Panhandle Renewable Energy Zone (PREZ) Study
Preliminary Results

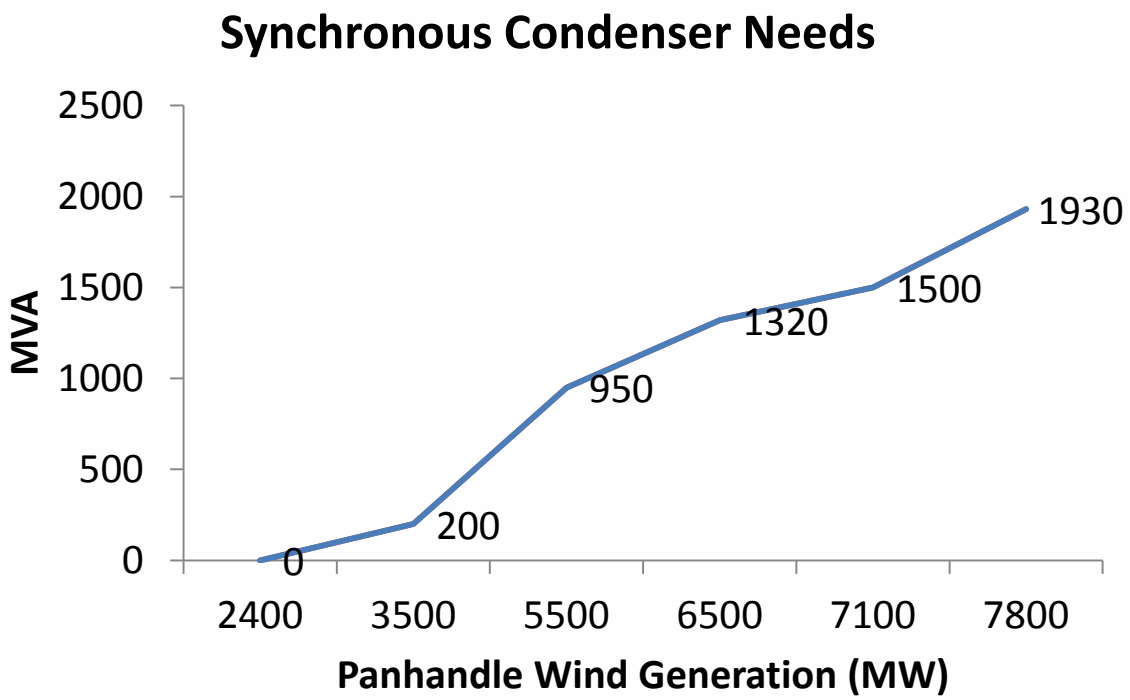
ERCOT System Planning

ERCOT Regional Planning Group (RPG) Meeting
11-15-2013

Outlines

- Update
  - Synchronous condenser needs
  - System strength assessment
- Roadmap – In progress
- Appendix
  - Needs, Purpose, and Goal of PREZ

Synchronous Condenser Needs



- Panhandle SCR target = 1.5
- Actual synchronous condenser needs will vary based on transmission line upgrades and wind generation projects.

