2020 Panhandle Regional Stability Study

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ROS Meeting
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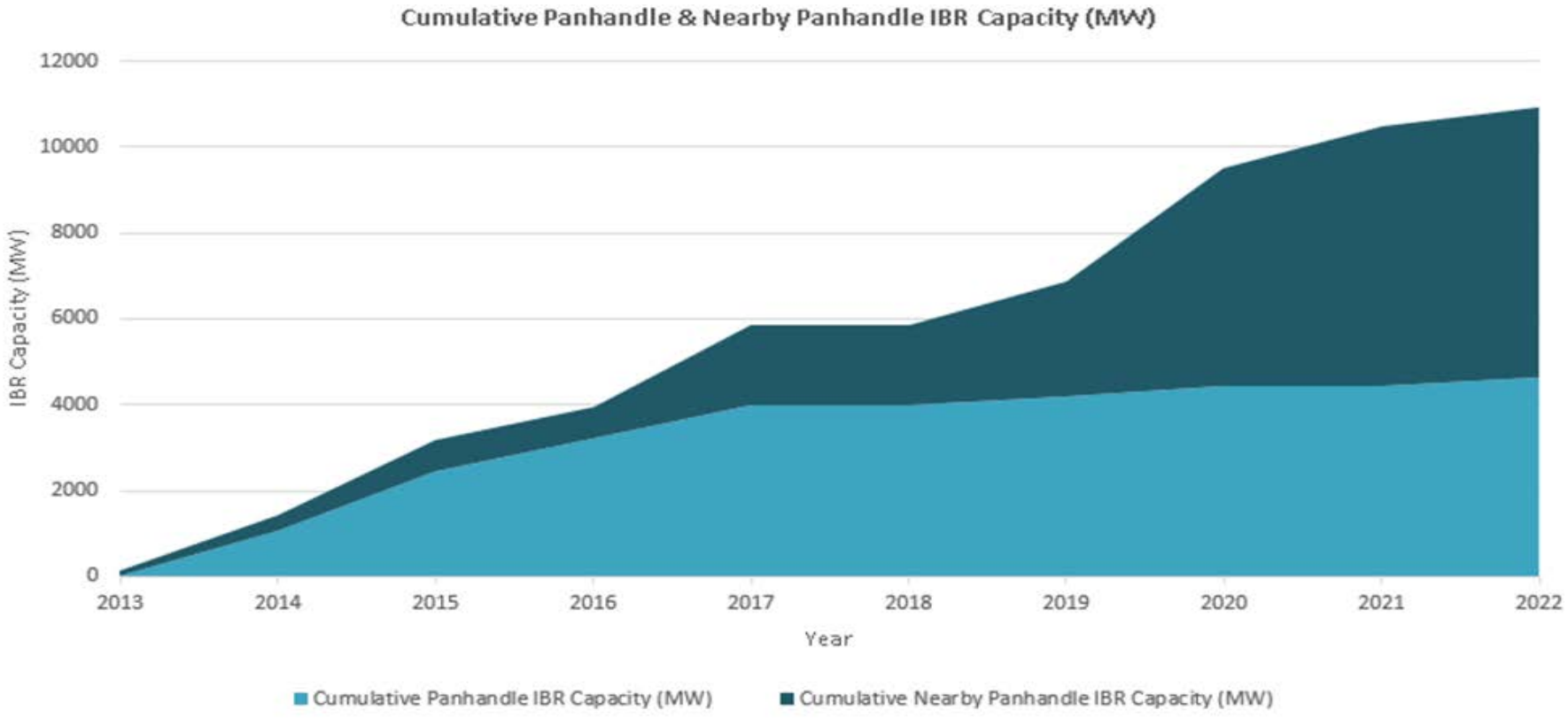
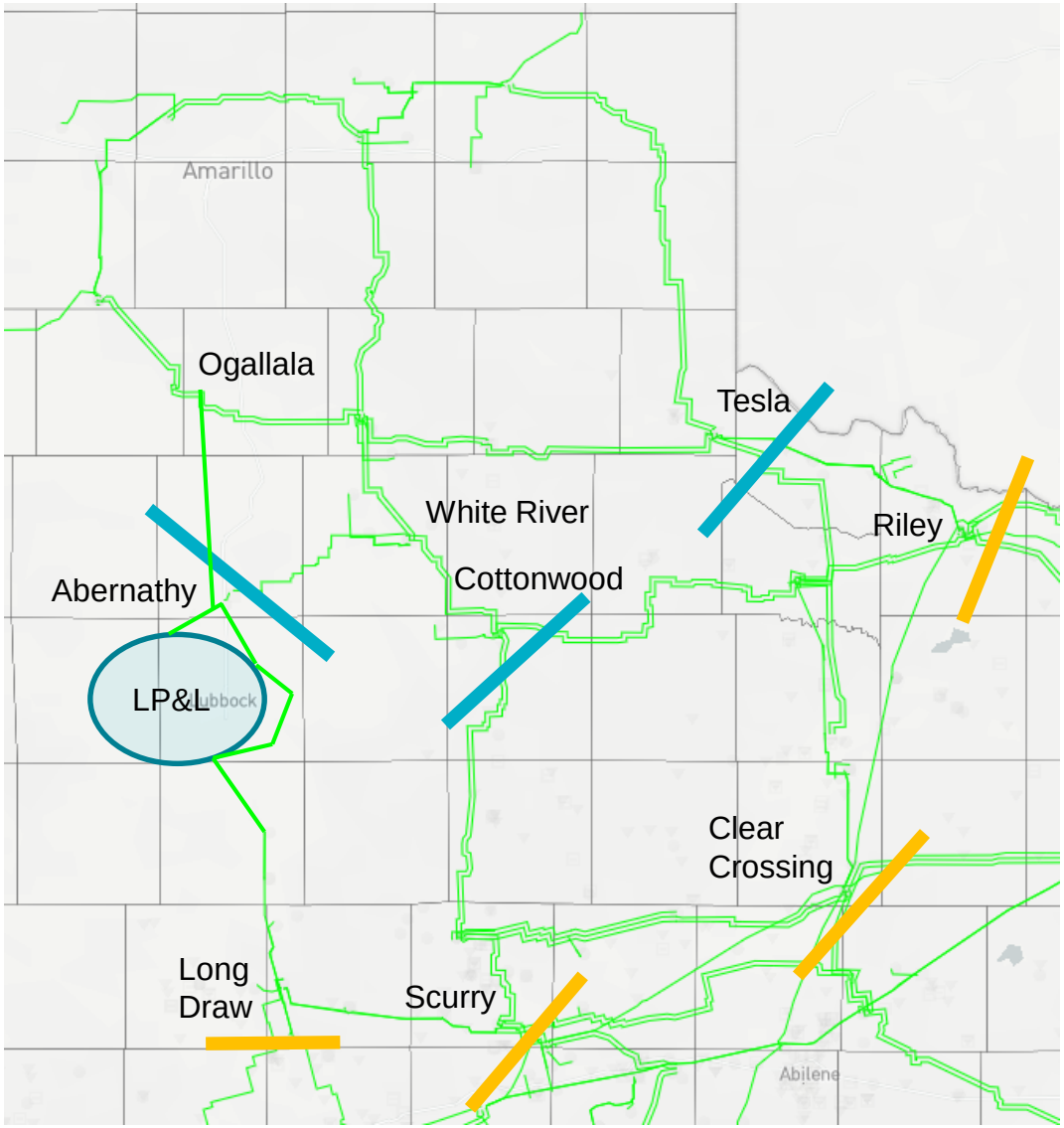
Background and Study Purpose

