



Long-Term West Texas Export Special Study
ERCOT Transmission Planning
ESIG Fall Workshop

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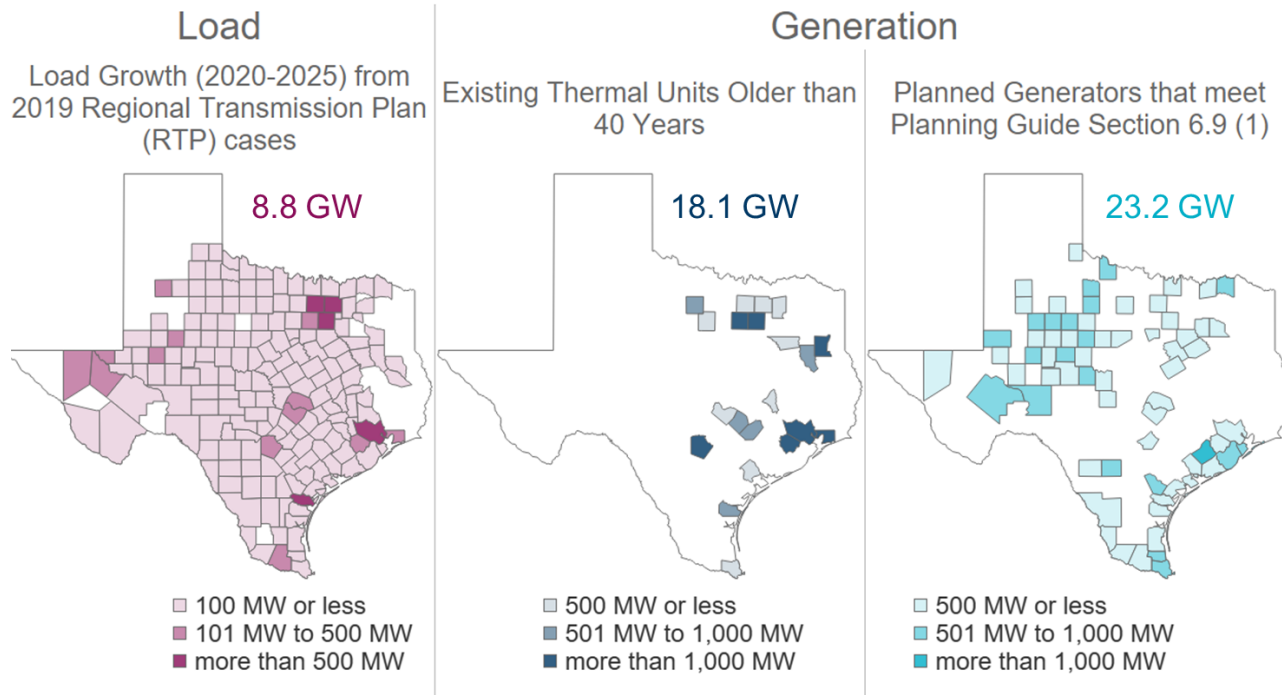
October 21, 2021

Outline

- Background
 - ERCOT system trends
 - Study case assumptions
- Key results from study year 2030
 - Base case findings
 - Performance of tested improvement options

ERCOT System Load and Generation Trends

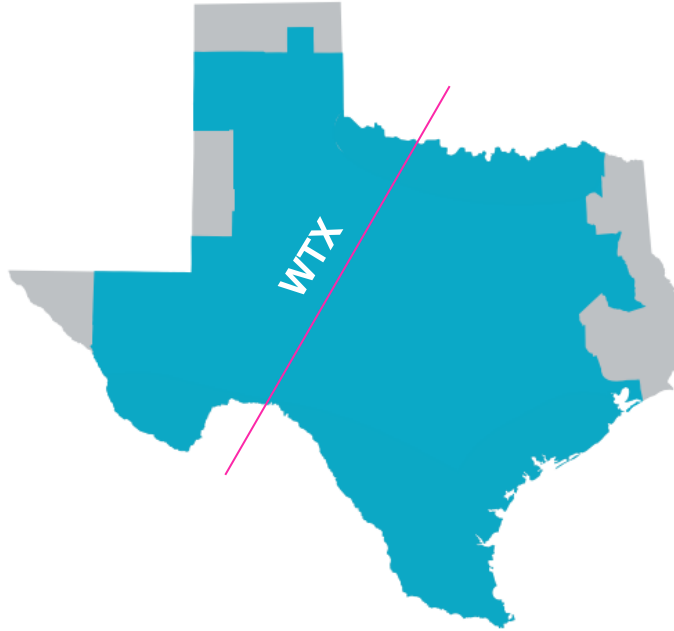
- Increased transfers from renewable-rich regions to load centers, continued load growth, and the retirement of thermal generation closer to load centers all contribute to an increase in transmission constraints near load centers.
- The full benefit of new transfer paths to relieve stability-related export constraints cannot be realized without corresponding relief to local transmission constraints.
- Holistic solutions that address both stability constraints and downstream local transmission constraints are needed.



