



Study Scope: Effectiveness of Transmission Upgrades in terms of Loss of Load Reduction

Sun Wook Kang
Dynamic Studies, ERCOT

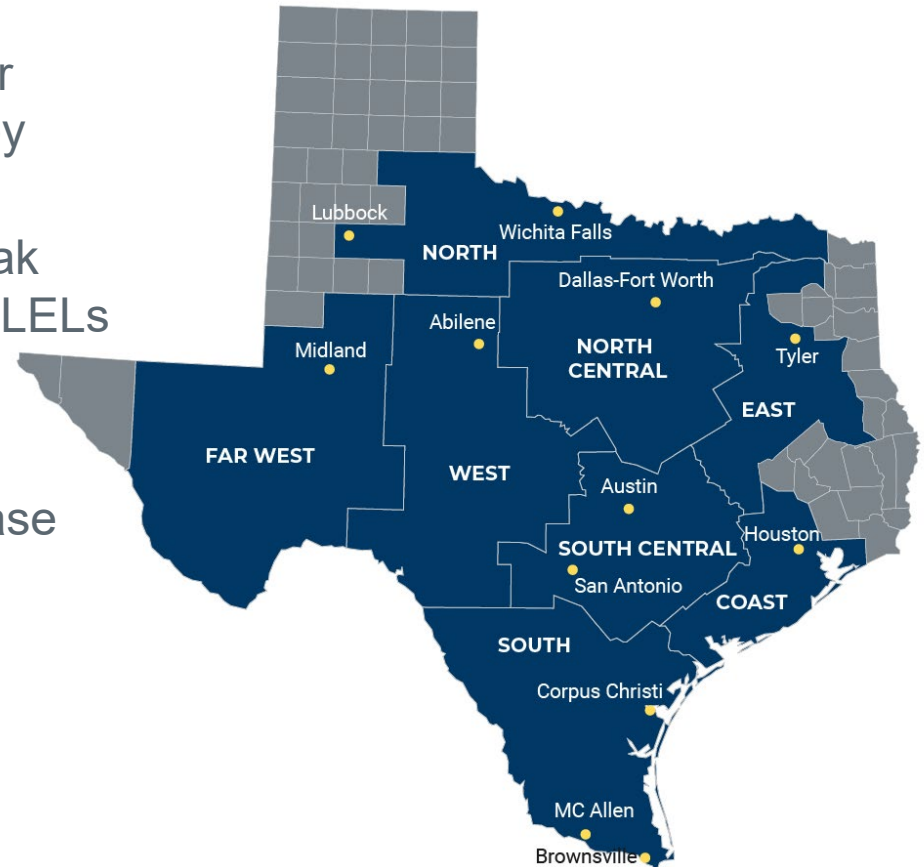
LLWG, September 19, 2025

Background and Objectives

- Background
 - Significant growth of Large Electronic Loads (LELs) are expected
 - Voltage ride-through capability of LELs is uncertain, and potential large load losses could pose challenges to real-time operations.
 - As introduced at the [August LLWG](#), ERCOT is currently conducting a study in terms of load loss for the transmission planning horizon
- Objectives of Planning Study
 - Assess potential load loss across planning horizons
 - Evaluate effectiveness of transmission upgrades in mitigating load loss
 - Note: This study is **NOT** intended to propose transmission projects

Assumptions and Methodology – Transmission Study

- Study Region:
 - The study will focus on West, Far West, and Panhandle and Nearby Panhandle regions in North
 - The study region is relatively weak region and significant amount of LELs are expected
- Original Case
 - 2024/2025 DWG 2028 HRML Case
- Study Year
 - Year 2030/2031
- Software: PSS/E (Ver. 35.6.3)



Assumptions and Methodology – Transmission Study (continued)

