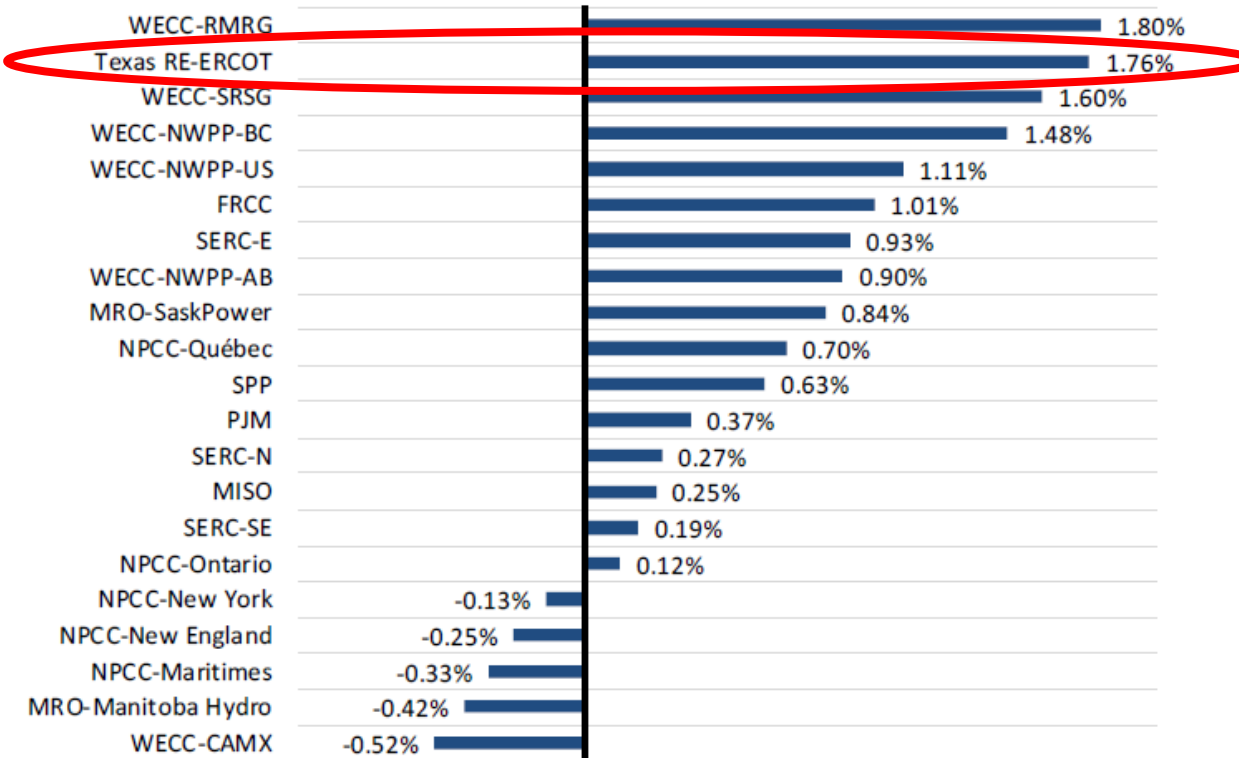


ERCOT Transmission Improvements by In-service Year (\$ Billion)



Natural Load Growth

Annual Peak Demand 10-Year Forecast Growth Rate by NERC Assessment Region

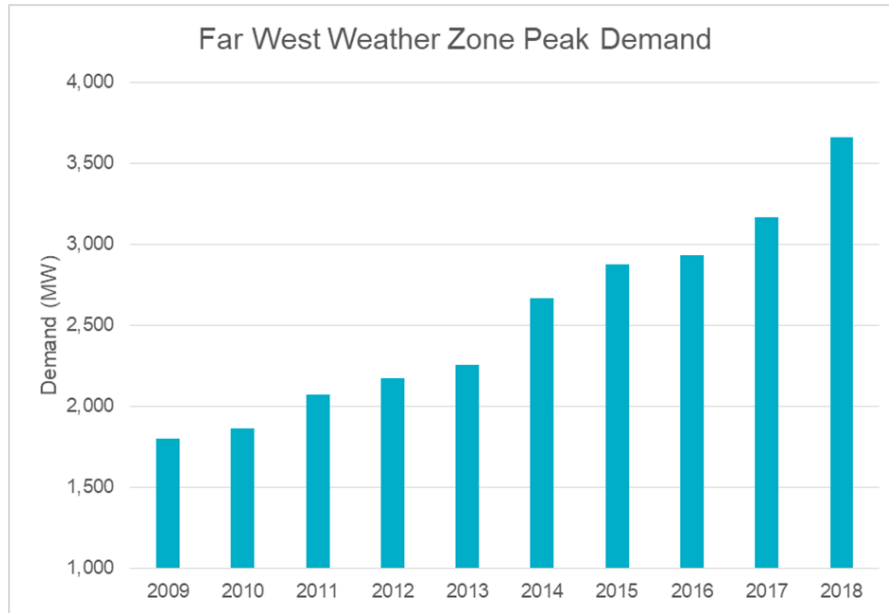


- Texas added 365,000 jobs between November 2017 and November 2018
- November 2018 unemployment was 3.7% - the lowest on record

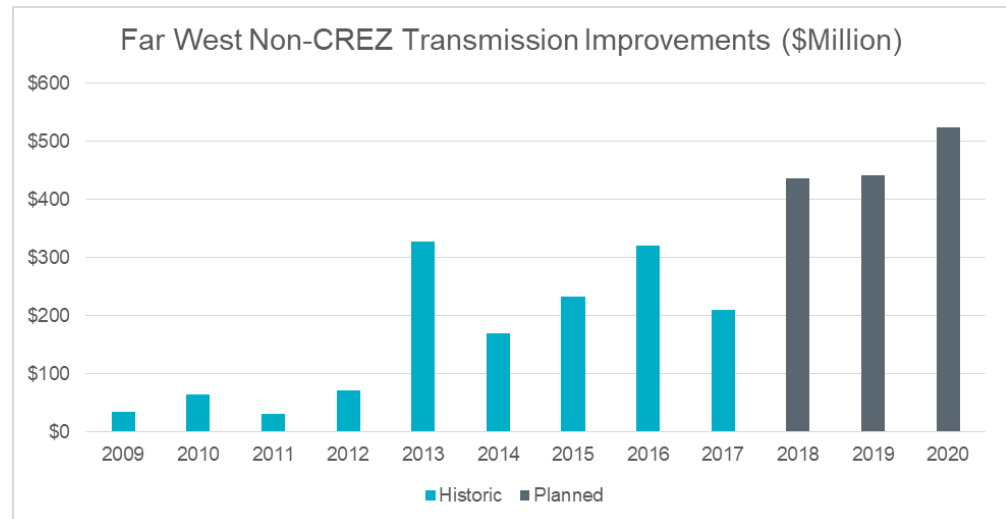
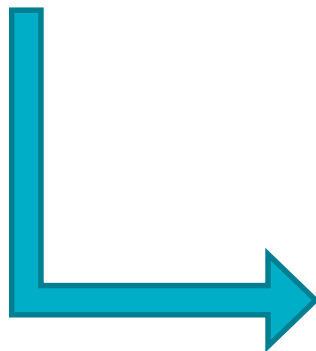
Source: Labor Department