System Strength Assessment

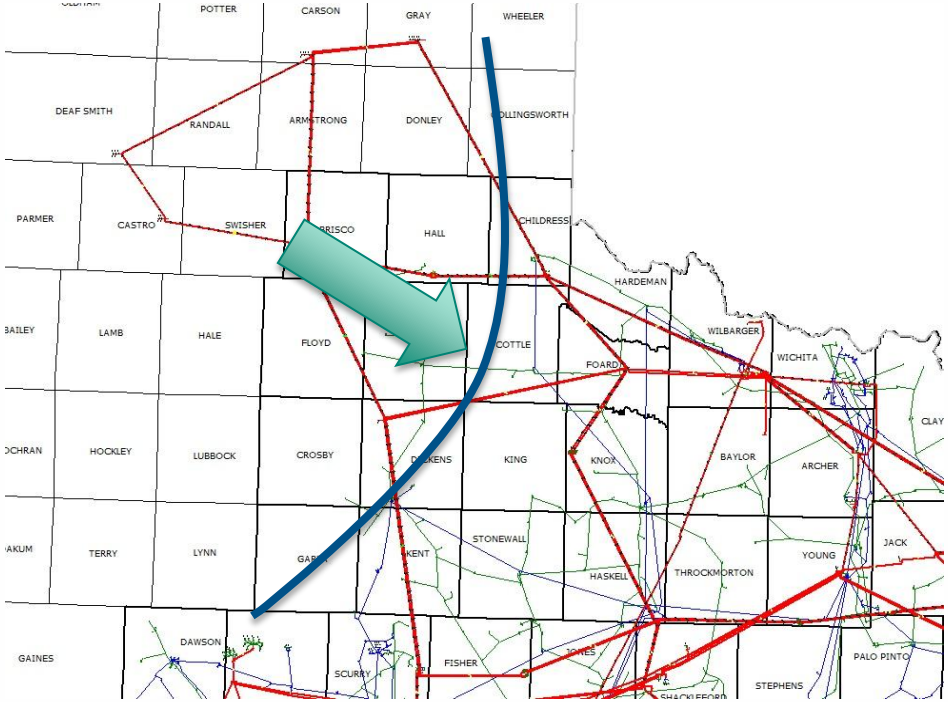
	Synchronous Condenser	SVC	VFT
Dynamic Reactive Support	√	√	√
System Strength	√	–	√**
Cost	$$	$$	$$$

Notes
SVC: Static Var Compensator
VFT: Variable Frequency Transformer
** Dependent on the strength and appropriate modeling of the adjacent system

Panhandle Constraint and Interface

- Constraints:
  - Voltage stability
  - System strength

- Panhandle Interface
  - Gray - Tesla
  - Tule Canyon - Tesla
  - Cottonwood - Edith Clarke
  - Cottonwood - Dermott

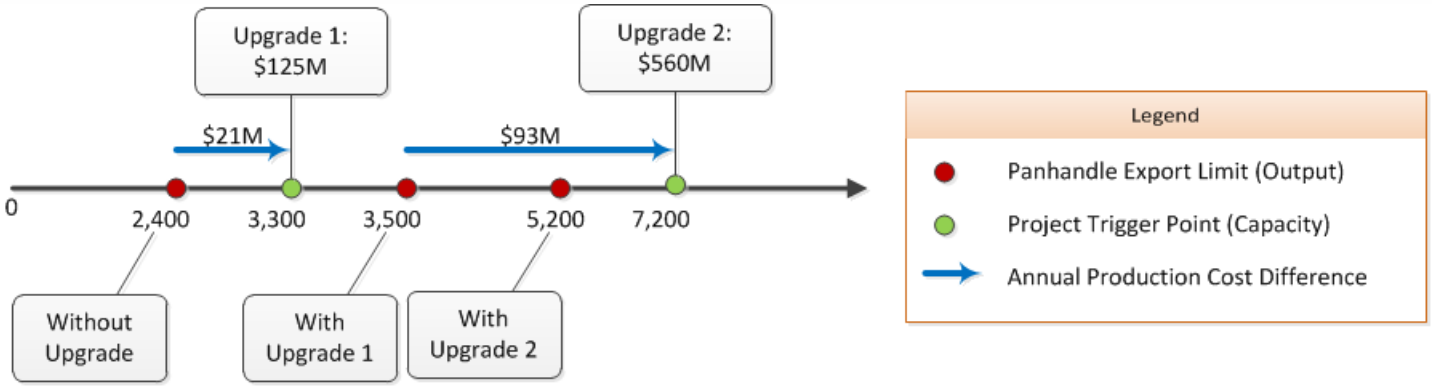


Study Criteria

- Reliability Criteria (ERCOT SOL methodology*)
  - Steady State:
    - Thermal:
      - 100% rate A for base case
      - 100% rate B for contingency analysis
  - Transient stability:
    - Post disturbance voltage within the range from 0.9 to 1.1 pu
    - Post disturbance frequency within the range from 59.4 Hz to 60.4 Hz
- Economic Criteria
  - Thermal: 100% rate A for base case, 100% rate B for contingency analysis
- Panhandle Short Circuit Ratio >= 1.5

