Panhandle Renewable Energy Zone (PREZ) Study
Preliminary Results

ERCOT System Planning

ERCOT Regional Planning Group (RPG) Meeting
10-22-2013

Outlines

- Disclaimer
- Study Assumptions
- Study Observations
- Roadmap – In progress
- Next Step
- Appendix
  - Needs, Purpose, and Goal of PREZ

Disclaimer

- PREZ study focuses on the upgrade needs to increase Panhandle export capability. Other ERCOT regions may require further studies for potential thermal and stability challenges.

- The identified upgrades may be revised base on the actual implementation of wind projects in Panhandle.

- The upgrades identified in this study are “NOT” approved projects. The identified projects may still require RPG review.

Standard Generation Interconnection Agreements in Panhandle (3489 MW, 09/30/2013)

GINR	ProjectName	County	Capacity (MW)	COD**
13INR0059	Hereford Wind	Castro	499(*200)	10/1/2013
14INR0012	Miami Wind 1 Project	Gray	401	5/1/2014
13INR0048	Spinning Spur Wind Two	Oldham	*161	6/1/2014
14INR0030a2	Panhandle Wind	Carson	*218	8/1/2014
11INR0050	Moore Wind 1	Crosby	149	8/8/2014
13INR0010a	Mariah Wind	Parmer	200	10/30/2014
14INR0023	Longhorn Energy Center	Briscoe	361	12/1/2014
13INR0005	Conway Wind Farm	Carson	*600	12/15/2014
13INR0010b	Mariah Wind	Parmer	200	12/31/2015
12INR0029	Comanche Run Wind	Swisher	500	12/31/2015
13INR0010c	Mariah Wind	Parmer	200	12/31/2016