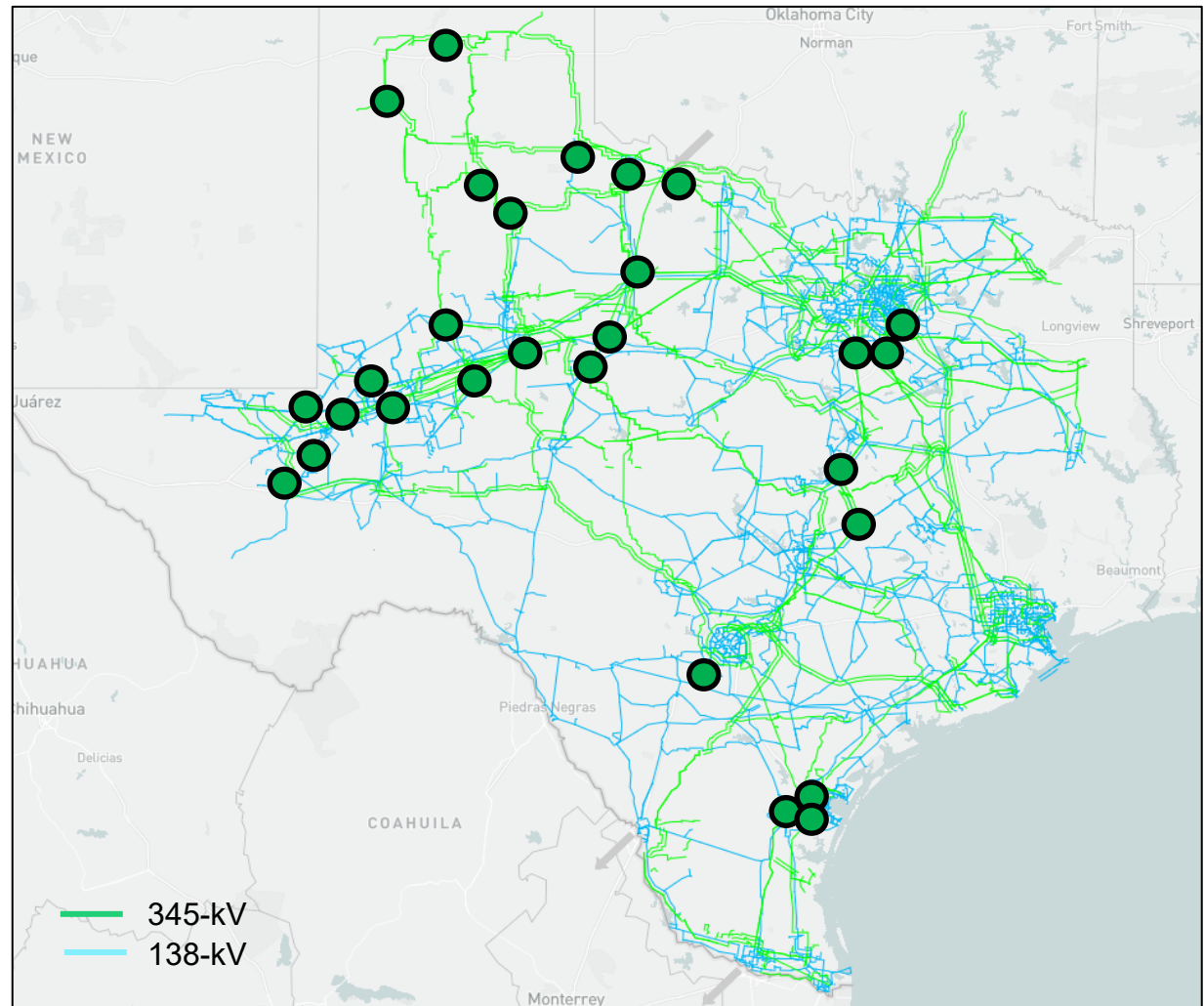
- Generation Updates
 - Based on the review of the June 2025 GIS report, ERCOT modeled 25 additional generators (total ~ 4.2 GW) that met the PG 6.9 conditions within the study region if not already modeled in the original case
 - Generators in the Coast, East, South, and South Central weather zones were redispatched as needed to balance the case when additional load was modeled
- Transmission Updates
 - All major RPG-approved transmission upgrades (e.g., 345-kV and 765-kV) were modeled within the study region, if not already modeled in the original case

Assumptions and Methodology – Transmission Study (continued)

- Load Updates
 - Over 20 Planned LLs (~8.8 GW) with completed interconnection studies, as provided by the ERCOT LLI Team in Q2, were incorporated if not already included in the original case, with projections extending through December 2030
 - Added approximately 2 GW of operational LELs not included in the original case
 - Approximately 15.2 GW of LELs assumed in the study case
- Dynamic Model Updates for LLs
 - Incorporated dynamic load models corresponding to the original case
 - Incorporated dynamic load models associated with the planned LLs
 - Solicited feedback from the relevant TSPs regarding the ride through capability of the planned LELs
 - Updated ride through capability of LELs based on ITIC Curve:
 - Assumed trip settings at 0.7 pu for 20 ms and no reconnection after voltage recovery

Approx. Locations of LELs

Note: This map is intended to illustrate approximate, high-level locations to highlight areas of heavy LEL concentration, particularly within the study region. It should not be interpreted as identifying or representing any specific LEL projects



Assumptions and Methodology – Transmission Study (continued)

- Contingency Screening, Selection, and Dynamic Analysis

Contingency Screening

- Apply 3 ϕ faults at all 345 kV buses within the study region
- Assume no line tripping and no post-fault LEL reconnections (initially using the original load models for the LELs)
- Estimate the resulting load loss for each tested 345 kV bus

Contingency Selection

- Identify critical locations based on the load loss ranking and 2,600 MW threshold
- Consider POI of planned LEL in contingency selection as needed

Detailed Analysis

- Test planning events (e.g., P1 thru P7) relevant to the selected locations
- Use the load model with ITIC assumptions: trip at 0.7 pu for 20 ms, with no reconnection after recovery)

Assumptions and Methodology – Transmission Study (continued)

- Criteria
 - NERC reliability standard and ERCOT Planning Guide Section 4
- Assumed Load Loss Threshold :
 - 2,600 MW based on ERCOT Operations assessment
- Monitored system response (e.g., load loss, voltage, frequency) at various locations within the study region

Next Step

- ERCOT will provide status updates at the future LLWG meeting(s)
 - Evaluate effectiveness of transmission upgrades (e.g., synchronous condensers, E-STATCOM)
- Tentative target date: Q4 2025

Questions?



Ehsan Rehman, ehsan.rehman@ercot.com
Christian Danielson, christian.danielson@ercot.com
Sun Wook Kang, Sunwook.Kang@ercot.com