* Available at http://planning.ercot.com/procedures/irtcm/

Roadmap – Preliminary Result

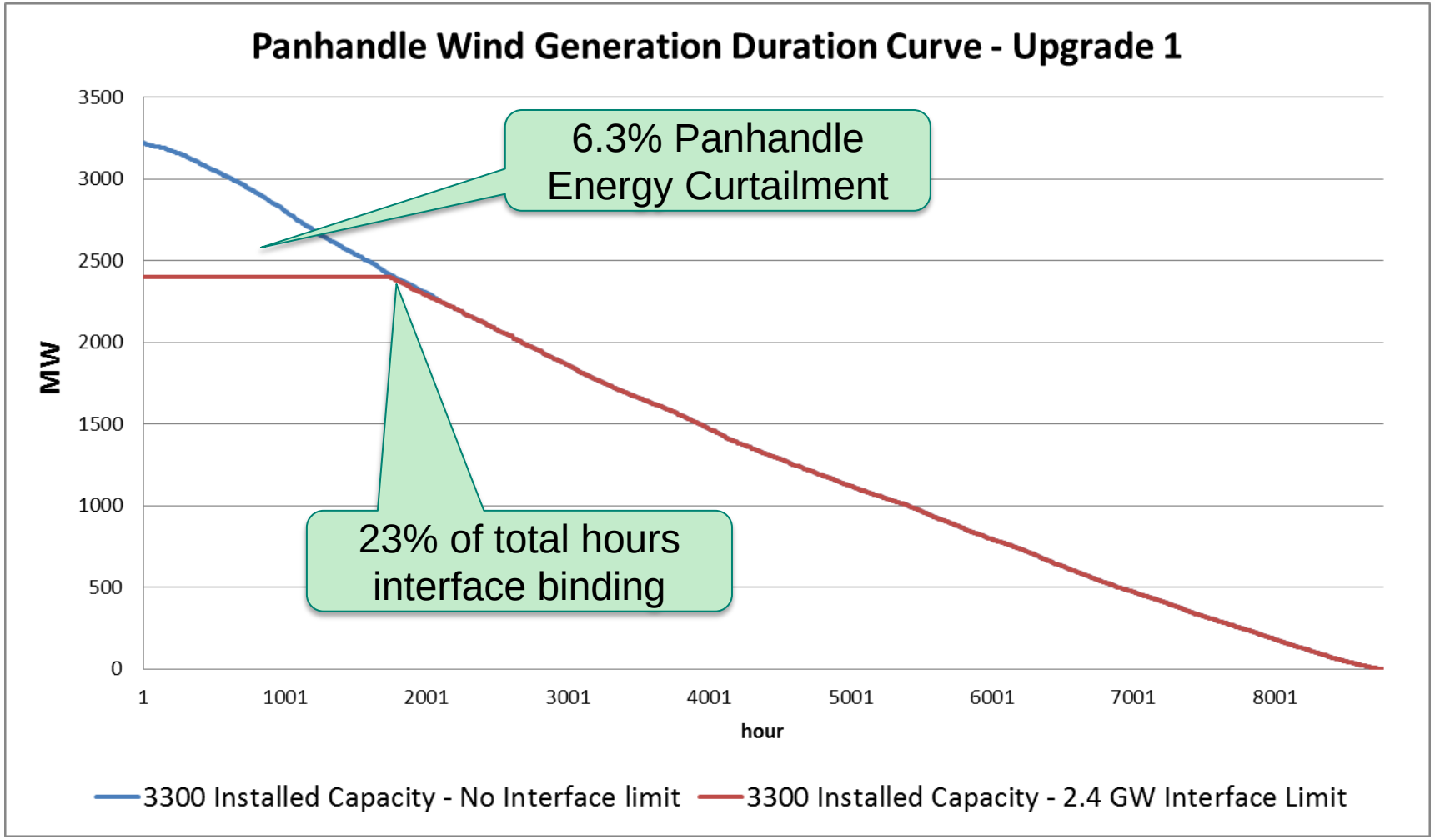


Upgrades

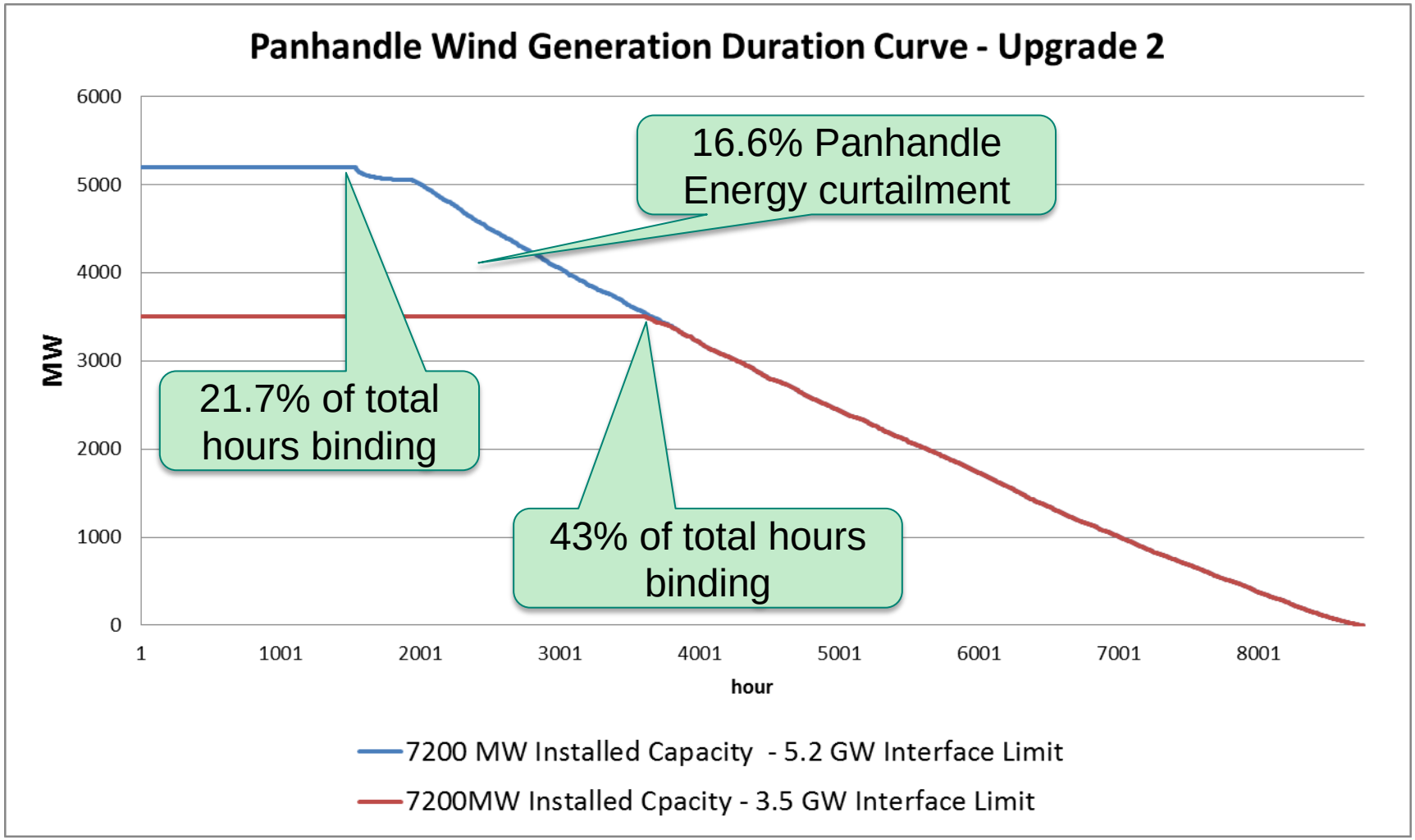
Element	Description	Circuit #	Upgrade	Length/Size	Note	Estimated Cost ($M)
345kV Line	Alibates-Windmill	1	1	93 miles	On the existing tower	125
345kV Line	Windmill-Ogallala	1	1	27 miles	On the existing tower	
345kV Line	Ogallala-Tule Canyon	1	1	47 miles	On the existing tower	
Synchronous Condenser	Windmill	--	1	200 MVA		
Reactor	Alibates	--	1	50 MVAr		
Reactor	Ogallala	--	1	100 MVAr		
345kV Line	Ogallala-Long Draw	2	2	190 miles	New line	560
Synchronous Condenser	Windmill	--	2	400 MVA		
Synchronous Condenser	Alibates	--	2	200 MVA		
Synchronous Condenser	Gray	--	2	150 MVA		
Reactor	Windmill	--	2	50 MVAr		
Reactor	Ogallala	--	2	150 MVAr		
Reactor	Long Draw	--	2	150 MVAr		