*With financial commitment: 1179MW

** Projected commercial operation date

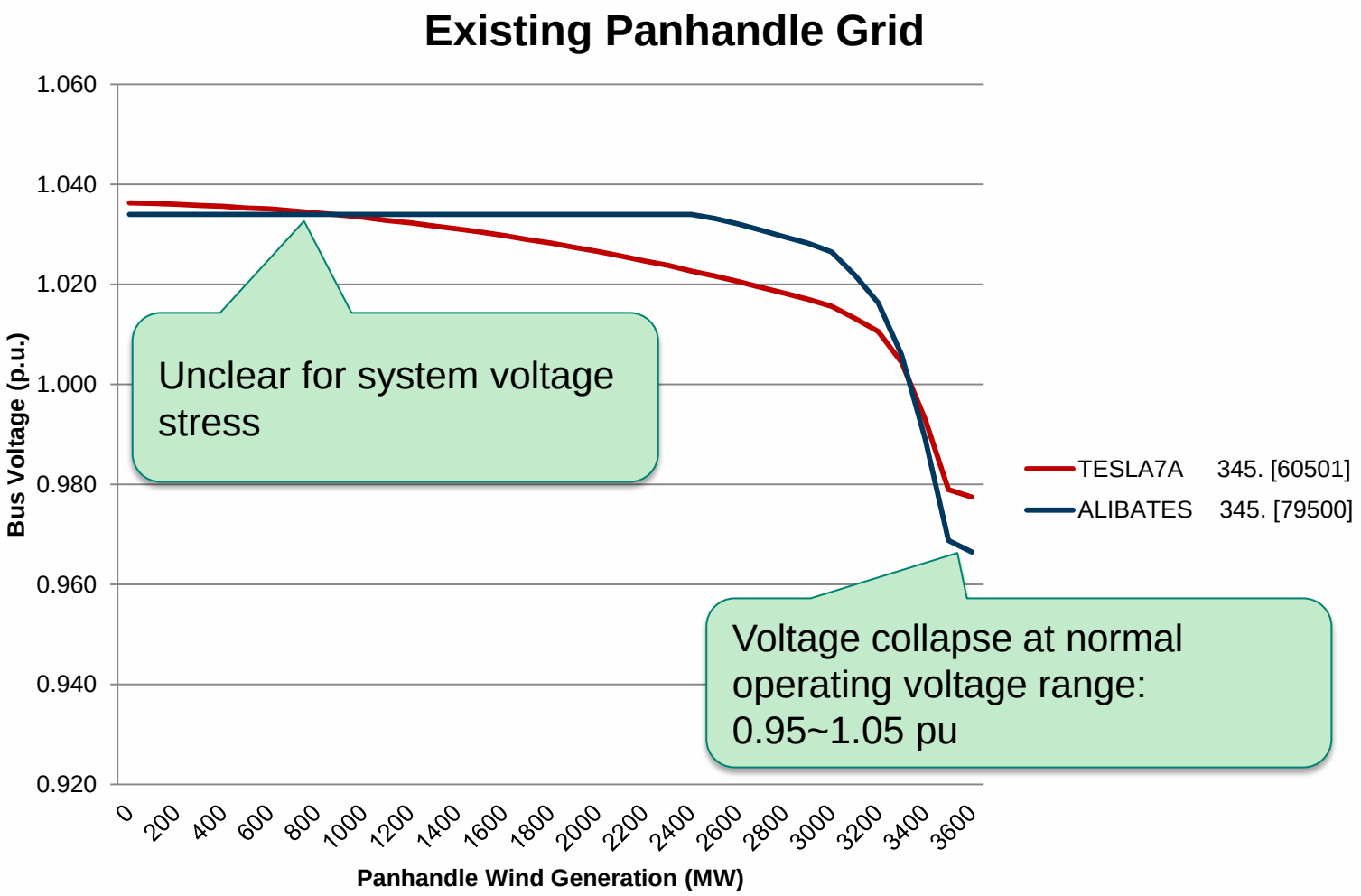
Assumptions

- Dynamic model and data for Panhandle wind projects are based on the Generation Interconnection Request (GINR) and Standard Generation Interconnection Agreement (SGIA)
- Panhandle wind generation reactive capability: +/- 0.95pf at Point of Interconnection (POI)
- Panhandle wind generation is dispatch at 95% output in the reliability analysis
- Limited conventional units that are in service in west Texas in the reliability analysis
- No short circuit current contribution from wind generation in short circuit ratio calculation