Existing thermal unit capacities are from the Final Winter 2020/21 SARA report and planned generation capacities are from the October 2020 GIS report.
<http://www.ercot.com/gridinfo/resource>

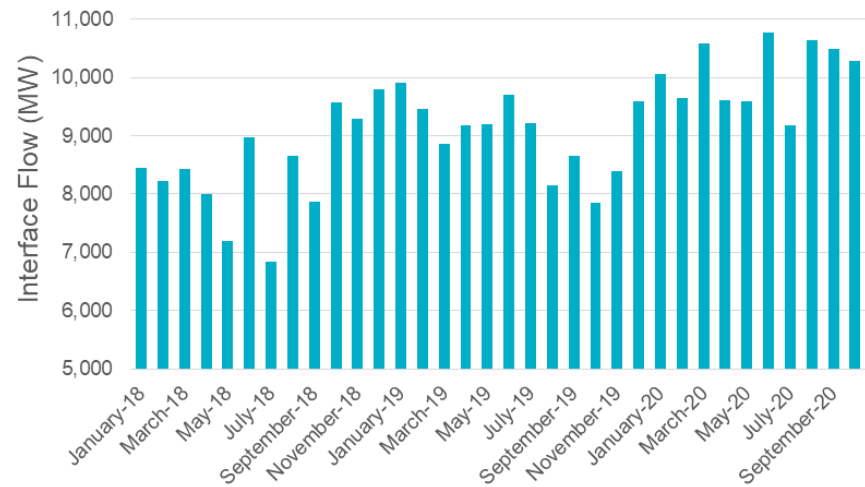
West Texas Export Trends

- West Texas (WTX) Export is a stability constraint whose interface flow is measured as the sum of the flow on 16 existing West/East 345-kV circuits