Source: NERC 2018 Long-Term Reliability Assessment

Reliability Need for Transmission: Far West



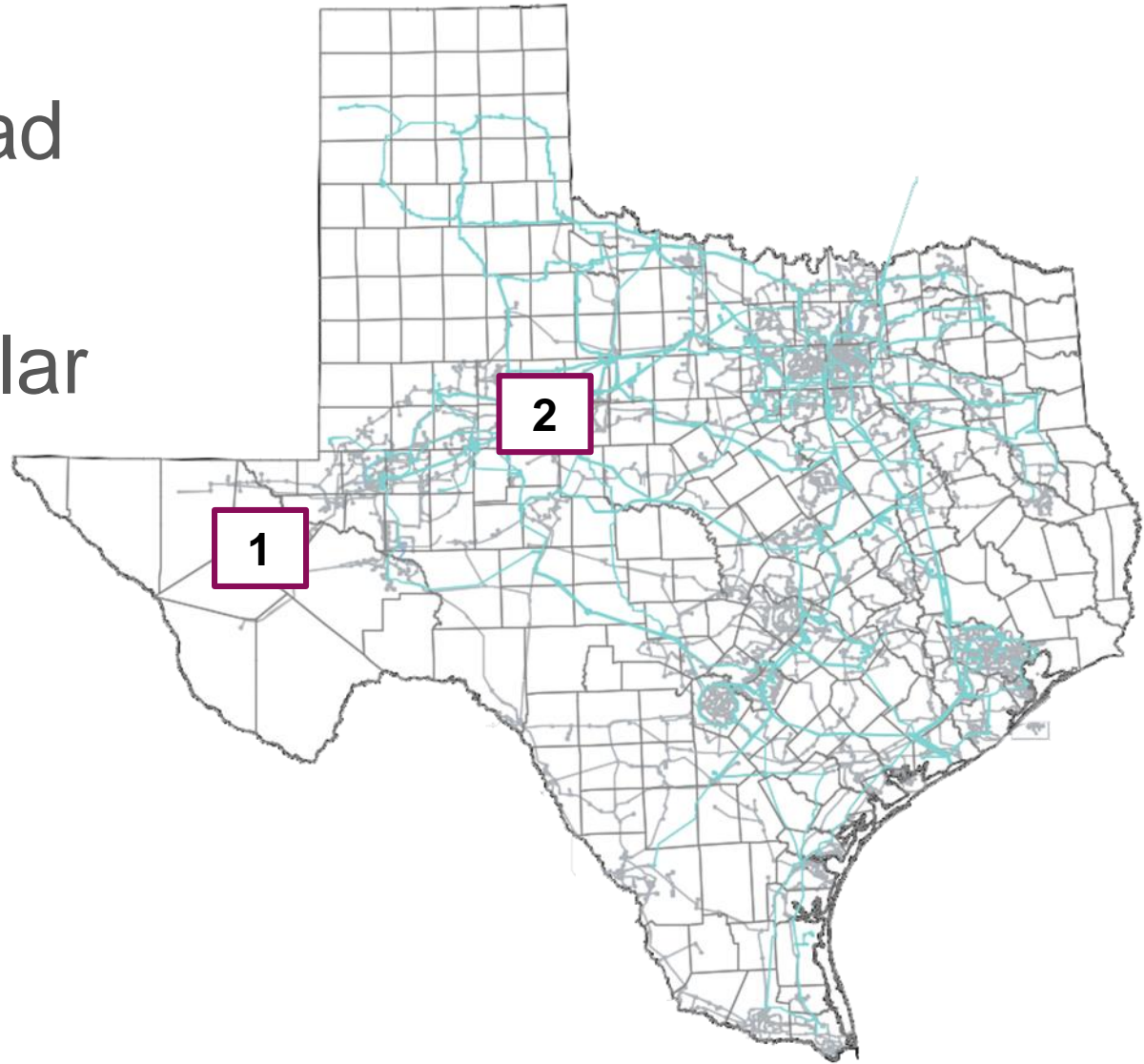
- Far West peak demand has doubled since 2009
- Demand growth primarily due to oil and gas development in the Permian Basin



