Panhandle Renewable Energy Zone (PREZ) Study
Preliminary Results

ERCOT System Planning

ERCOT Regional Planning Group (RPG) Meeting
08-27-2013

Outlines

- Needs and Purpose of PREZ study
- Preliminary Results
- Observation and Discussion

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.

Notes

- 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.

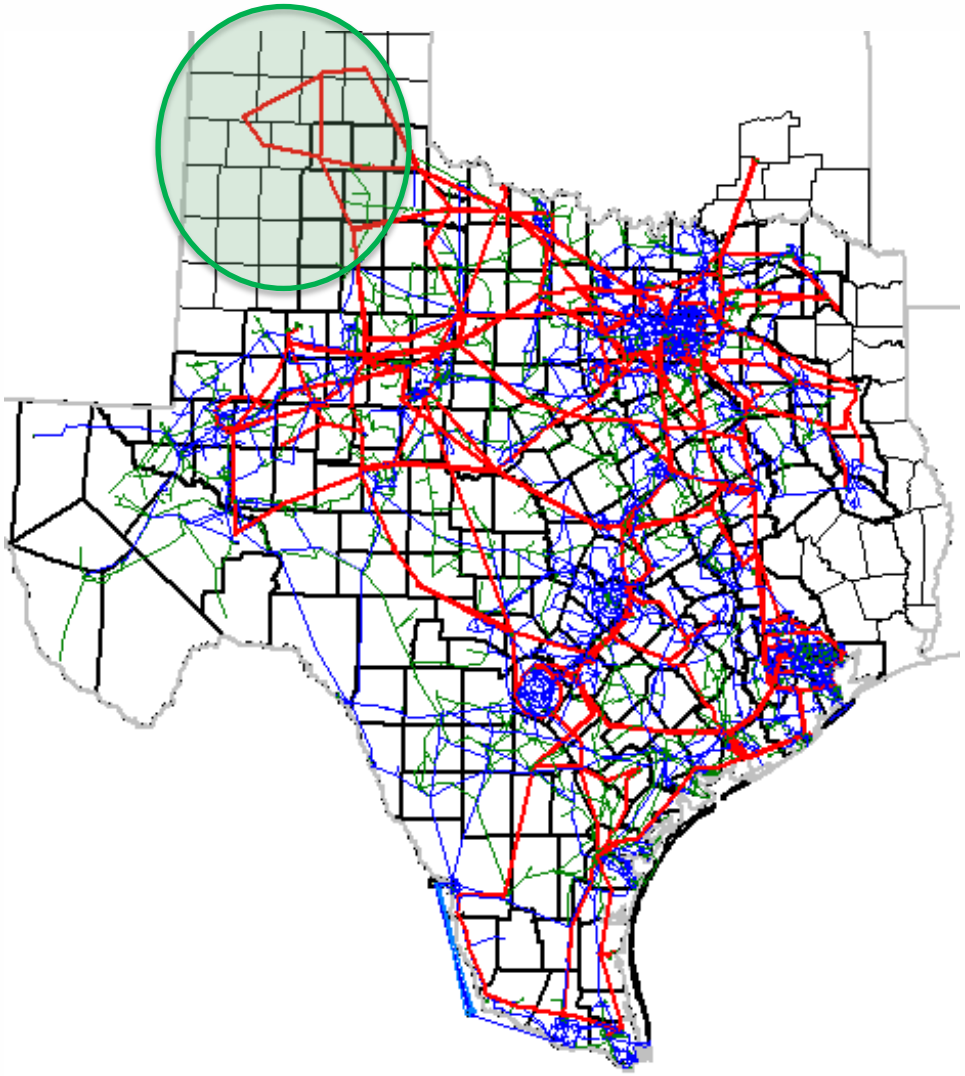
- The identified upgrades may be revised base on the actual implementation of wind projects in Panhandle.

- The upgrades identified in this study may still require RPG review.