- Calculated project trigger points and export limits may vary based on the assumed location of wind generation projects

Panhandle Wind Generation Duration Curve



Panhandle Wind Generation Duration Curve



Appendix

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 based 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 (3837 MW, 11/7/2013)

GINR	ProjectName	County	Capacity (MW)	COD**
13INR0059	Hereford Wind	Castro	499(*200)	4/15/2014
14INR0012	Miami Wind 1 Project	Gray	401(*231)	5/1/2014
13INR0048	Spinning Spur Wind Two	Oldham	*161	6/1/2014
14INR0030a2	Panhandle Wind	Carson	416(*218)	8/1/2014
11INR0050	Moore Wind 1	Crosby	149	8/8/2014
13INR0010a	Mariah Wind	Parmer	200	10/30/2014
14INR0032a	Route66 Wind	Randall	150	9/1/2014
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: 1410 MW

** Projected commercial operation date

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

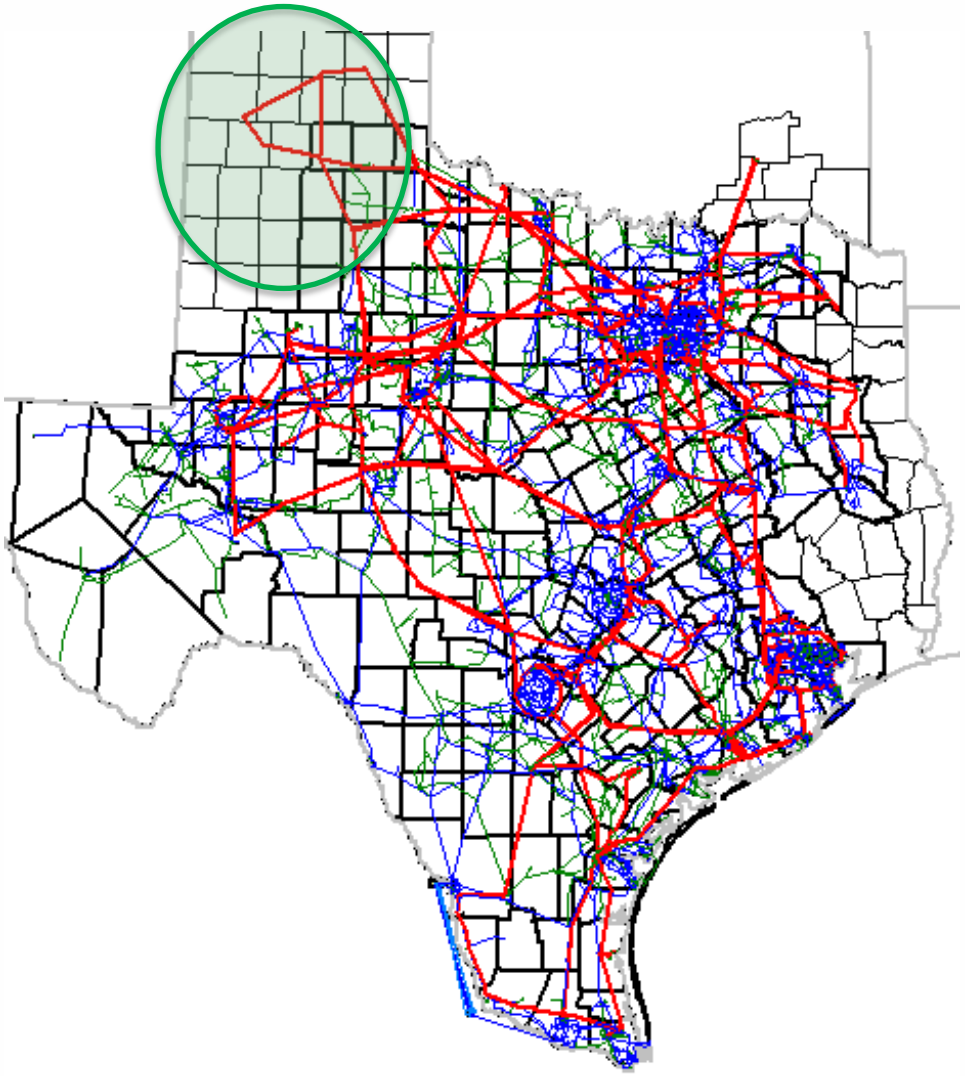
- To identify system constraints and upgrades to accommodate future wind generation projects.