Planned Projects and Projected Constraints

1. Far West Load

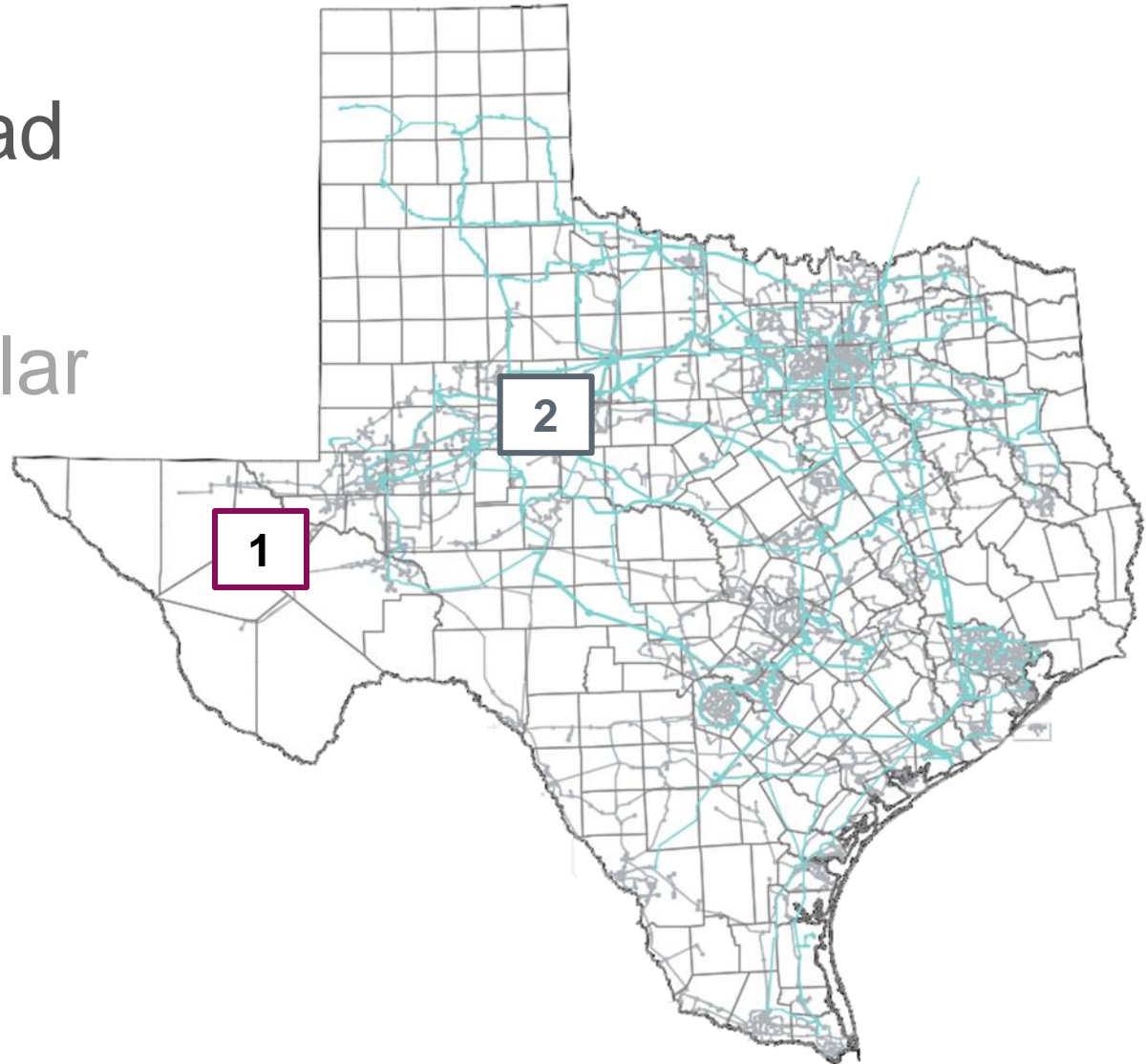
2. Wind and Solar



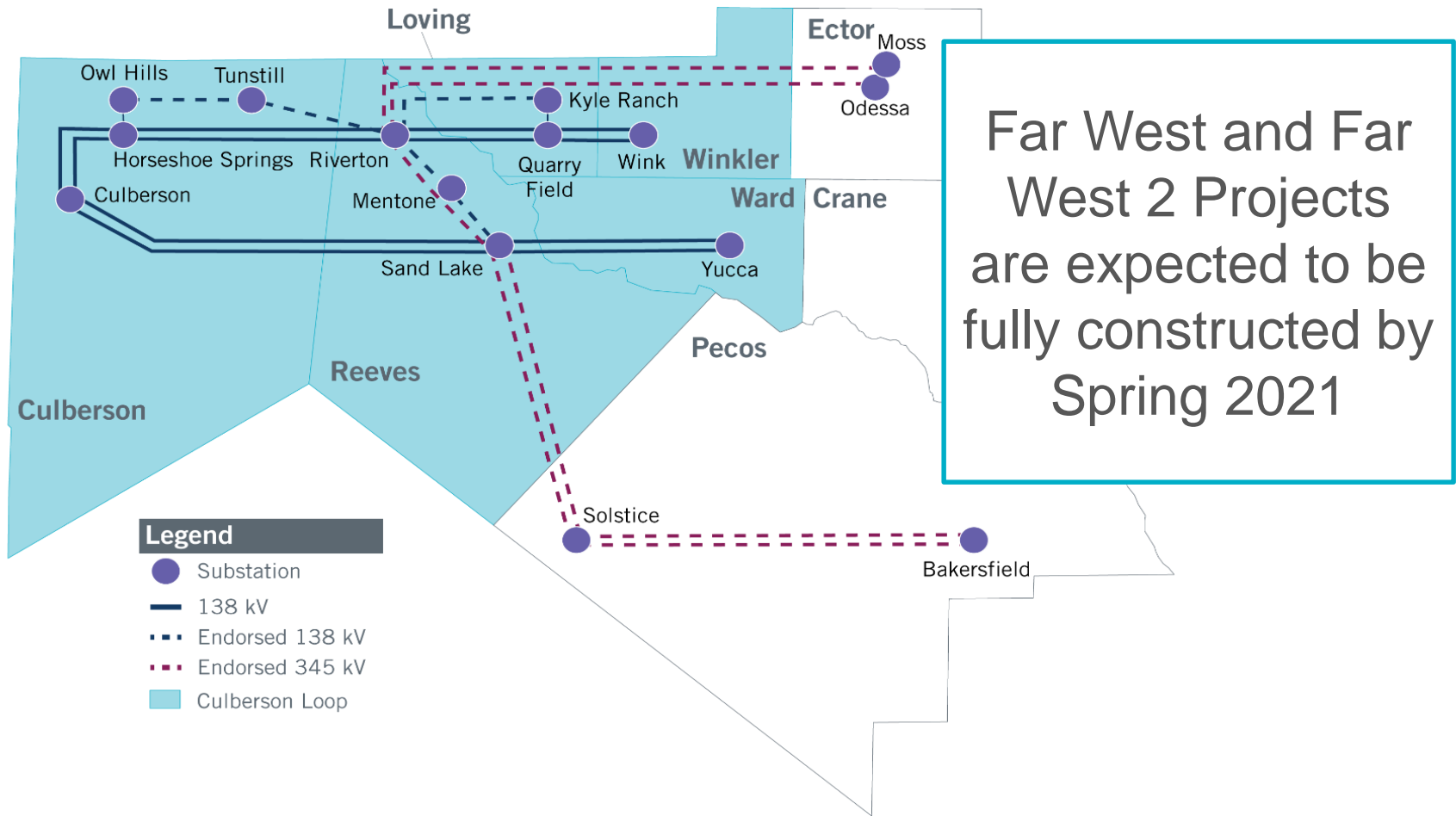
Planned Projects and Projected Constraints