Panhandle Grid Characteristics

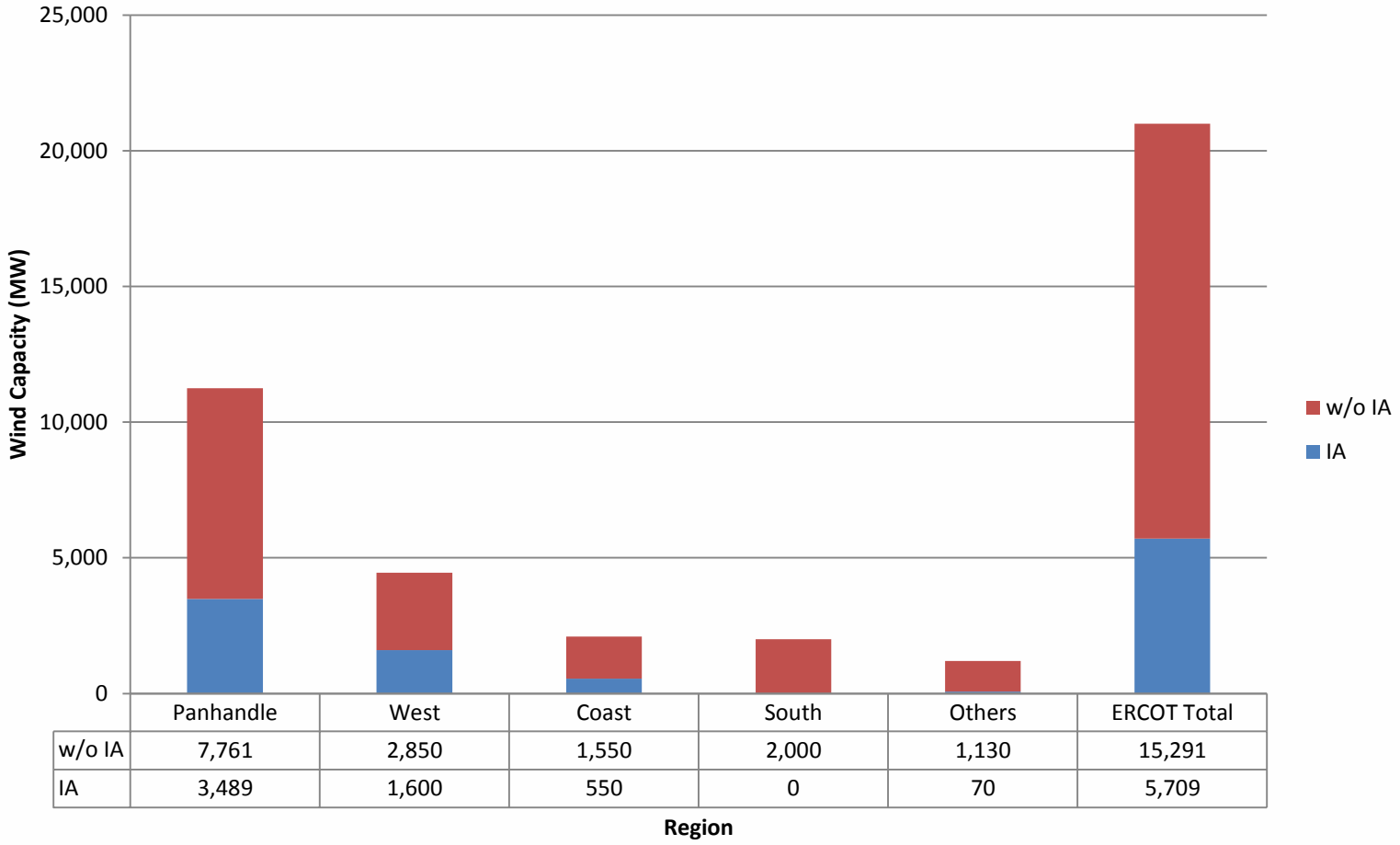
- Minimal/no local load
- Minimal/no sync generation
- 11 GW wind capacity in GINR

- 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

Signed Generation Interconnection Agreements in Panhandle (3489 MW as of July, 2013)

GINR	ProjectName	County	Capacity (MW)	COD**
13INR0059	Hereford Wind	Castro	499	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

