
ERCOT Trending Topics

TOPIC: ERCOT Transmission Planning: 345-kV and TX 765-kV Strategic Transmission Expansion Plan (STEP)

Regional Transmission Plan (RTP)

Transmission Plans: 345-kV and TX 765-kV Strategic Transmission Expansion Plan (STEP)

Cost Benefit Comparison

In this Trending Topic, we explain transmission planning in the ERCOT region, compare the difference between the 345-kV and TX 765-kV STEP plans, and summarize how the TX 765-kV STEP would provide the means to address the significant growth and reliability needs of Texas.



FACTS:

The ERCOT region is experiencing rapid changes, including trends of notable demand for more power and increasing penetration of intermittent generation, such as wind, solar, and large-scale batteries. The trend of rising demand is expected to continue, driven by factors such as the further electrification of oil and gas processes in the Permian Basin and continued interest in connecting large loads (i.e., data centers, hydrogen and hydrogen-related manufacturing, crypto mining, and general electrification) to the ERCOT region.

Unprecedented load growth coupled with the utilization of current transmission system capacity prompted discussions about introducing 765-kV infrastructure to the ERCOT transmission grid. The 765-kV addition would enable power to flow more efficiently through long-distance transmission from resource-rich regions to load centers, such as the Dallas-Fort Worth, Houston, San Antonio, and Corpus Christi areas. On January 24, 2025, ERCOT filed the [2024 Regional Transmission Plan 345-kV Plan and Texas 765-kV Strategic Transmission Expansion Plan Comparison](#) with the Public Utility Commission of Texas (PUCT) as an assessment of the relative reliability and economic benefits of constructing a new 765-kV transmission infrastructure rather than simply expanding the existing 345-kV network to meet future system needs.

What is Texas House Bill (HB) 5066, and what role does it play in ERCOT's transmission planning?

Sufficient transmission capacity plays a vital role in ensuring system reliability while meeting

rapid growth in demand. As new load connecting to the grid outpaces the development of transmission projects, the Texas Legislature in the 88th Legislative Session (2023) recognized the need to update transmission planning rules in the ERCOT region. Previous planning rules did not allow ERCOT to include anticipated loads in planning studies unless they had executed an interconnection agreement with a Transmission Service Provider (TSP). Updating these rules was essential to modernizing the transmission planning process to account for the rapid growth in demand. HB5066 allowed ERCOT to incorporate more load information supported by TSP officer letters – recognizing that TSPs were talking directly to customers about their expectations to build in Texas. With the addition of new HB5066 forecasting rules, the load forecast for ERCOT transmission planning grew to more than 150 GW for 2030.

What is the 2024 Regional Transmission Plan (RTP)?

Annually, ERCOT produces an RTP to comply with national and state planning rules to provide a six-year roadmap for grid improvements to address ERCOT System transmission needs. In December 2024, ERCOT published the [2024 RTP](#). Unlike any previous RTP, the 2024 RTP developed two transmission plans (345-kV and 765-kV), which incorporated versions of the [Permian Basin Reliability Plan](#) to address statewide reliability needs.

What is the Permian Basin Reliability Plan Study?

At the direction of the PUCT, ERCOT filed the Permian Basin Reliability Plan to reliably serve the significant load growth in the Permian Basin region. The study included both 345-kV and 765-kV import paths to the Permian Basin area. The PUCT approved the Permian Basin Reliability Plan in October 2024, irrespective of the voltage level, and is anticipated to decide on the import path voltage level (345-kV or 765-kV) by May 1, 2025.

What is the TX 765-kV STEP?

Prompted by unprecedented load growth across the ERCOT region, ERCOT included a 765-kV plan to increase transmission system capability as an alternative to the 345-kV plan to meet the future growth, reliability, and need for large power transfer between major generation locations and load centers.

When did Texas last make a voltage step change in transmission planning?

Over 60 years ago, Texas utilities joined together in the early 1960s to plan and build the first 345-kV circuits in Texas. The change was described as building a “power highway” to make ample power available to meet growing requirements. The new transmission lines were characterized as being greater in power capacity than any other lines in the Southwest United States and providing flexibility to exchange power across the system. In 1962, it was estimated that Texas utilities were planning to build an additional \$8 billion in transmission by 1970.

Is 765-kV a new technology?

While the 765-kV voltage level would be new to the ERCOT region, it has been used in other parts of the United States since the 1960s and in many foreign countries. The Southwest Power Pool (SPP) and the Midcontinent Independent System Operation (MISO), both system operators in the Eastern Interconnect, have proposals for building 765-kV lines in non-ERCOT parts of Texas in coming years. Preliminary discussions with 765-kV equipment manufacturers as well as the TSPs who would build the infrastructure indicate the supply chain timeline for 765-kV equipment is similar to that of 345-kV equipment.

What are the benefits of a higher-voltage transmission plan?