1. Far West Load

2. Wind and Solar



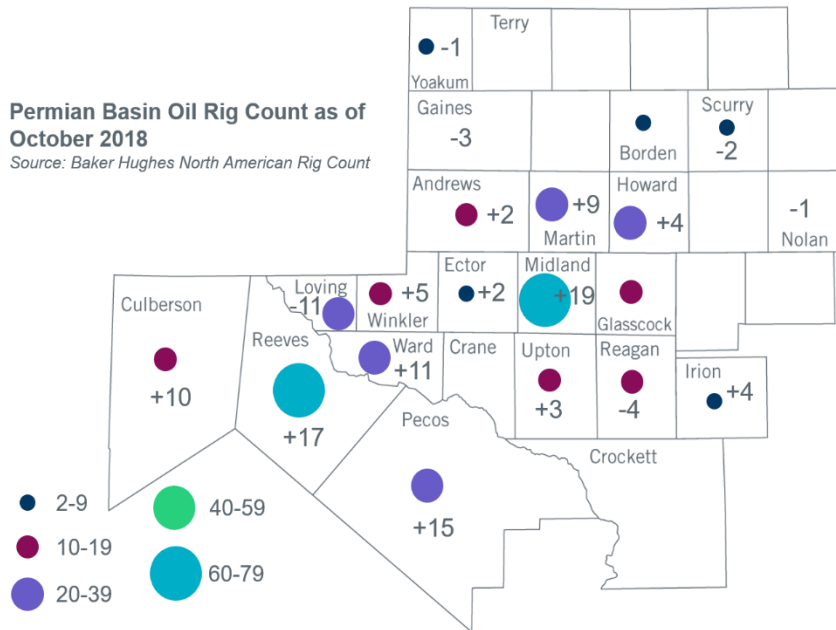
Far West Transmission Projects



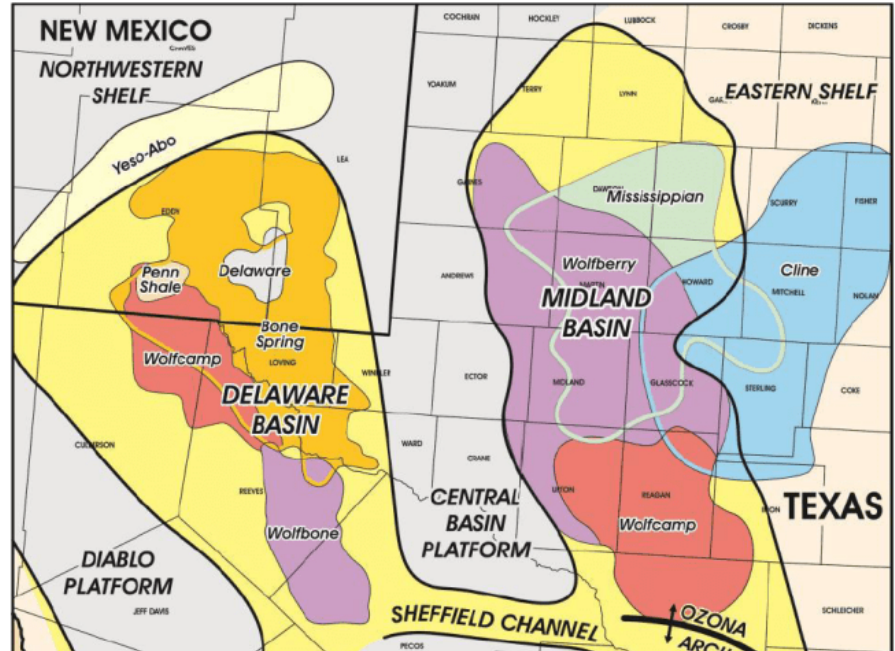
Far West Load Growth

Permian Basin Oil Rig Count as of October 2018

Source: Baker Hughes North American Rig Count



+/- indicates change in rig count since October 2017



Delaware Basin and Midland Basin oil and gas activity and load growth remain strong

Will the Far West load forecast increase higher?

Yes

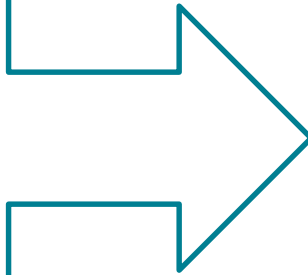
- Drilled but uncompleted wells waiting on pipeline completion (Q3-Q4 2019)
- Many existing facilities have self-serve generation and will switch to grid power when wires are available
- Many existing facilities are using gas compressors/motors but new facilities will likely use electric if wires are available
- Technology/environmental regulation changes will mean future barrels of oil are more electric energy intensive than today

- Recent history shows actual oil and gas demand is lagging the committed load forecast
- Labor shortages impact ability of oil and gas industry to build out infrastructure
 - Electric system congestion and reliability risk may impact future electric versus gas infrastructure decisions for oil and gas customers

No

The Far West Planning Challenge

Oil and gas industry investment decisions are made 12-24 months in advance;
Electric transmission infrastructure takes 2-6 years



If the load grows faster than the transmission system upgrades it can lead to congestion and operational reliability challenges

