Updates on Weak Grid Analysis

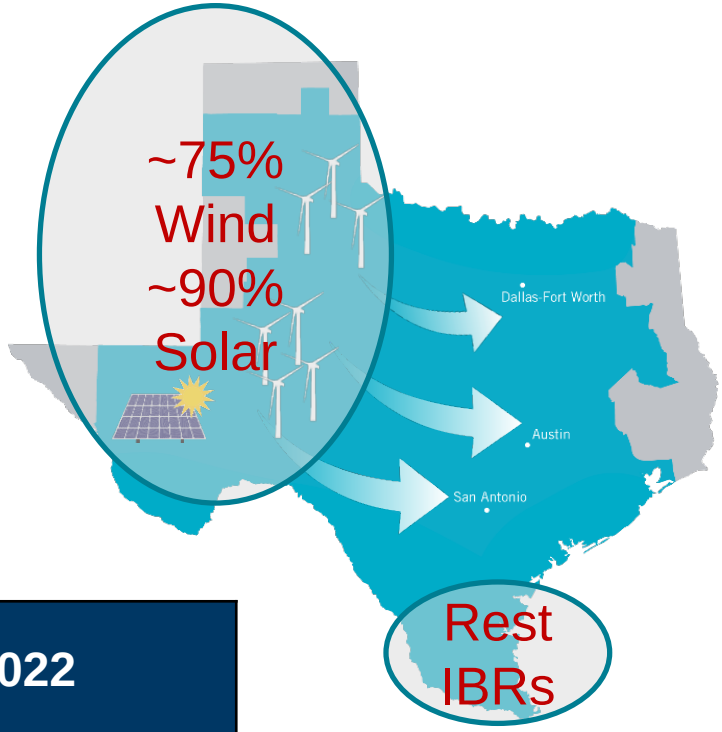
Shun Hsien (Fred) Huang
shuang@ercot.com

ESIG Fall Technical Workshop
Challenges with Weak Grid and Low Inertia System

October 6, 2020

Overview of Inverter-Based Resources (IBRs, mainly Wind and Solar) Development in ERCOT

- **Wind Generation Records (instantaneous)**
- Output: 21,375 MW
  - June 28, 2020, 11:22 p.m.
- Penetration (load served): 59.30%
  - May 2, 2020 2:10 a.m.
  - Total MW Served by Wind = 19,426 MW



Utility Scale IBRs Capacity	2020	2022
Wind	~31 GW	> 36 GW
Solar	~6 GW	> 15 GW

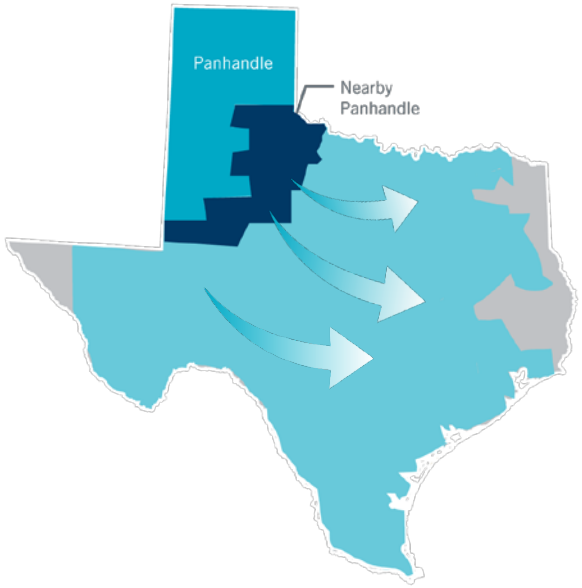
[2]