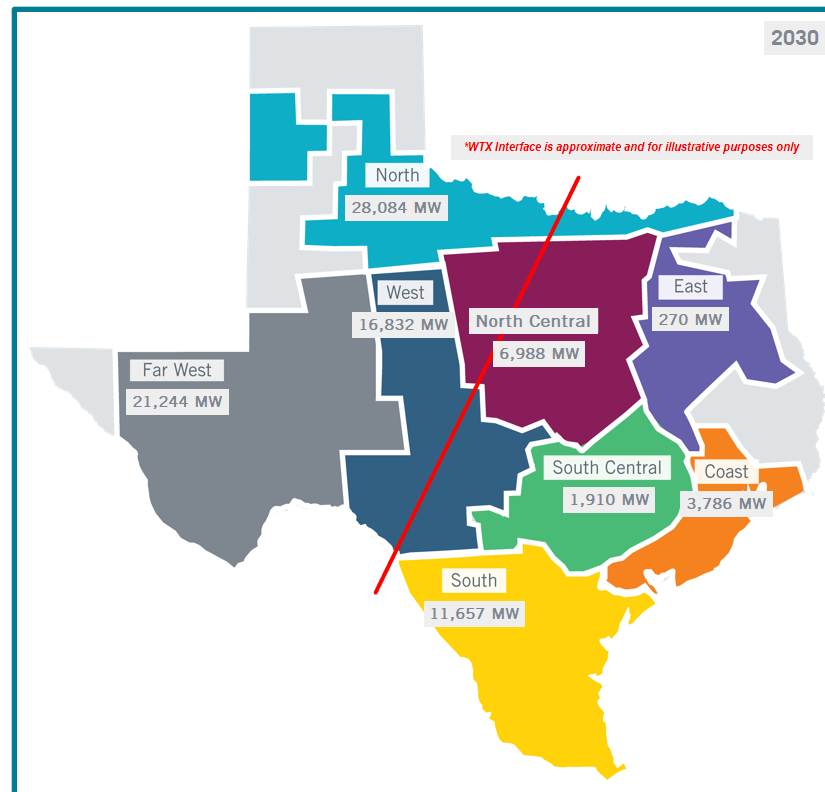
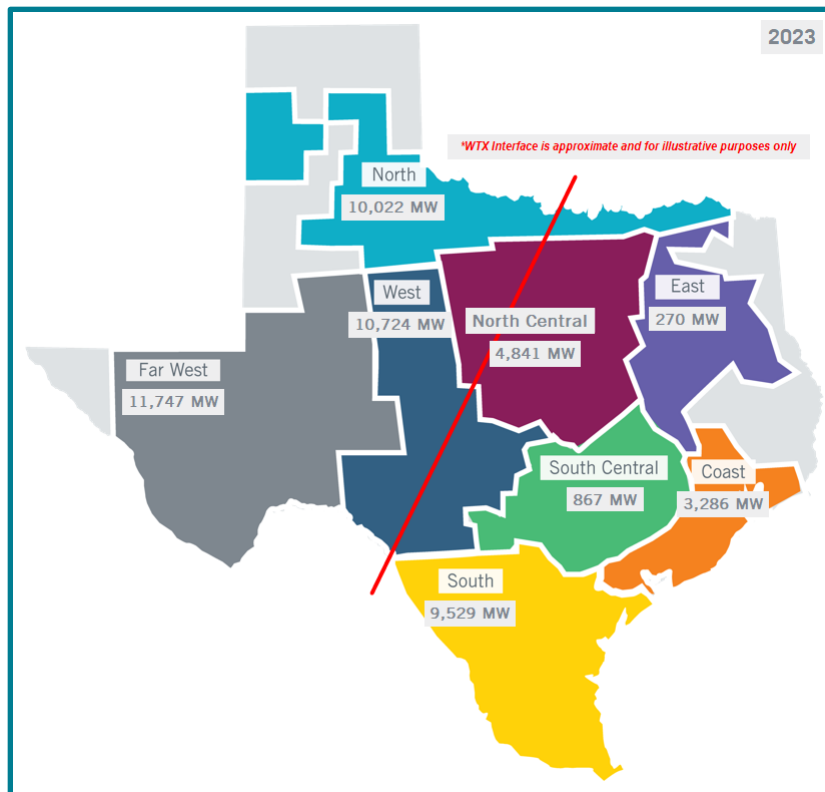
For illustrative purposes

Highest Monthly Flow on the West Texas Export Circuits



- ERCOT initiated the West Texas Export Special Study in late 2020 to develop a roadmap of transmission improvements that will allow more power transfers from West Texas to ERCOT load centers.
- It is the first-of-its-kind study within ERCOT combining both dynamics and economics.

IBR Capacity and Load in the Study Cases

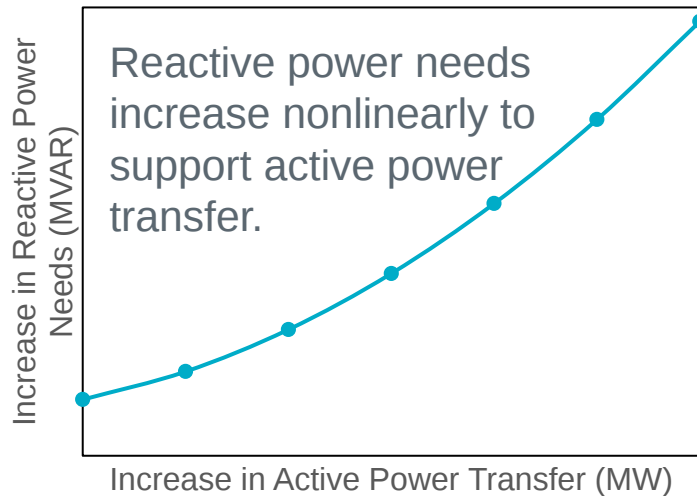


Scenarios	IBR Capacity ⁽¹⁾	System Load ⁽³⁾ in the Reliability Cases
2023	~ 53.3 GW ⁽²⁾	~42 GW
2030	~ 92.8 GW	~48 GW