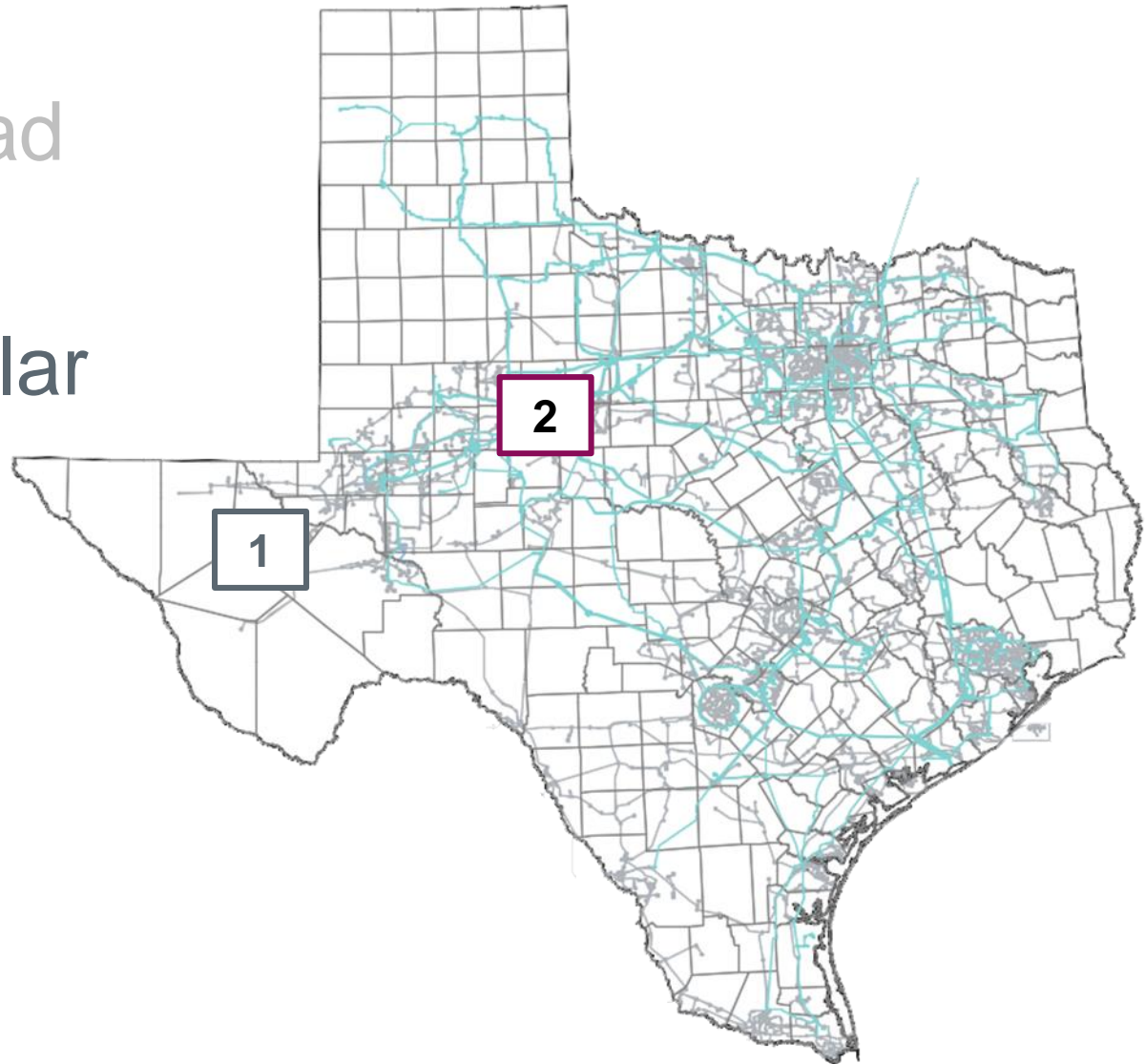
Solutions:

- Planned upgrades have built-in expandability (higher kV and/or double circuit capability)
- Delaware Basin Special Assessment (2019)
- Load forecast flexibility