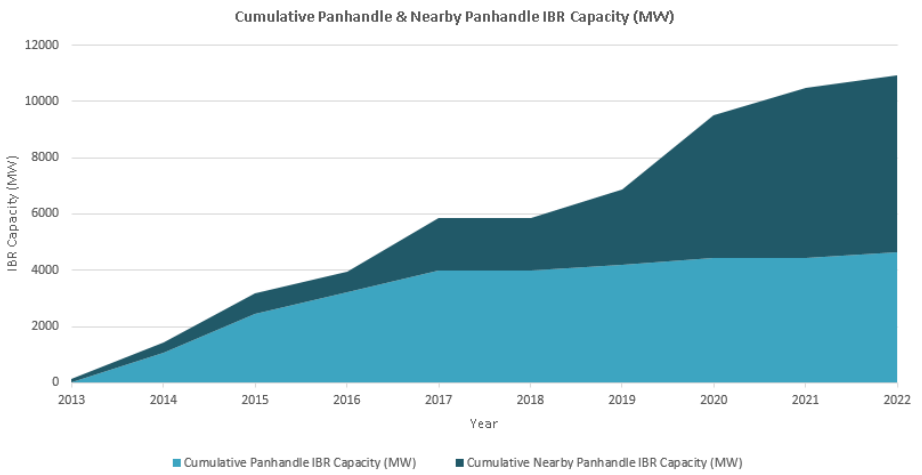
18-24 Months

Typical time for IBRs from initial planning to physical interconnection

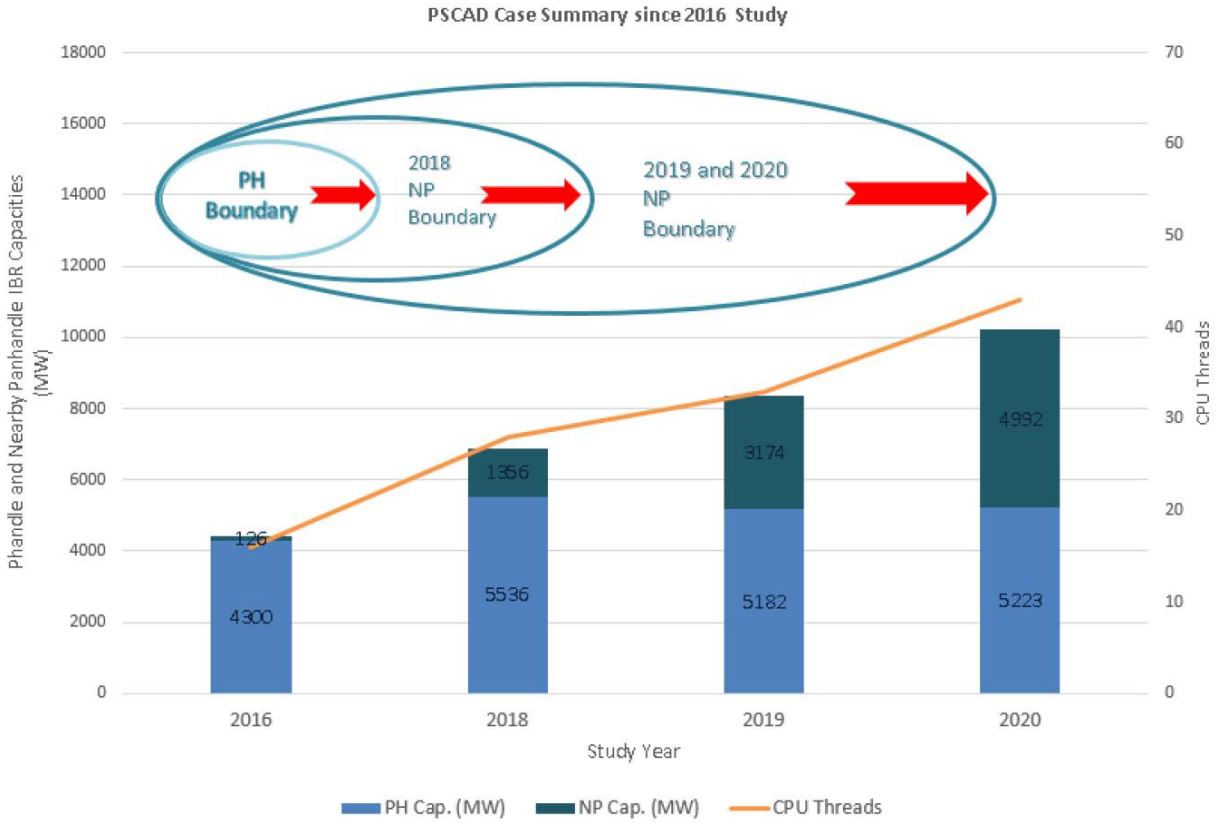
Renewable Generation in Panhandle

- Remote from synchronous generators and load centers
- Long distance large power transfer (>200 miles,>10 GW)
- All inverter-based resources
- Challenges and Needs
  - Weak Grid
  - Voltage Stability
- System Improvements
  - Two synchronous condensers
  - SVCs
  - New transmission export path





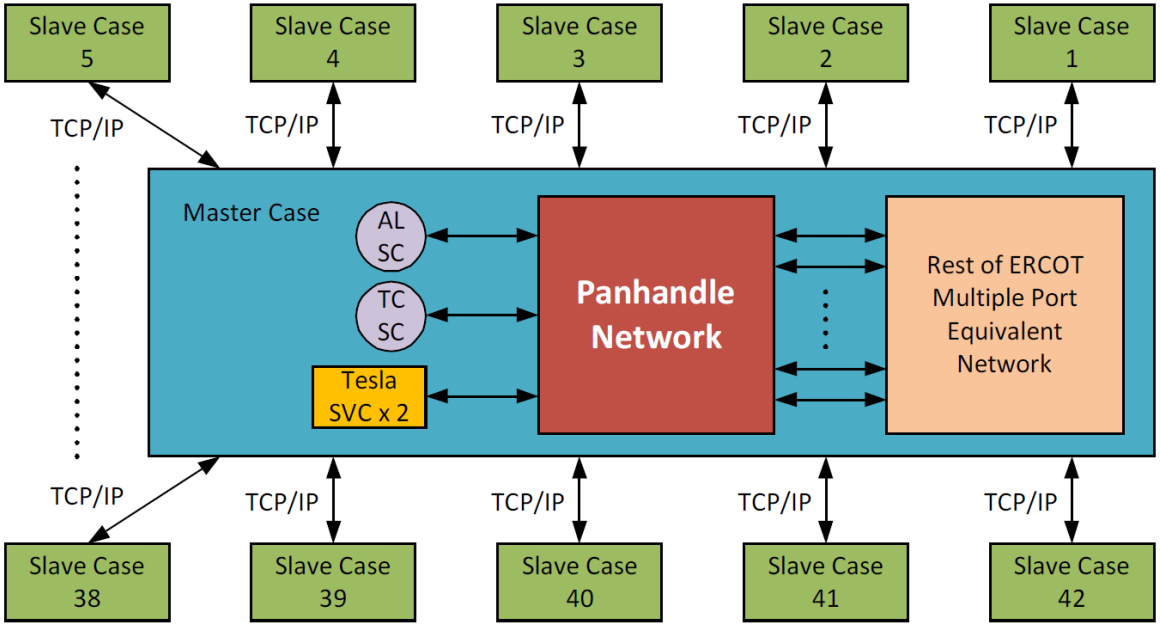
Panhandle PSCAD Study



- Assess system stability
- Identify improvements
  - close loop voltage control, synchronous condensers
- Assess the adequacy of WSCR application

2020 Panhandle PSCAD Study Case Set Up

- Include all the transmission elements and IBRs in the Panhandle region
- PSCAD parallel simulation using more than 40 threads
- Complex and time consuming: >2 hrs/contingency
- Challenge for large scale system study



Takeaways

- Positive sequence dynamic stability and steady state studies are still critical to assess the system performance for the weak grid conditions
- The need of large scale PSCAD system studies is on the horizon but can be challenge (feasible? practical?)
- Continue to improve models: PSS/e and PSCAD model validation and verification improvements are under the ERCOT market rule revision review