- Integration of Lubbock Power and Light
- Rapidly increasing interconnections - Nearby Panhandle capacity (meeting PG 6.9) increased from ~3.5 GW to ~5.3 GW since 2019 study



Panhandle Boundary Assumptions*



345 kV Transmission Line
(only 345 kV network shown)

Panhandle Boundary*
Nearby PH Boundary*

*Boundaries are defined for purposes of classifying generation capacity as Panhandle or Nearby Panhandle and not indicative of a defined constraint interface

PSS/e Case Development

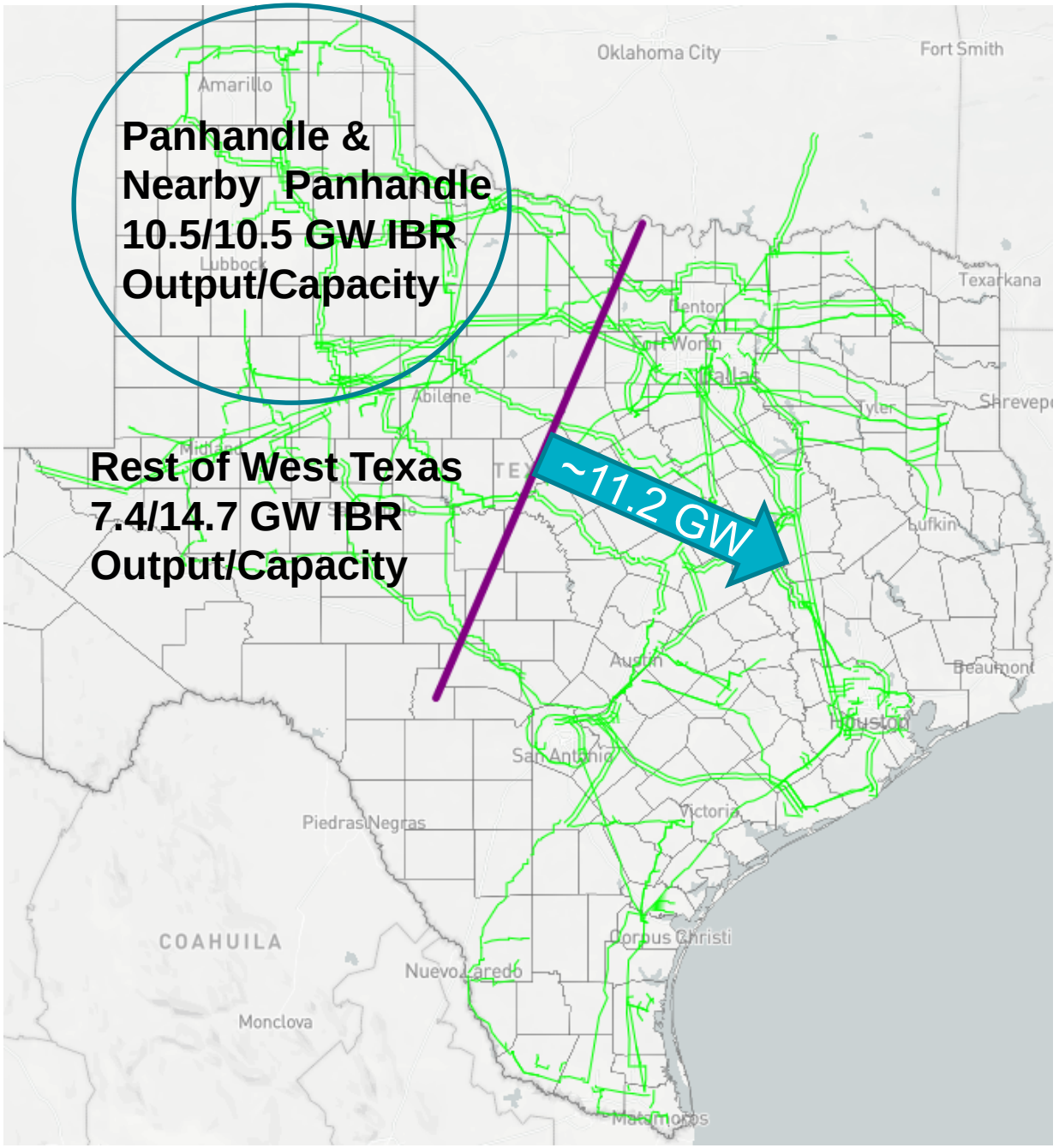
- Modified DWG 2022 HWLL case
- Panhandle IBR Capacity: ~5200 MW
- Nearby Panhandle IBR Capacity: ~5300 MW
  - GNET ~450 MW due to model unavailability
- West Texas Synchronous Machines off
- Solar resources turned on
- Lubbock Load at ~35% of Peak
- West-to-East Transfer: ~11.2 GW