Planned Projects and Projected Constraints

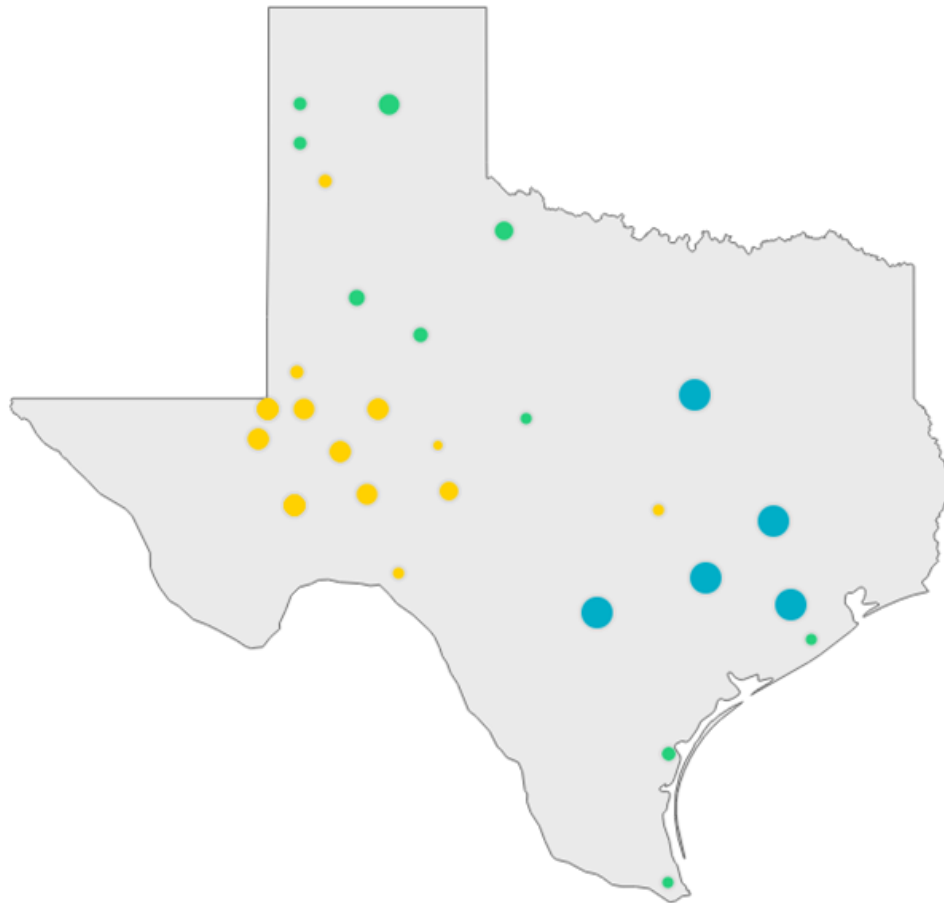
1. Far West Load

2. Wind and Solar

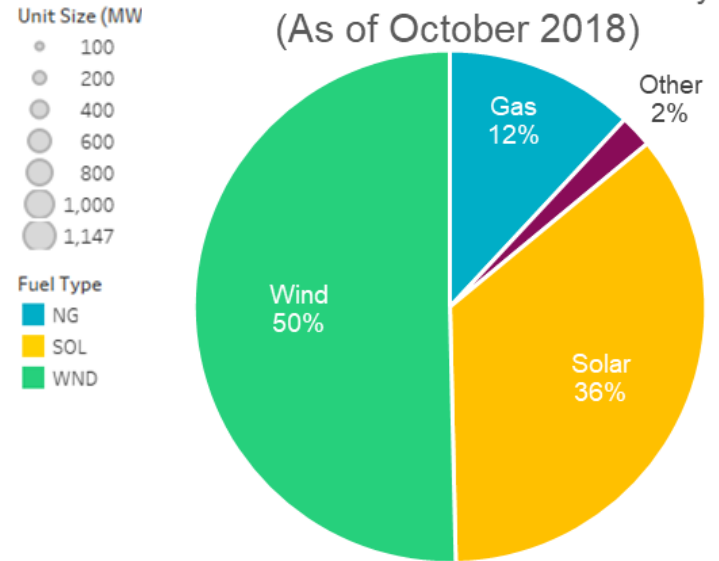


Wind and Solar Generation Trends

2018 Long-Term System Assessment: 2019-2033 Generation Additions



New Generation Under Study (As of October 2018)

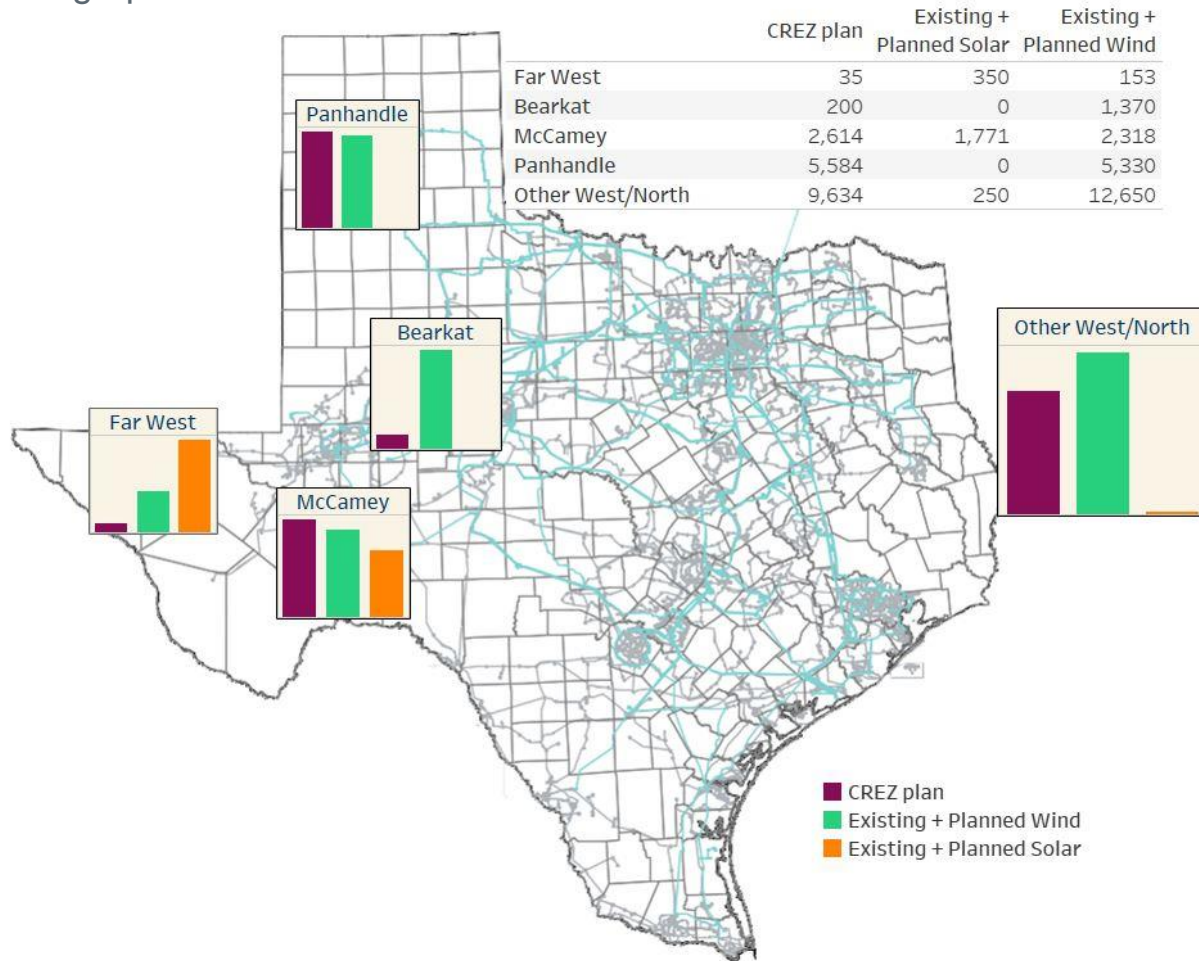


- Long-term models show mostly West Texas solar and wind generation additions with some natural gas over the next 10-15 years

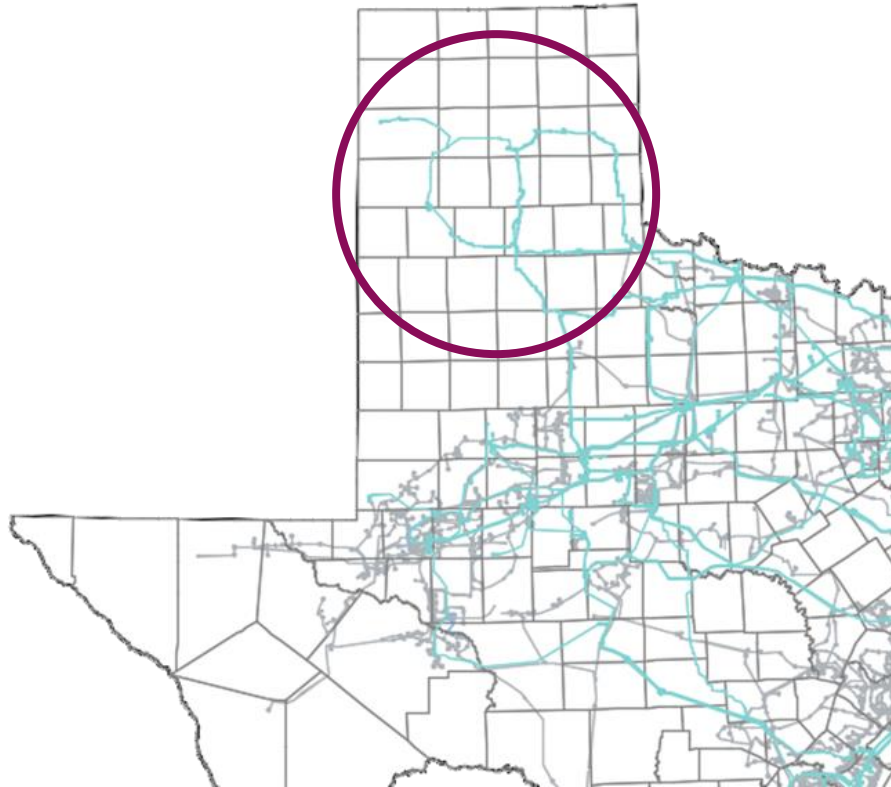
West Texas Wind and Solar Growth: Beyond CREZ