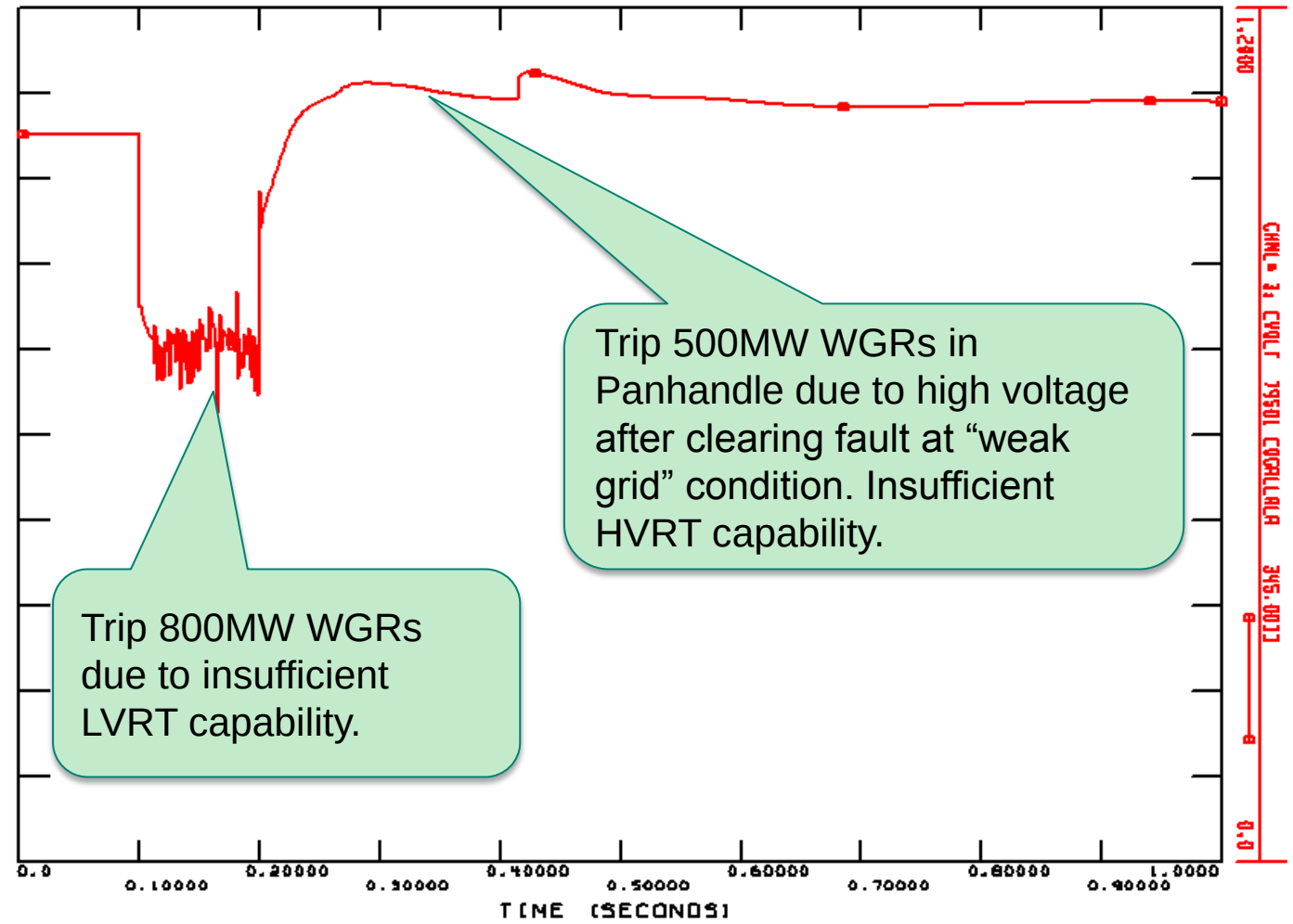
Study Observations

- Steady state and dynamic stability
- Short circuit ratio calculation
- Synchronous condenser location and size identification

Steady State Voltage Stability



Dynamic Voltage Stability: Voltage Ride Through Capability



Panhandle 345kV voltage response

Equivalent Short Circuit Ratio Calculation

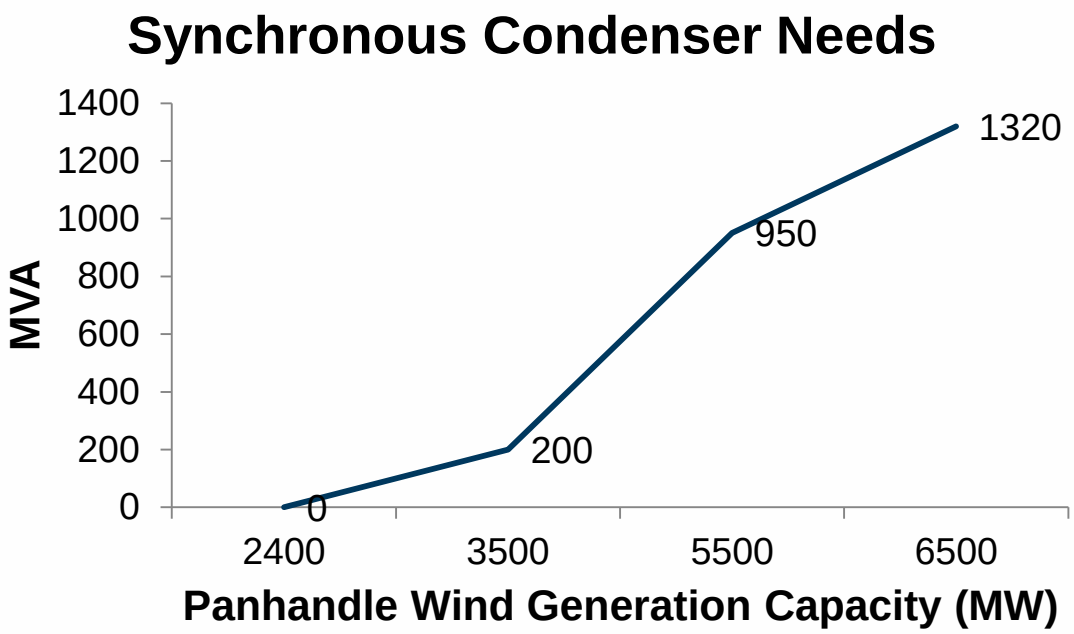
Example:

Bus	Wind Capacity (MW)	Short Circuit MVA: SCMVA	SCR=SCMVA/MW
A	1200	6500	5.42
B	1000	8000	8.00
C	800	8500	10.63