PSCAD Case Development

- Translated from PSS/e case
- PSCAD modeling for Panhandle and Nearby Panhandle 345 kV
- Passive equivalent representation for the rest of ERCOT
- GNET units (~450 MW) not represented in the case
- 43 parallel cases
- ~2.5 hours to run a single contingency

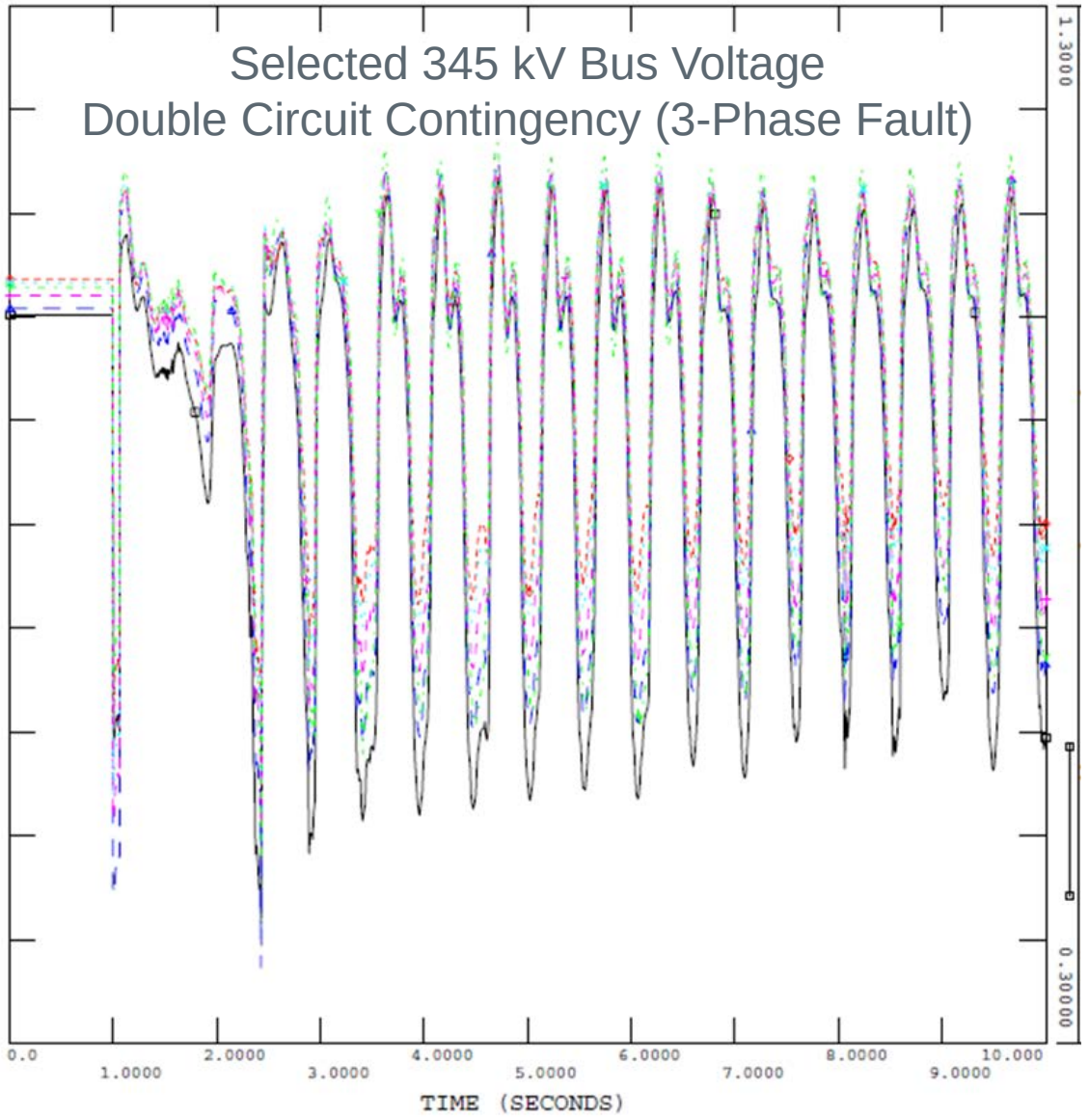
Power Transfer Map

PH100-NP100 Study Case: (100% Panhandle dispatch and 100% Nearby Panhandle dispatch)



100% Panhandle & Nearby Panhandle Dispatch

PH100NP100
Simulation Result:



Sensitivity Results at Reduced Output

Scenario	Study Results
PH80-NP80	Acceptable
PH80-NP100	Acceptable
PH100-NP80	Unacceptable

Scenario	Total Dispatch (MW)	Reactive Power Losses (MVAr)
PH80NP100	9023	2051
PH100NP80	9095	2827