Wind and Solar Generation Capacity (MW) in West and North Texas

*Regional graphics are not to scale



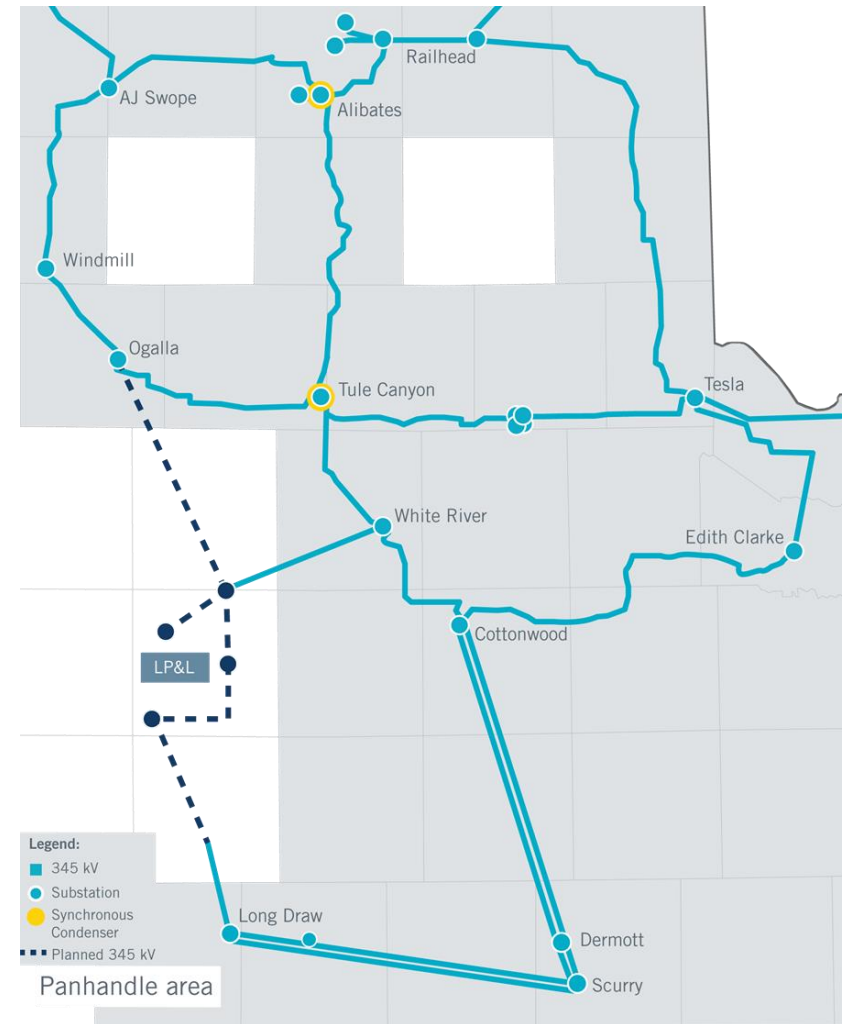
Panhandle Export Limit



- Exports of generation from the Panhandle are limited by stability constraints
- The Panhandle Export Limit had the second highest amount of congestion rent (\$164M) on the ERCOT system in 2018 for the second year in a row

Panhandle Outlook

- Near-term and long-term models indicate the Panhandle will remain one of the highest congested areas in ERCOT
- Development of generation in counties adjacent to the Panhandle may lead to ERCOT managing constraint differently in the future
- Lubbock Power and Light integration (2021) will increase Panhandle export capability
- ERCOT is currently performing a detailed model stability analysis to assess Panhandle export capability going forward



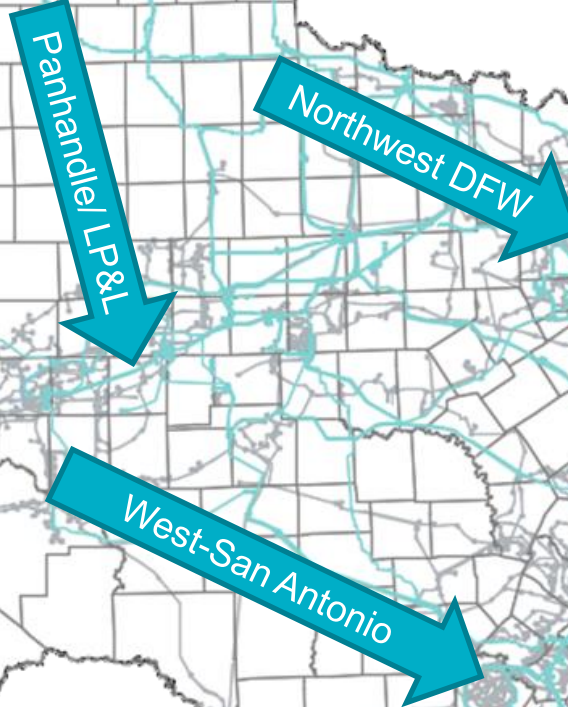
Projected West Texas Export Transmission Constraints

Year/Study*	Congestion Rent
2018 (Actual)	\$164M
2020 RTP	\$110M
2023 RTP	\$61M
2028 LTSA	\$289M