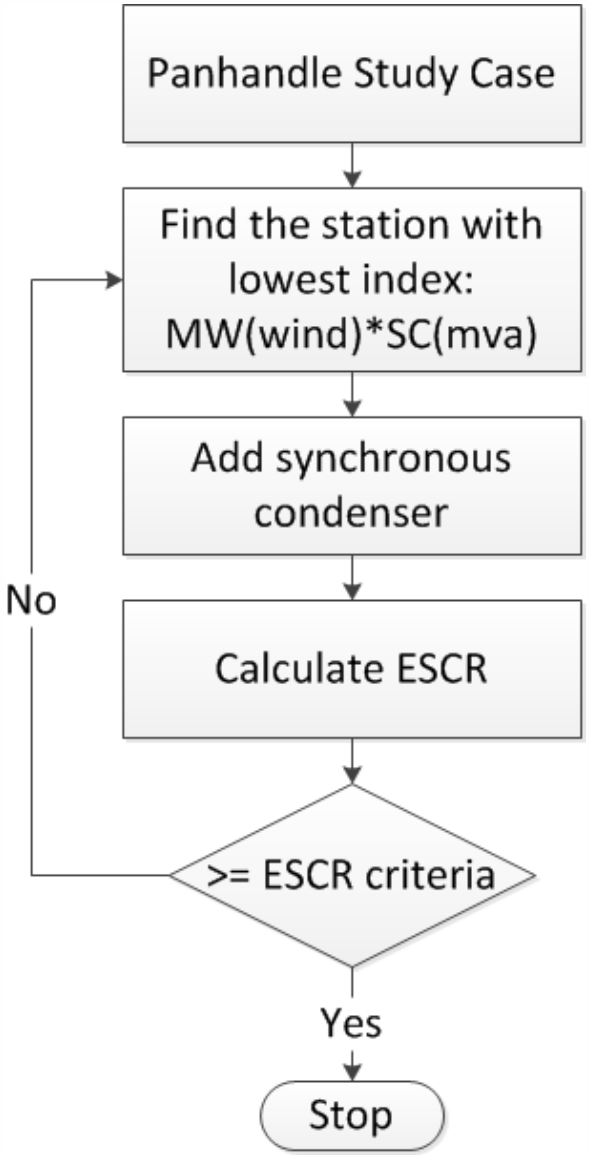
$$\text{ESCR} = \frac{\sum(SCMVA\ at\ bus_i * \text{Wind capacity (MW)connect to } bus_i)}{(Total\ Wind\ Capcity\ (MW)\ connect\ to\ Panhandle)^2}$$

- ESCR = 2.5

Synchronous Condenser: Location and Size



- As an example, need to be revised for different transmission line upgrades and wind generation projects
- ESCR criteria = 1.5



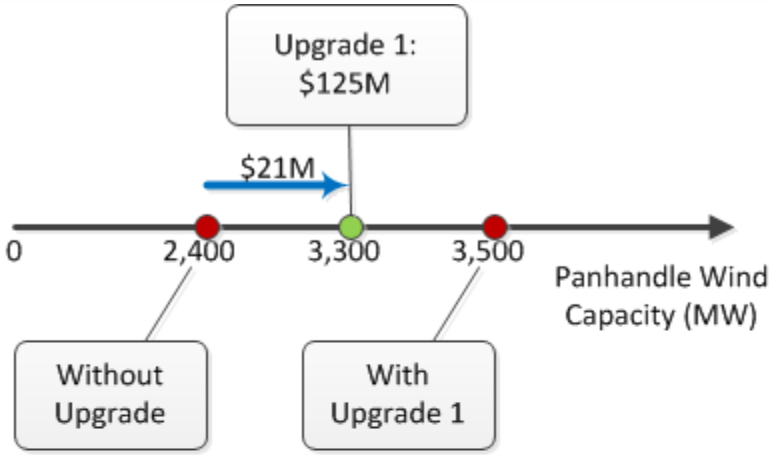
Roadmap – In Progress

- Identify upgrade needs and the associated Panhandle export limit.

- Perform economic cost analysis to find the triggers of upgrades
  - in terms of wind project capacity in Panhandle
  - Protocol 3.11.2 (5)

    …., the levelized ERCOT-wide annual production cost savings over the period for which the simulation is feasible is calculated and compared to the first year annual revenue requirement of the transmission project.….

Roadmap – Preliminary Result



Upgrades

Element	Description	Circuit #	Upgrade	Length/Size	Note	Estimated Cost ($M)
345kV Line	Alibates-Windmill	1	1	93 miles	On the existing tower	125
345kV Line	Windmill-Ogallala	1	1	27 miles	On the existing tower	
345kV Line	Ogallala-Tule Canyon	1	1	47 miles	On the existing tower	
Synchronous Condenser	Windmill	--	1	200 MVA		
Reactor	Alibates	--	1	50 MVAr		
Reactor	Ogallala	--	1	100 MVAr		

Next Step

- Complete roadmap
- Prepare report

Appendix

Needs of PREZ Study

- 2012 Long Term System Assessment
  - 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.