- 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

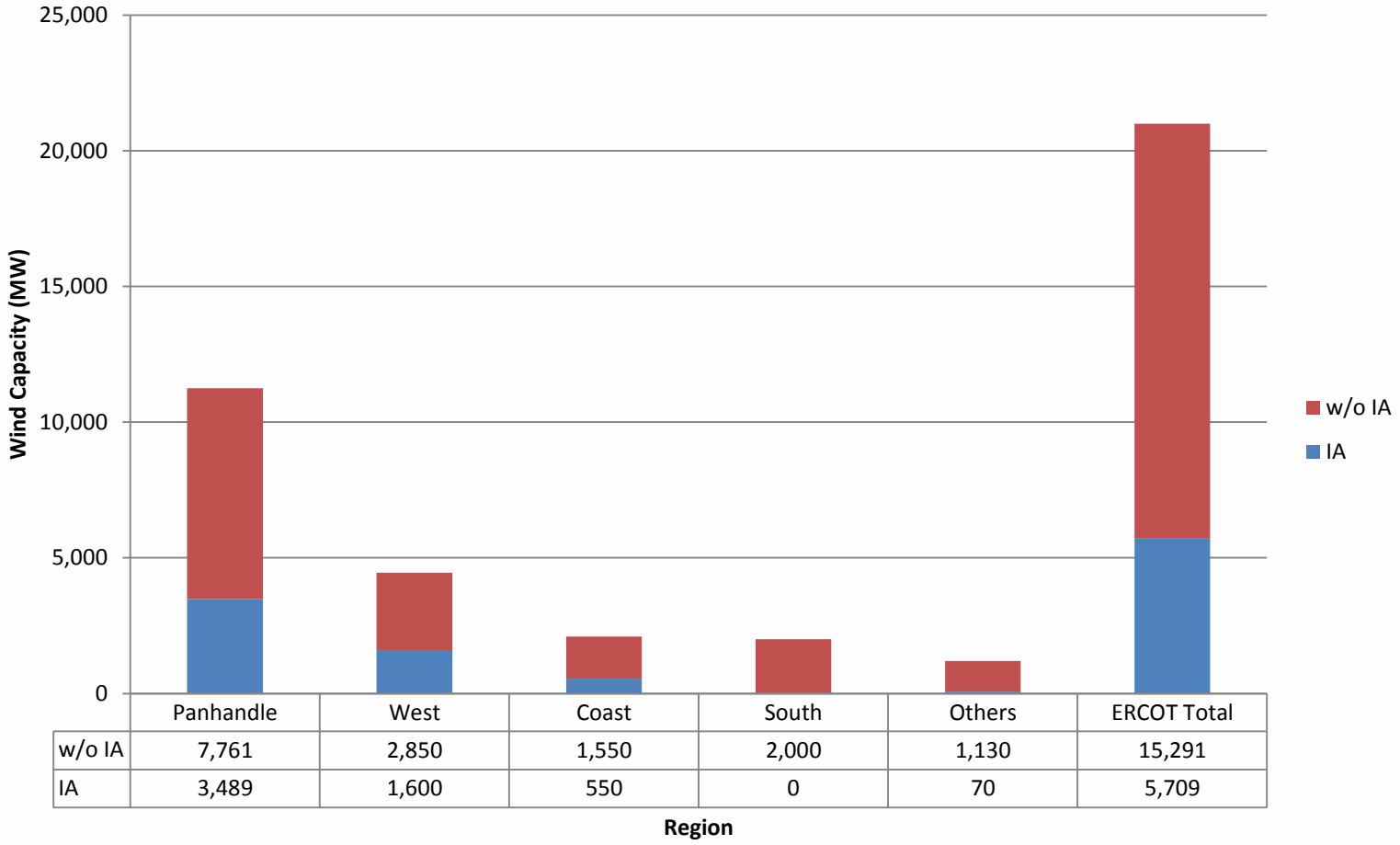
- Minimal/no local load
- Minimal/no sync generation
- 11 GW wind capacity in GINR

- 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