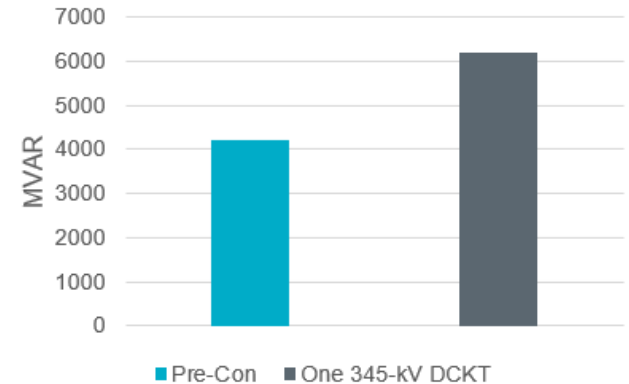
(1). Maps show IBR capacity by Weather Zone (2). As of 12/31/2020 (3). Economic cases use 8760 hourly load profiles

Y2030 Reliability Assessment – Base Case

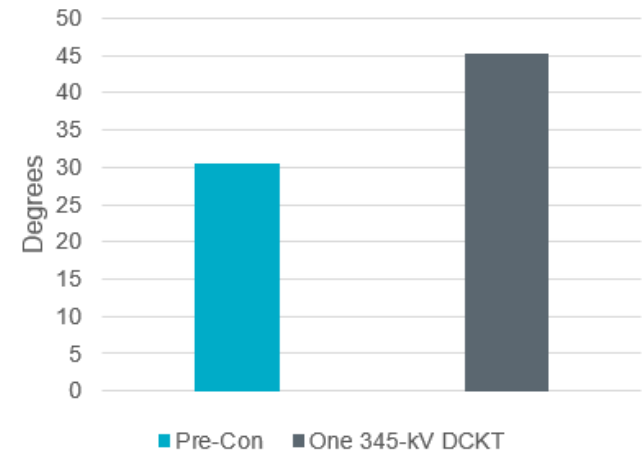
- Long distance power transfer led to
 - Significant increase of reactive power consumption under normal and outage conditions
 - Significant angle separation on major transfer corridors under normal and outage conditions
 - Both stressed conditions would lead to dynamic instability prior to reaching thermal overload