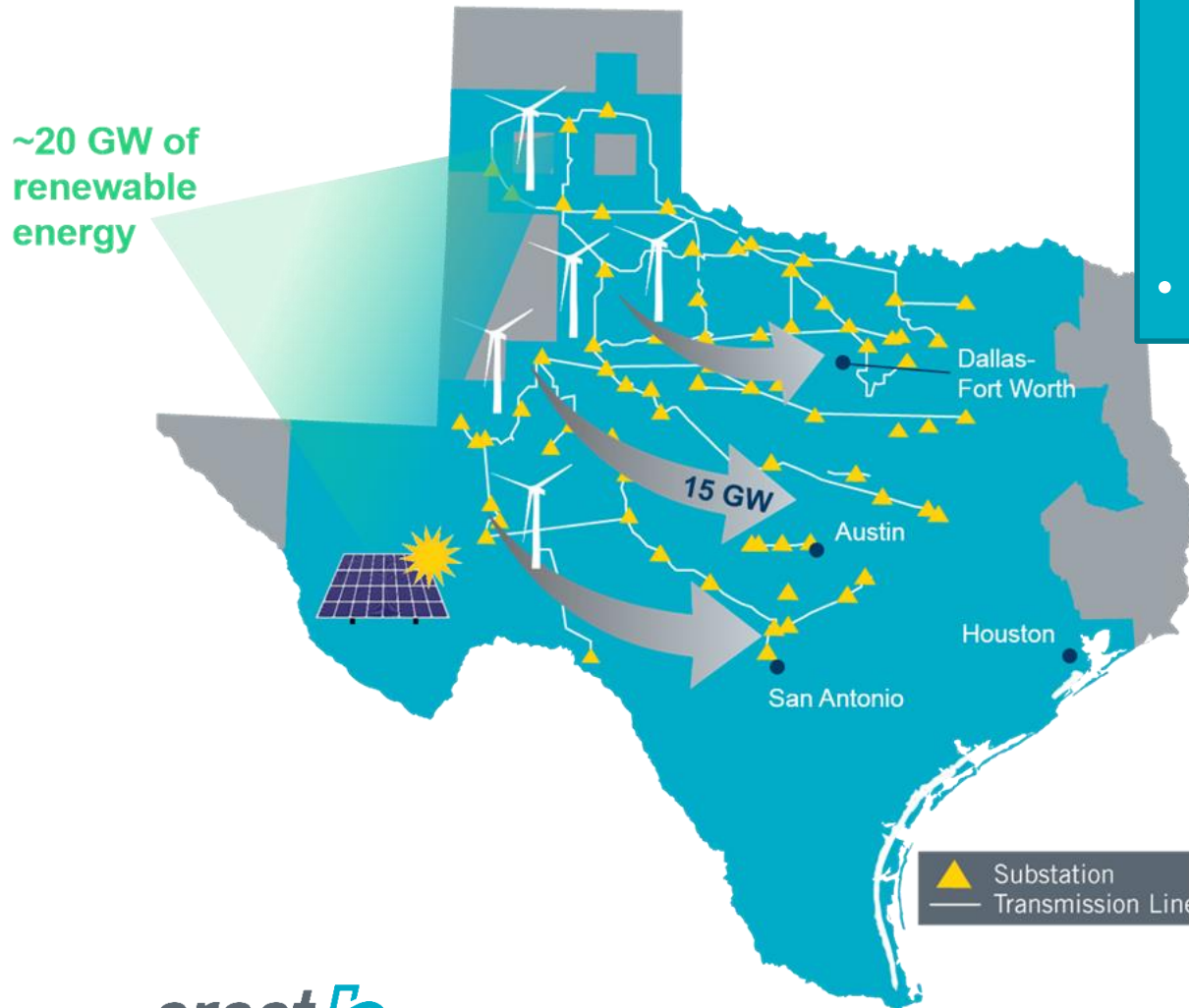
Year/Study*	Congestion Rent
2018 (Actual)	\$163M
2020 RTP	\$58M
2023 RTP	\$56M
2028 LTSA	\$262M

Year/Study*	Congestion Rent
2018 (Actual)	\$12M
2020 RTP	\$114M
2023 RTP	\$127M
2028 LTSA	\$344M

*RTP = Regional Transmission Plan;
LTSA = Long-Term System Assessment

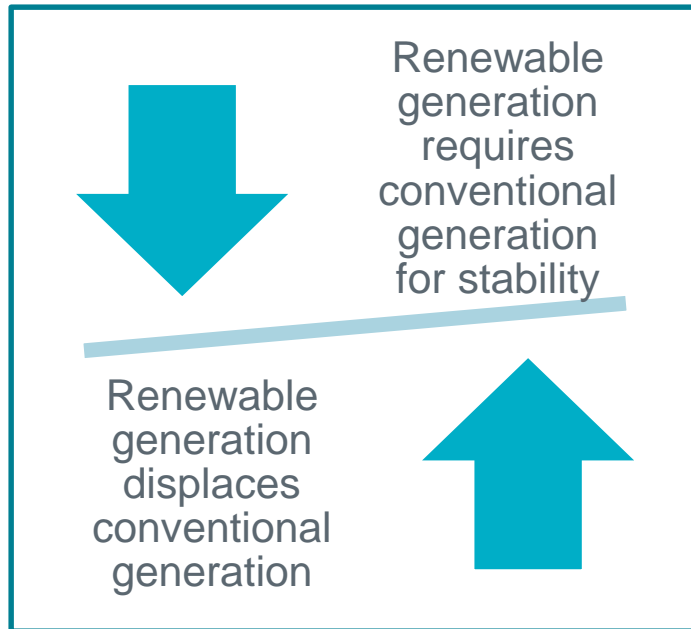


Future Stability Constraints Study



- ERCOT studied grid stability of future high renewable generation penetration scenario
- ~70% penetration

Future Stability Constraints Study: Key Findings



- Stability constraints will increase going forward

- Control system stability may become limiting on a system-wide basis

- Technology to run future high renewable generation penetration grid is not yet commercially available

Questions, Answers, and Links

- 2018 Regional Transmission Plan (Study Horizon: 2019-2024)
http://www.ercot.com/content/wcm/lists/144927/2018_RTP_PublicVersion.zip
- 2018 Long-Term System Assessment (Study Horizon: 2028-2033)
http://www.ercot.com/content/wcm/lists/144927/2018_LTSA_Report.pdf
- 2018 Constraints and Needs Report
http://www.ercot.com/content/wcm/lists/144927/2018_Constraints_and_Needs_Report.pdf
- Future Stability Constraints Study (High Renewables Penetration)
http://www.ercot.com/content/wcm/lists/144927/Dynamic_Stability_Assessment_of_High_Penetration_of_Renewable_Generation_in_the_ERCOT_Grid.pdf