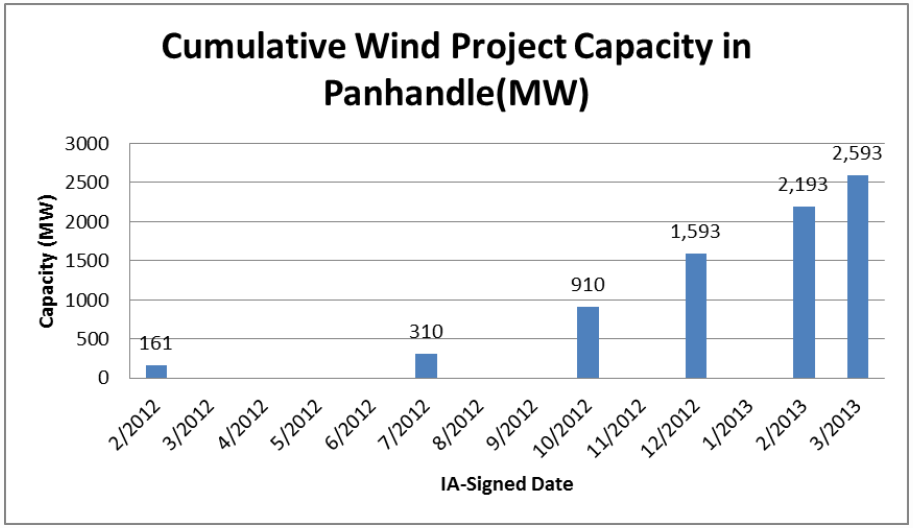
Panhandle Renewable Energy Zone Study – Progress Update

Shun-Hsien (Fred) Huang
ERCOT System Planning

RPG Meeting
5-21-2013

Needs of Panhandle Study

- 2012 Long Term System Assessment
  - Indicated significant expansion of wind resources in the Panhandle under a range of future outcomes.
  - If the northwestern-most portion of the Panhandle CREZ system becomes over-subscribed, voltage stability limits will constrain wind power delivery to the rest of the ERCOT system.
- The approved CREZ projects will be in-service by 2013



All projects except one with 200 MW are proposed to be in service by 2015.

Study Scenarios

- SSWG 2016 HWLL(high wind low load) case
  - Wind output dispatch: 8,946 MW (10,785 MW installed capacity)
  - Load: 36.5 GW
- Study scenario
  - Scenario 1: IA-Signed + FIS Complete (as of March 08, 2013, based on study scope)
    - Add 5,043 MW of Panhandle wind at 95% output
    - Wind penetration: 37.6% (13.7GW wind output / 36.5 GW load)

Panhandle Station	Scenario 1	Initial Build CREZ
TOTAL	5,043 MW	2,400 MW
Windmill/Ogallala	1,800 MW	400 MW

ERCOT

Study Progress: Scenario 1

- Voltage Stability Analysis
  - Identify system constraints and system upgrade needs in Panhandle
  - Observe voltage collapse when voltage in Panhandle is above 0.95 pu
  - In the process to evaluate alternative upgrade options
- Economic Analysis
  - Based on the 2017 UPLAN case from 2012 Five-Year Transmission Plan
  - No thermal constraint in Panhandle
  - Observe Panhandle wind curtailment for approximately 40% of the study year with stability limit included in the economic analysis.
  - In the process to identify the potential upgrade needs based on economic analysis results

Study Progress: Scenario 1 (continue)

- Transient Stability Analysis
  - Complete the scenario 1 dynamic flat start
  - In the process to evaluate the system upgrade needs based on voltage stability results
- Short Circuit Ratio (SCR) Calculation
  - The equivalent SCR without system upgrades in Panhandle is close to 1.0 (extreme weak)
    - No conventional units, no load, long distance, dominated by power electronics (wind turbine, SVC)
  - A higher SCR is important to maintain stable dynamic responses for both system and wind plants