2030 MVAR Losses on WTX Interface

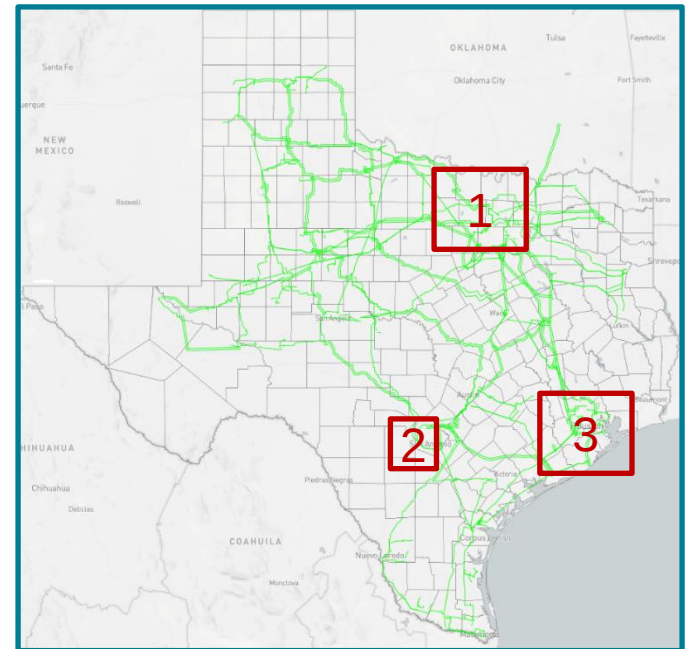


2030 Angle Separation



Y2030 Economic Assessment – Base Case

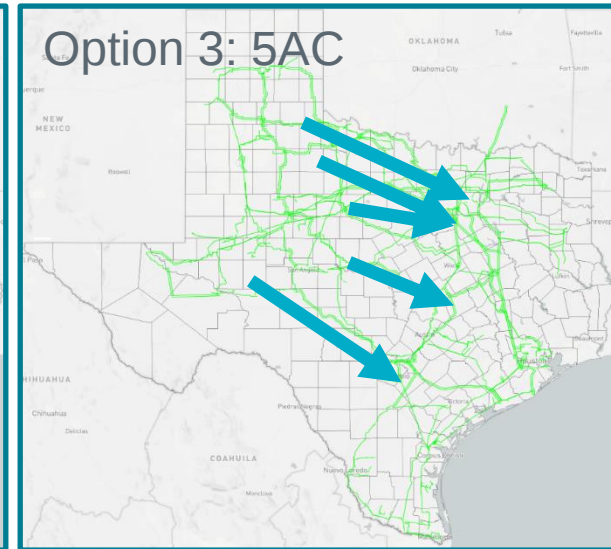
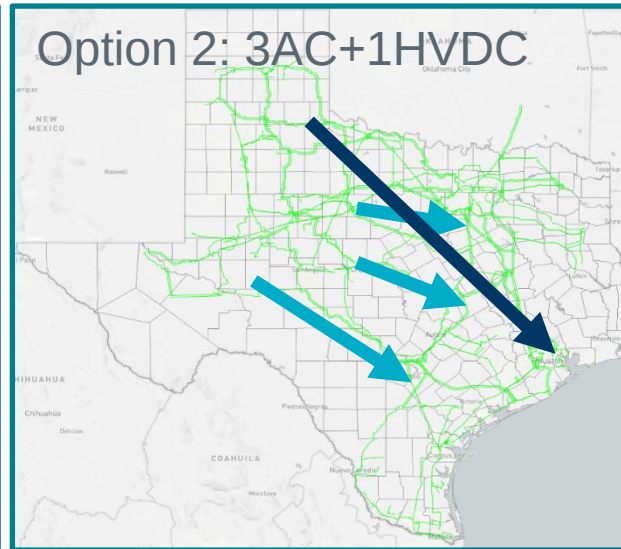
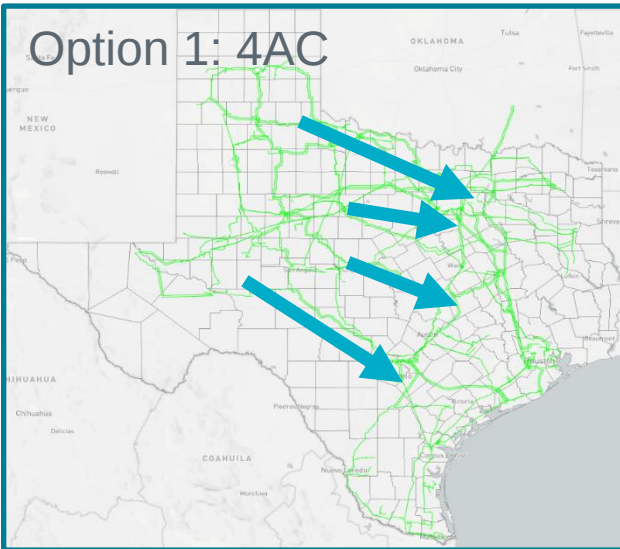
- 88% of total system IBR curtailment is behind the WTX interface.
- Significant congestion is observed in the following areas in the Y2030 base case:
 1. Northwest DFW area
 2. Western San Antonio
 3. North Houston (Houston Import)



Considerations in Identifying System Improvements

- Stability issues and needs
- Thermal constraints and congestion
- Generally, the options to address stability may not be the best ones for thermal related congestion since the cause of stability and thermal issues are not always the same.
 - Stability: more relevant to impedance and controls
 - Thermal: more relevant to thermal rating
- Both AC only and HVDC+AC hybrid options have been tested for Y2030 improvements

Tested System Improvements for WTX Transfer



Option ⁽¹⁾	Description	Estimated Circuit Miles ⁽⁴⁾	Estimated WTX Transfer Capability in VSAT (GW)
	Base Case		13.8
1	4AC ⁽²⁾	~1,027	18.3
2	3AC and 1HVDC ⁽³⁾	~721 (AC) and ~545 (HVDC)	18.6
3	5AC	~1,292	19.2