** Projected commercial operation date

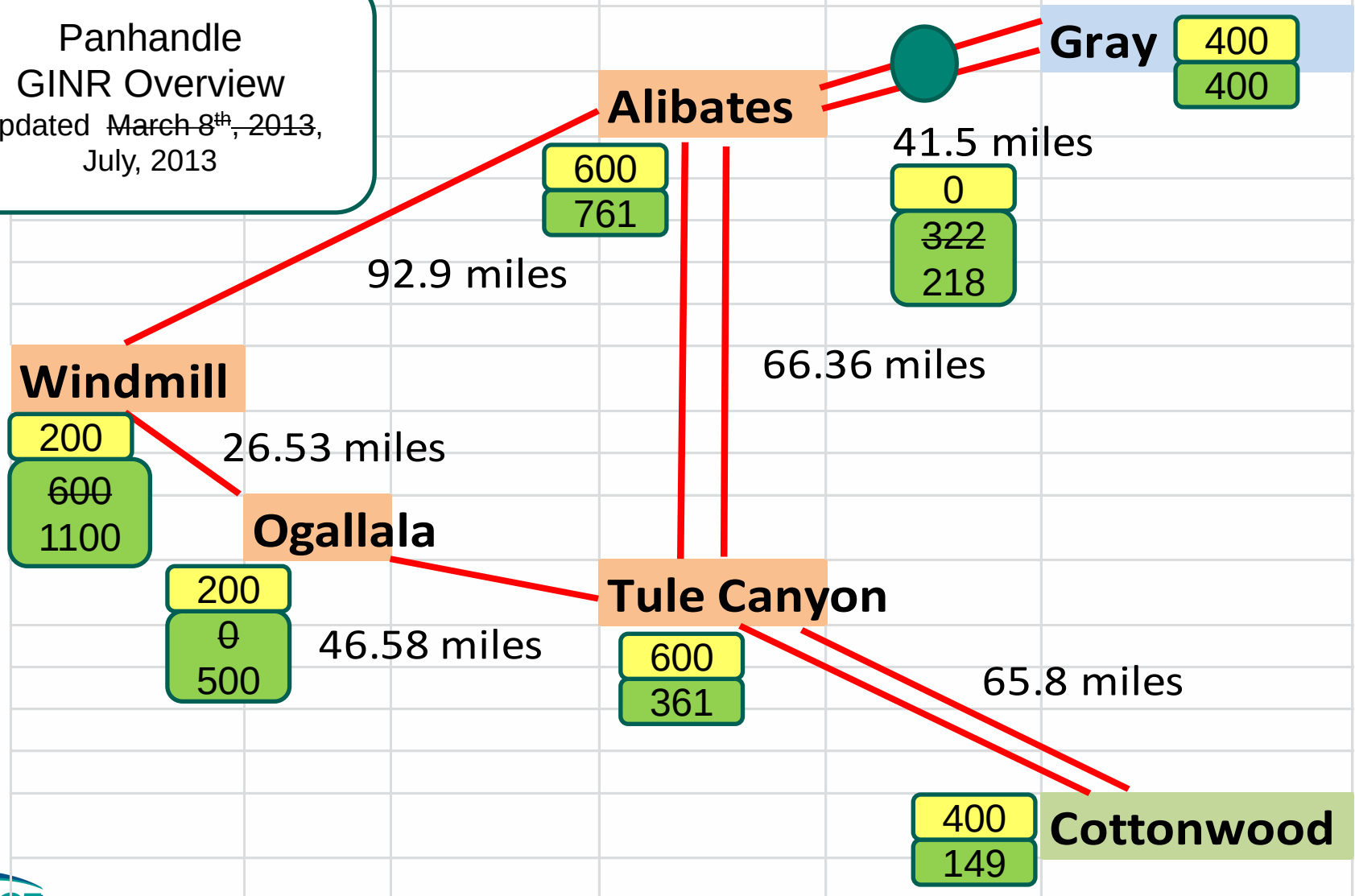
Initial Build (2400 MW)

IA (~~2593~~ 3489 MW)

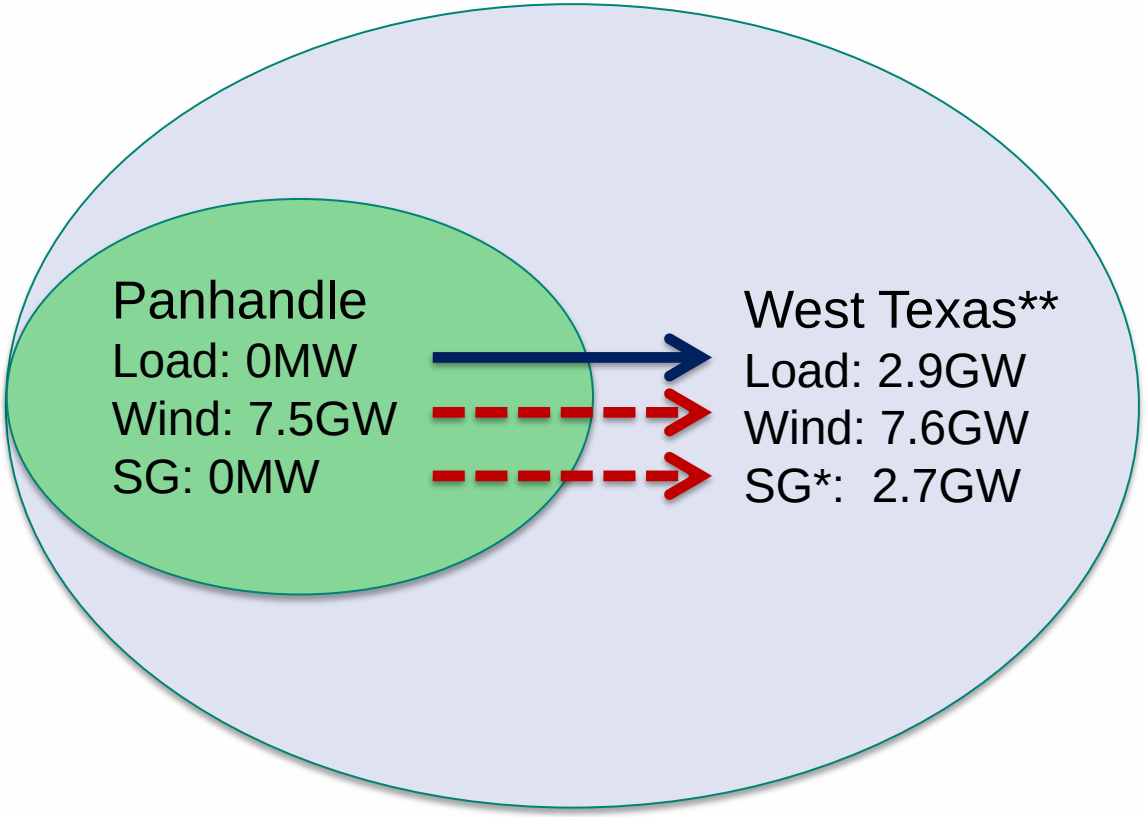
FIS-Complete (~~2450~~ 1401 MW)