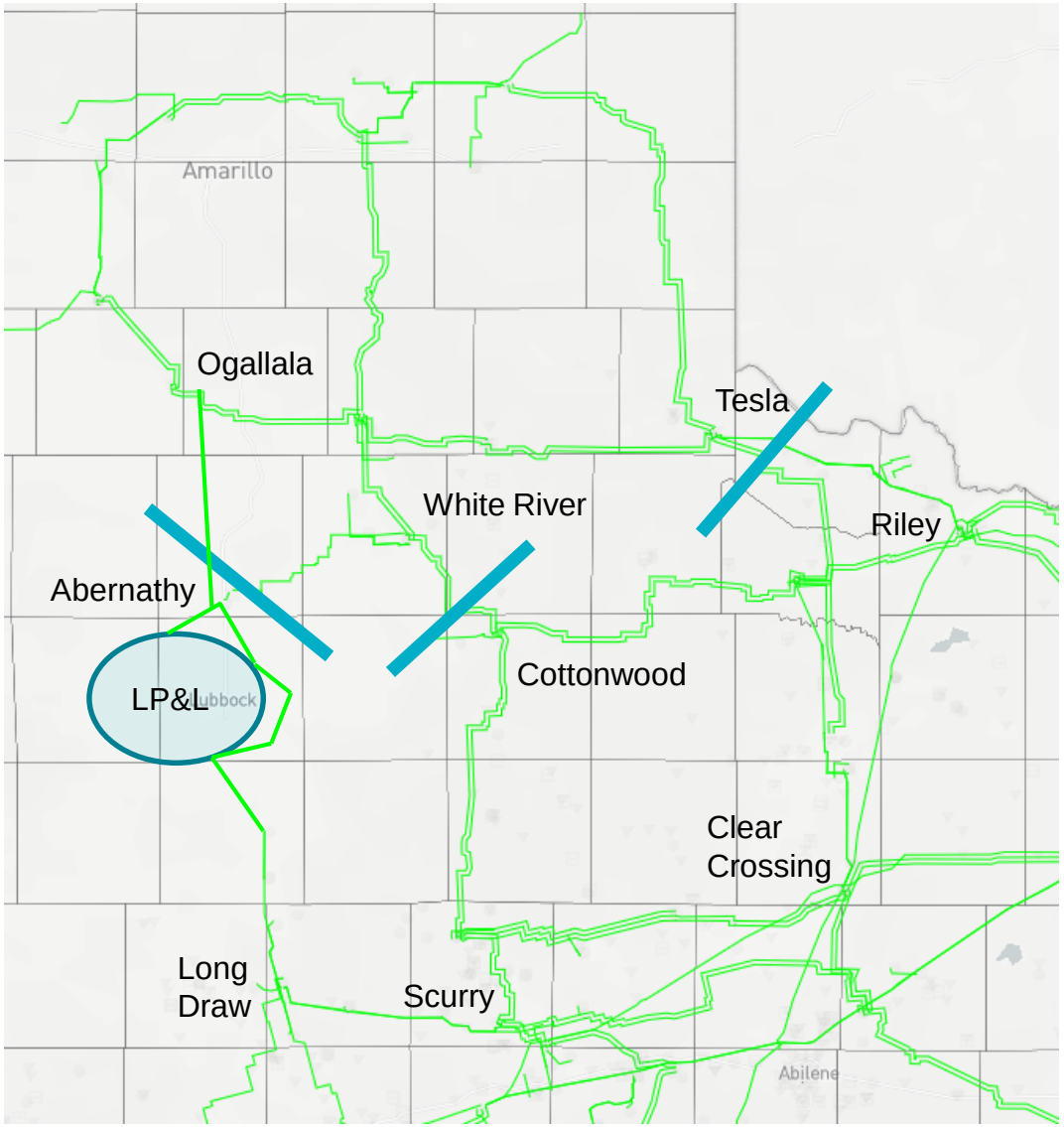
Study Conclusions

- Output reductions necessary to maintain stability
  - Instabilities observed at 100% dispatch level
  - Stable simulation results observed if Panhandle output reduced to an 80% dispatch level
  - Panhandle and Nearby Panhandle could be constrained by potential West Export stability constraints
- Controlling Panhandle generation output is a proper approach for maintaining stability
  - More effective than controlling Nearby Panhandle output
  - Reduces reactive losses
  - No identified reliability benefit for controlling both Panhandle and Nearby Panhandle output

Interface Assessment

- Major interface changes do not appear beneficial
  - Consider flows into Abernathy from White River and Ogallala after LP&L integration
- Assessed minor changes to existing interface
  - Consider flows into Cottonwood from White River instead of flows out of Cottonwood to Edith Clarke and Dermott
  - Consider flows into Riley from Jim Treece/Tesla instead of the flows out of Tesla to Jim Treece/Riley
- No significant difference in stability performance when considering the interface modifications
  - Option to allow highest generation output proposed

Proposed Interface after LP&L Integration



345 kV Transmission Line
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Proposed Panhandle Interface Boundary*
- Tesla – Riley/Jim Treece (Measured at Tesla)
- Tesla – Edith Clarke dckt (Measured at Tesla)
- White River – Cottonwood dckt (Measured at Cottonwood)
- Ogallala – Abernathy (Measured at Abernathy)
- White River – Abernathy (Measured at Abernathy)

*Final determination of the interface and implementation are subject to further review by ERCOT Operations

System Strength Assessment

- No widespread control instabilities related to low system strength identified in PSCAD analysis
  - Study did not consider prior outage conditions
  - Less Nearby Panhandle generation in PSCAD case
- WSCR metric is inadequate after LP&L integration
  - Assumptions associated with calculating and applying the WSCR metric are no longer valid
  - WSCR metric does not effectively reflect the impact of LP&L load and Nearby Panhandle IBRs
- Voltage stability limits are expected to be more binding than system strength issues in the near term

Additional Observations & Recommendations

- PSS/e is still the primary tool to assess stability
  - PSCAD analysis is necessary in regions with a high penetration of IBRs
- ERCOT needs to continue work with stakeholders to adopt the dynamic model validation and verification process as soon as possible
- IBR tripping due to transient overvoltage was observed and can be further exacerbated with more IBR connections under weak grid conditions

QUESTIONS?