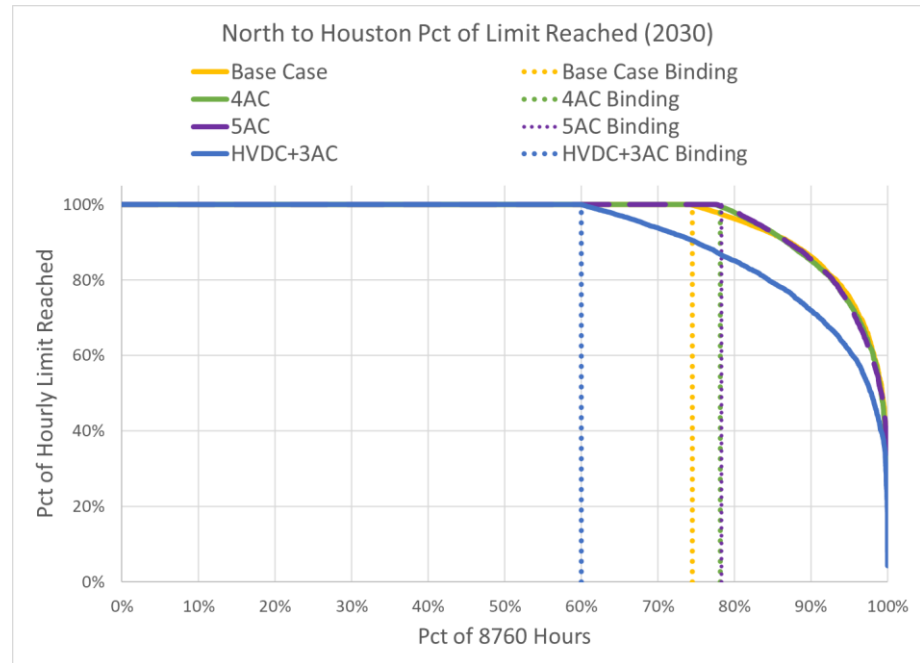
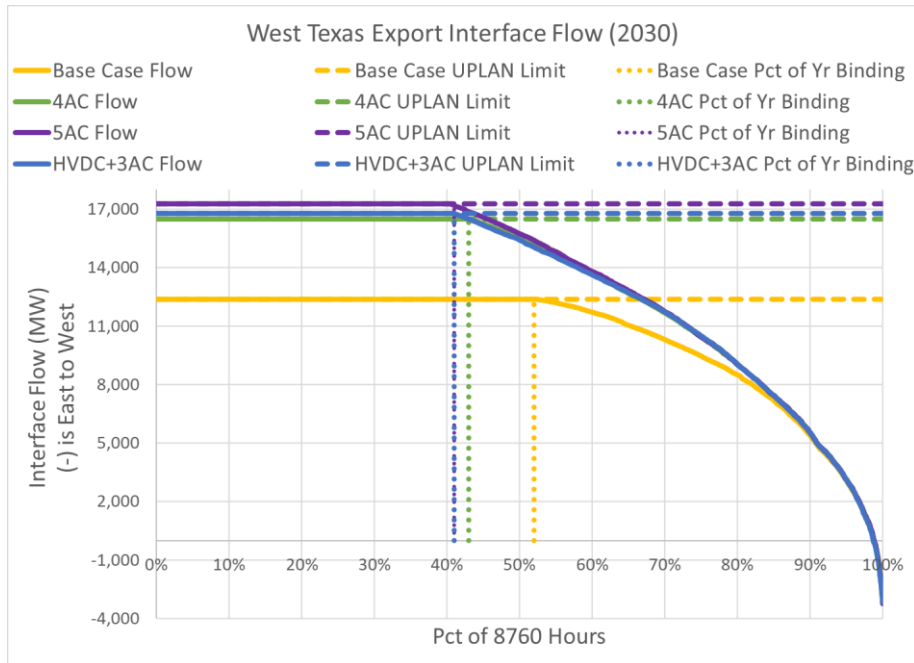
(1). Arrows represent general locations; specific locations are still under review

(2). A low impedance 345-kV double circuit line is assumed in this assessment

(3). A ~1.5GW VSC-HVDC is assumed in this assessment

(4). Miles represent DCKT AC and HVDC lines

Y2030 Economic Assessment with Improvement Options



- All three tested options improve the WTX transfer capability and Option 2 (1HVDC+3AC) also improves North to Houston Import capability.
- **Based on the Y2030 results, WTX export is expected to remain a significant constraint even with system improvements.**

Preliminary Results with System Improvements for the Y2030 Condition

- Further improvement of WTX transfer capability may be limited by thermal constraints inside and outside WTX.

Comparison	Option 1 (4 AC)	Option 2 (1HVDC+3AC)	Option 3 (5AC)
Estimated WTX Transfer Capability in VSAT (GW)	18.3	18.6	19.2
Estimated Production Cost Savings (\$M)	670	808	774
Congestion in DFW	Decreased	Decreased	Decreased
Congestion in Western S.A.	Resolved	Resolved	Resolved
Congestion on Houston Import	Increased	Decreased	Increased
Congestion behind WTX interface ⁽¹⁾	Increased	Increased	Increased

Thank you! Questions?