FIS Study (~~5409~~ 5552MW)

Panhandle
GINR Overview
Updated ~~March 8th, 2013~~,
July, 2013



Upgrades for PREZ



Stability Constraint:

- Voltage stability
- Weak link
- Low short circuit ratio
- Controller challenge

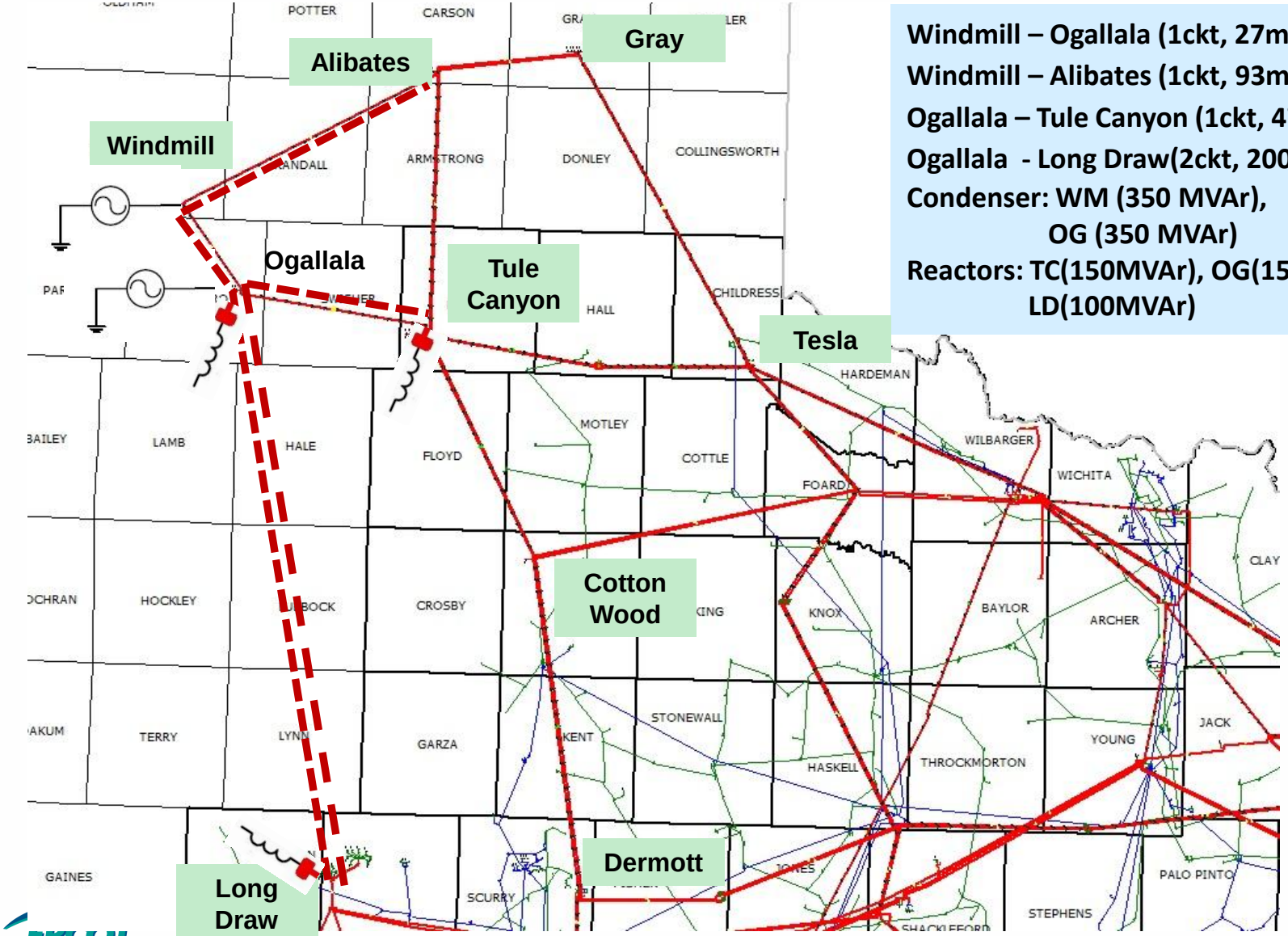
Existing link

Identified Panhandle Upgrades

*Include Comanche Peak units

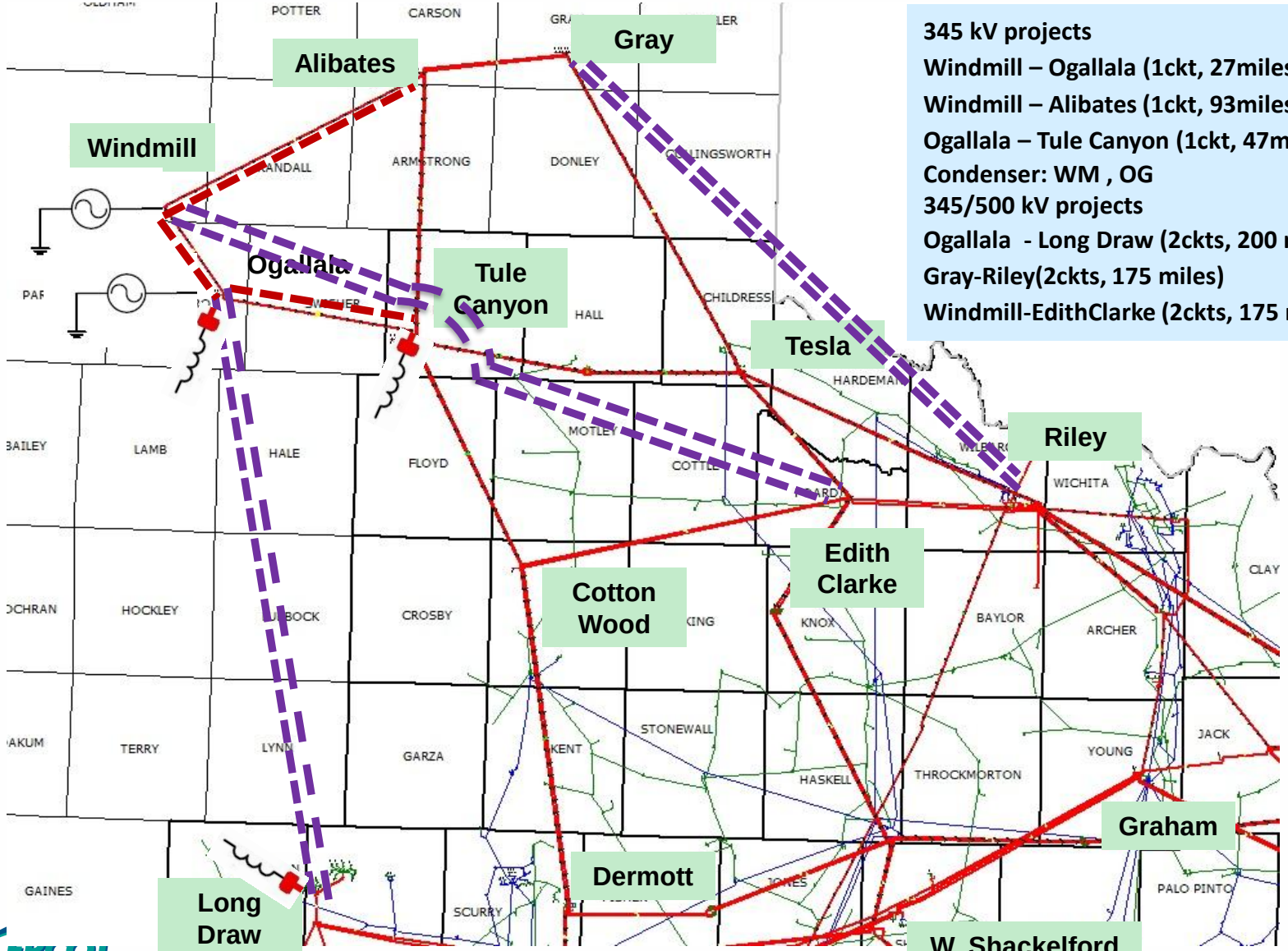
** not include Panhandle

Scenario 1 Upgrades - 5 GW PREZ



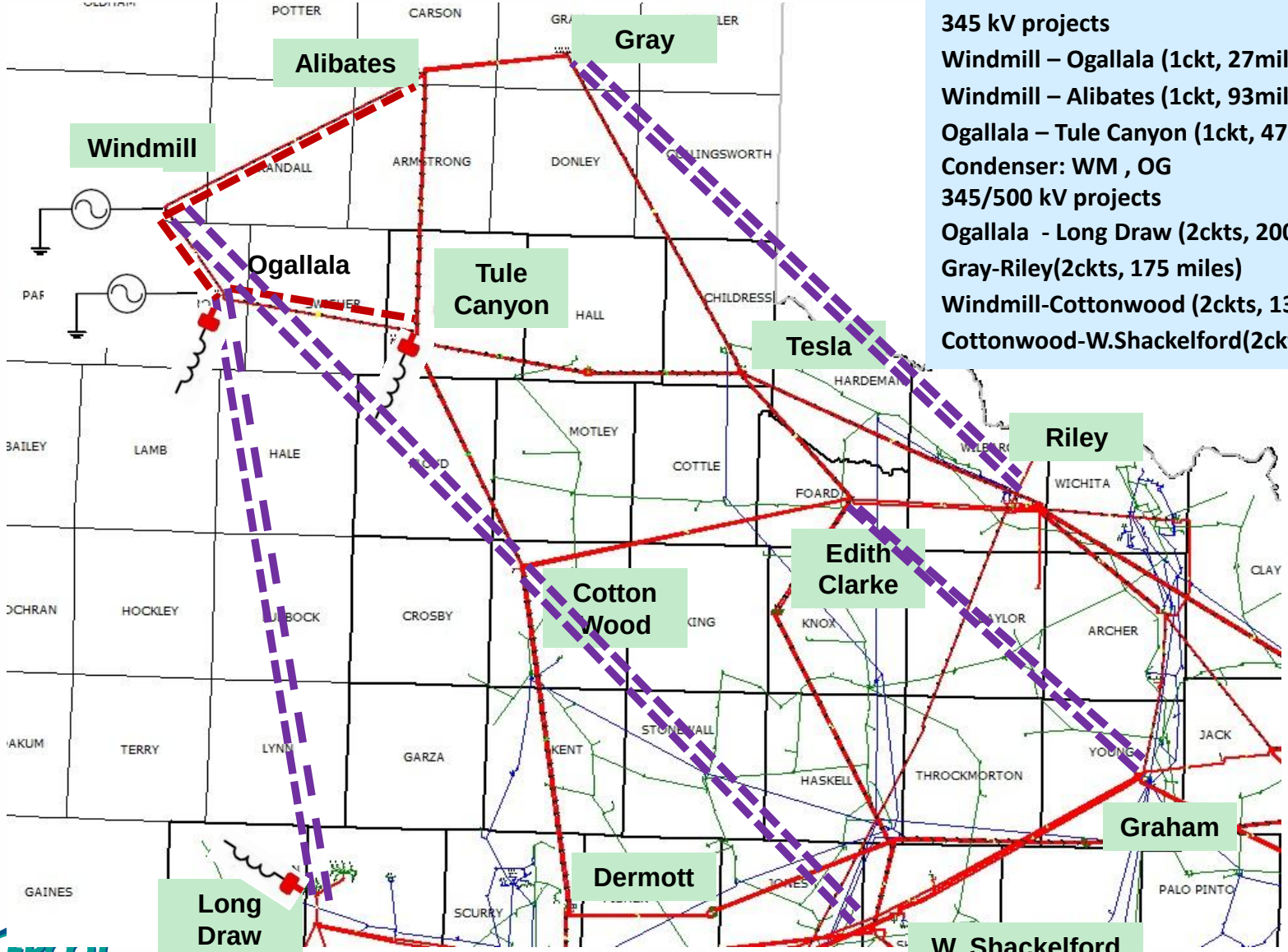
Windmill – Ogallala (1ckt, 27miles)
Windmill – Alibates (1ckt, 93miles)
Ogallala – Tule Canyon (1ckt, 47miles)
Ogallala - Long Draw(2ckt, 200 miles)
Condenser: WM (350 MVAr), OG (350 MVAr)
Reactors: TC(150MVAr), OG(150MVAr), LD(100MVAr)