- Generation projects will exceed the CREZ design capacity for the Panhandle area (based on the CREZ Reactive Study “Initial Build” recommendations).

- No near-term Panhandle transmission projects being developed post CREZ 2013.

Purpose of PREZ Study

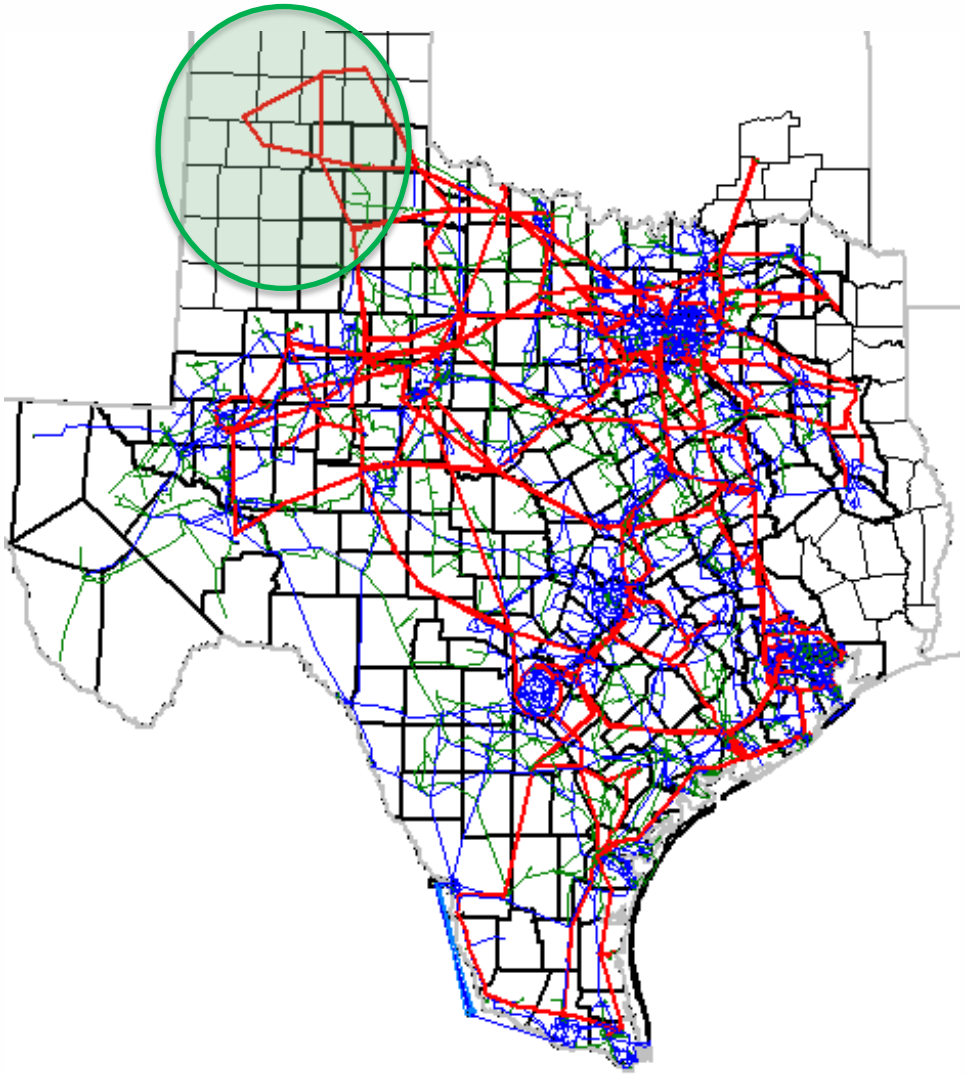
- To identify system constraints and upgrades to accommodate future wind generation projects.

- To provide a project roadmap for both ERCOT and TSPs to accommodate additional generation resources in the study area.
  - List of potential system upgrade projects.
  - Triggers for when those projects will be recommended.