Scenario 2 Upgrades - 7.5 GW PREZ: Option 1



345 kV projects
Windmill – Ogallala (1ckt, 27miles)
Windmill – Alibates (1ckt, 93miles)
Ogallala – Tule Canyon (1ckt, 47miles)
Condenser: WM , OG
345/500 kV projects
Ogallala - Long Draw (2ckts, 200 miles)
Gray-Riley(2ckts, 175 miles)
Windmill-EdithClarke (2ckts, 175 miles)

Scenario 2 Upgrades - 7.5 GW PREZ: Option 2



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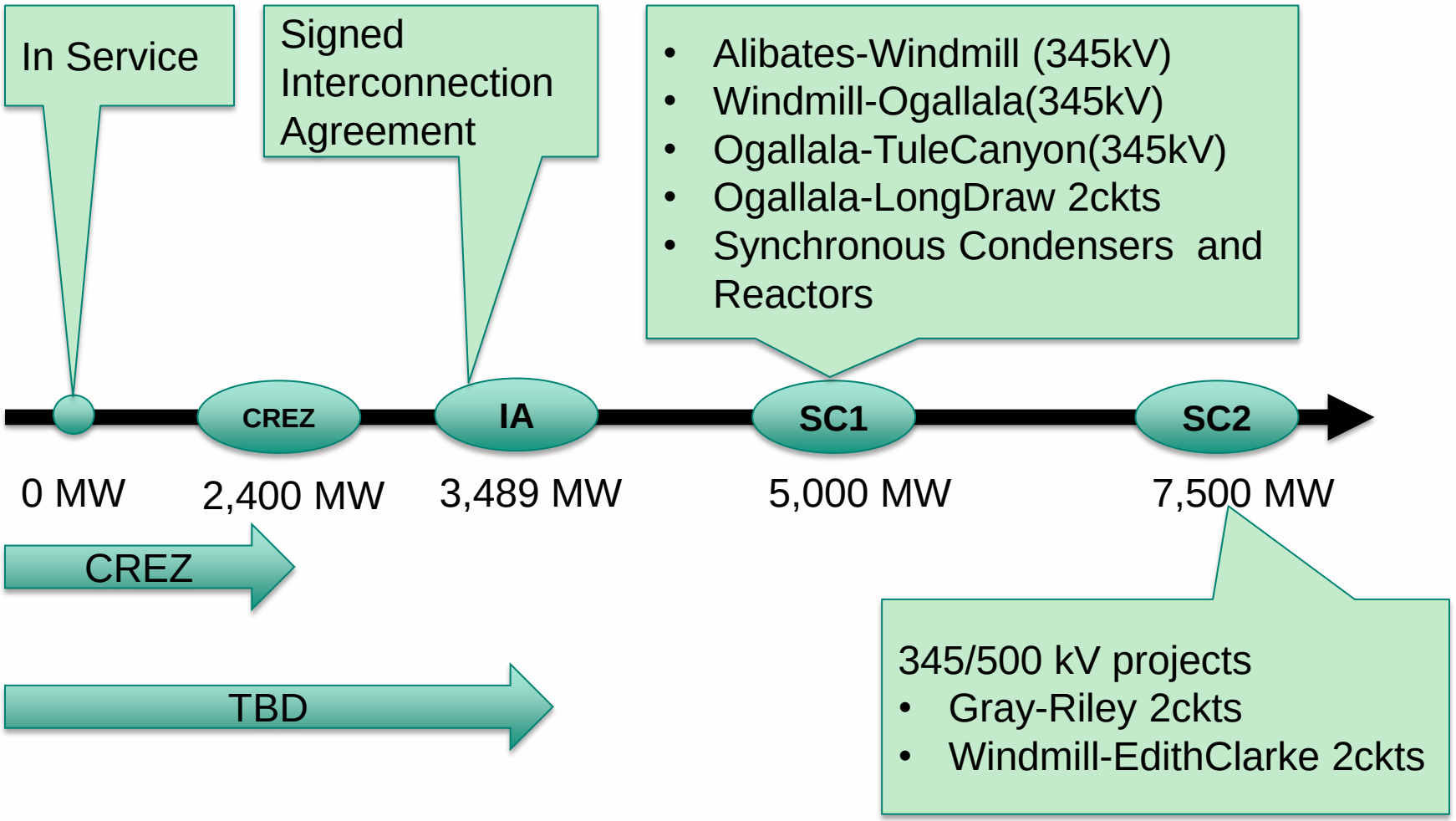
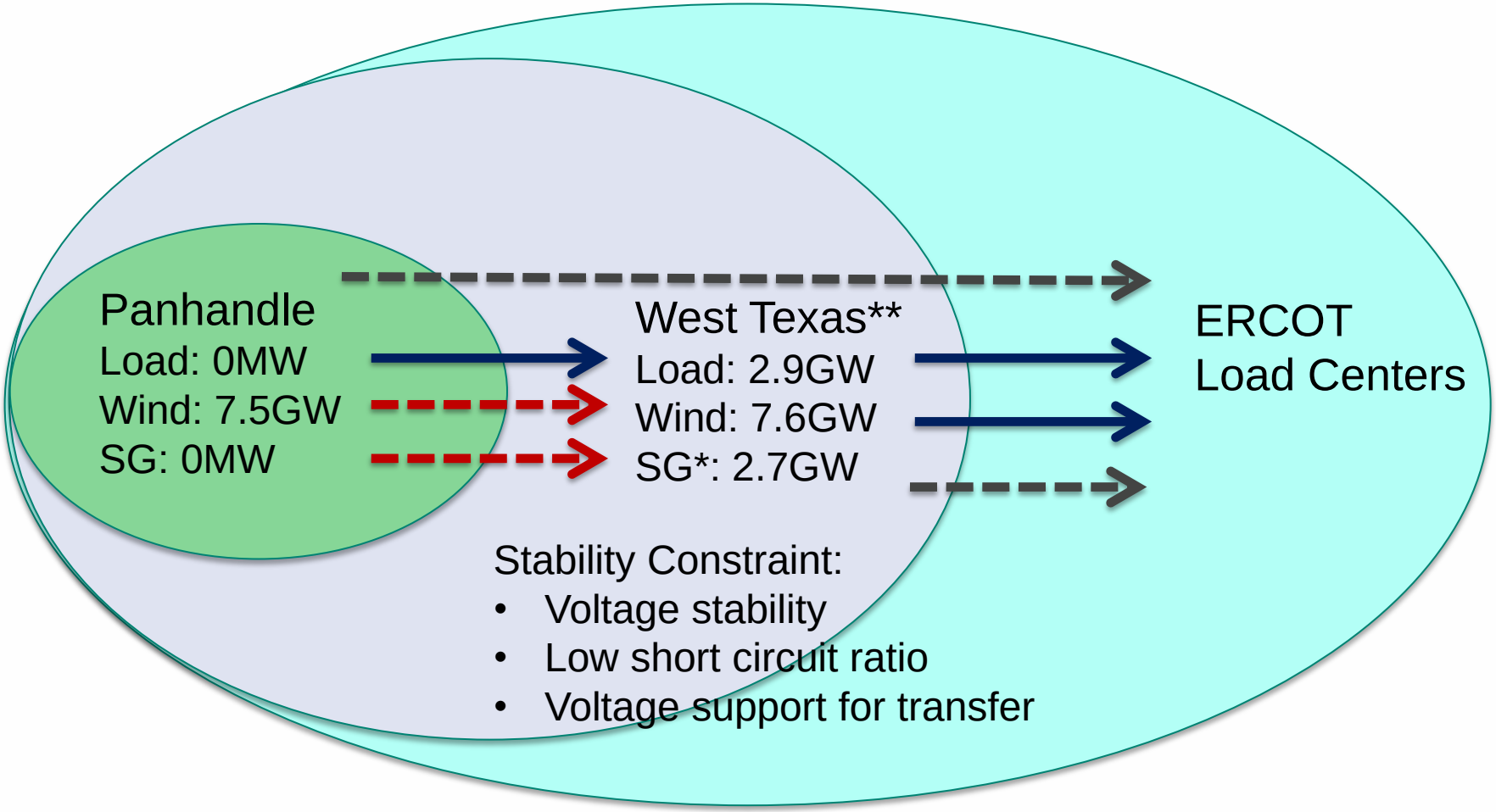
Windmill – Alibates (1ckt, 93miles)
Ogallala – Tule Canyon (1ckt, 47miles)
Condenser: WM , OG
345/500 kV projects
Ogallala - Long Draw (2ckts, 200 miles)
Gray-Riley(2ckts, 175 miles)
Windmill-Cottonwood (2ckts, 130 miles)
Cottonwood-W.Shackelford(2ckts, 150miles)

Wind Capacity in Panhandle and PREZ



Upgrades for West Texas wind generation



Existing link

Identified Panhandle Upgrades

Further Upgrades?

*Include Comanche Peak units

** not include Panhandle

Next

- Study other options
  - Variable Frequency Transformer
  - HVDC (VSC)
- Identify the roadmap: triggers of the upgrades
- Perform economic cost analysis