Panhandle Grid Characteristics

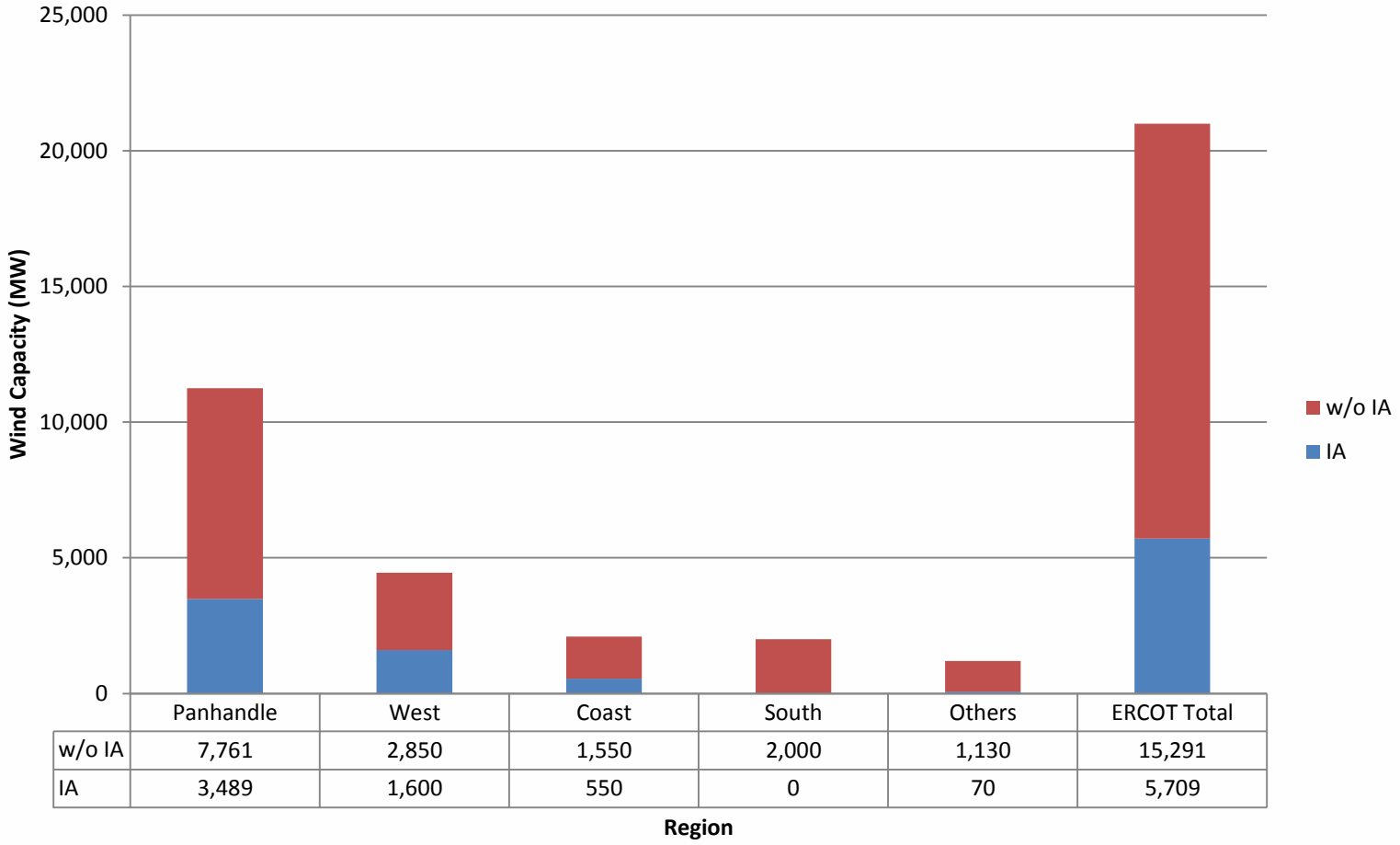
- Minimal/no local load
- Minimal/no sync generation
- 11 GW wind capacity in GINR

- Voltage stability and grid strength challenges



Wind Projects GINR Overview

Wind Generation Capacity in the Interconnection Request
July 2013



	Panhandle	West	Coast	South	Others	ERCOT Total
w/o IA	7,761	2,850	1,550	2,000	1,130	15,291
IA	3,489	1,600	550	0	70	5,709

Challenge and Need

- Challenge: Weak Grid
  - Natural system characteristic when a region is dominated by non-synchronous generation.
  - Sensitive voltage response
  - Coordination between voltage support resources
  - Steady state and transient voltage stability

- Need: System Strength
  - Stable voltage response (steady state and dynamics)
  - Allow voltage controller work properly
  - Minimize impact of critical contingency

Initial Build (2400 MW)

IA (~~2593~~ 3489 MW)

FIS-Complete (~~2450~~ 1401 MW)

FIS Study (~~5409~~ 5552MW)

Panhandle GINR Overview

Updated ~~March 8th, 2013~~, July, 2013