TX 765-kV STEP would enable power to flow more efficiently through long-distance transmission from resource-rich regions to load centers. The benefits include:

- **Reduced impact to current grid for upgrades** – While the TX 765-kV STEP includes approximately 400 more miles of new right-of-way (ROW), it significantly reduced the need to upgrade or rebuild current infrastructure by 1,400 fewer miles compared to the 345-kV plan. Fewer existing upgrades is a benefit for construction outages in the long-term as today's system fully utilizes its current capability and makes existing upgrades more difficult and expensive.
- **Lower line losses** – 765-kV transmission lines significantly reduce power losses by transmitting electricity at a higher voltage and can reduce annual systemwide transmission losses, which means more energy is delivered to customers.
- **More transmission congestion savings** – Transmission congestion occurs when uneconomic generators are dispatched to reduce power flows over constrained lines. TX 765-kV STEP is estimated to reduce congestion and, thus, produce more savings for consumers in the long term compared to the 345-kV plan.

What is the cost difference between the 345-kV plan and TX 765-kV STEP?

Based on generic cost estimates, the estimated initial new construction cost of the TX 765-kV STEP (\$32.99 billion) is comparable with the 345-kV plan (\$30.75 billion) – a difference of \$2.24 billion. When the estimated additional cost required to minimize construction outages, to maintain system reliability, and to ensure timely completion of certain major upgrades to complete construction of the two options are considered, this cost difference diminishes by \$890 million to \$1.35 billion. Additionally, economic analysis noted the 765-kV plan produces approximately \$230 million more savings in consumer energy cost each year compared to the 345-kV plan.

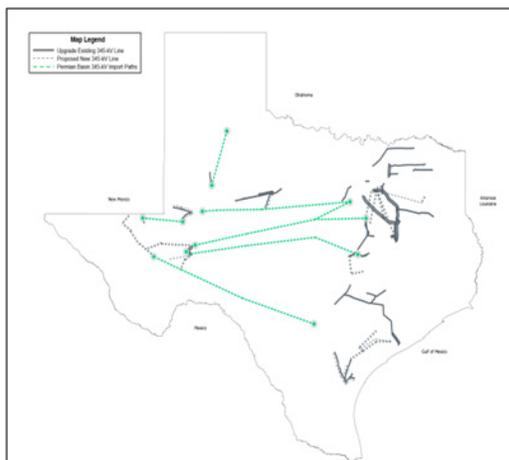
How does projected transmission investment compare to recent trends?

Both the 345-kV plan and the TX 765-kV STEP are estimated to require approximately \$5 billion per year of transmission project investment over the six-year planning horizon compared to an average of over \$3 billion per year of transmission projects endorsed in the past three years. In 2024, \$3.78 billion of new transmission was endorsed by the ERCOT Board of Directors. Note: Transmission investment costs are typically recovered over a

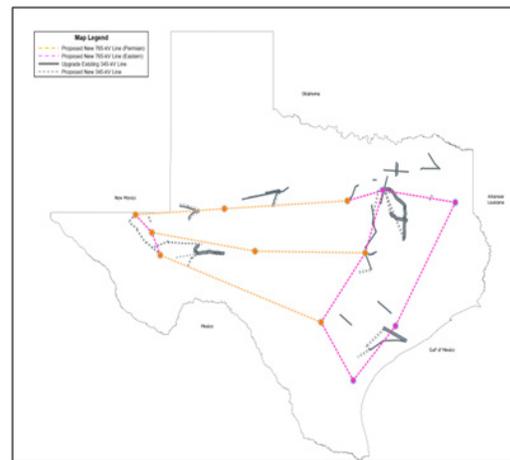
30- to 40-year period by TSPs. As demand grows and more customers are connected to the transmission grid, costs are distributed across the increased customer base.

What new transmission is proposed in the plans?

To serve both current and future load growth reliably and efficiently, many miles of new transmission build as well as upgrades to existing transmission lines will be required no matter the decision on which voltage level is to be used. Comparisons between the 345-kV and the TX 765-kV STEP are provided below. Note: Geographic locations for proposed new transmission lines are meant to demonstrate general electrical point-to-point connections. Specific routing of any new transmission infrastructure is determined by the PUCT as part of the Certificates of Convenience and Necessity (CCN) process with TSPs.



345-kV New Lines and Upgrades Needed with the 345-kV Plan



765-kV Core Plan with 345-kV New Lines and Upgrades Needed for the TX 765-kV STEP

What if demand does not materialize as projected in the load forecast?

Each year, ERCOT surveys TSPs who have a direct relationship with end-use customers to compile the load forecast to be used in the RTP. ERCOT performed a sensitivity analysis with a reduced load level (~ 20 GW less overall load) to assess the impact on the need for the 345-kV plan and the TX 765-kV STEP if less than forecasted load materializes. Results showed major portions of the 345-kV plan and the TX 765-kV STEP will still be needed to meet a reduced demand forecast. Before a new transmission line is approved to be constructed, the PUCT will review the need for the project.

Summary

After study and consideration of the costs and benefits associated with each plan, ERCOT believes that the proposed TX 765-kV STEP provides greater long-term benefits to the consumers of Texas. Integrating a new 765-kV transmission network into the ERCOT System would represent a strategic transformative step in power infrastructure, enabling efficient, reliable, resilient, and sustainable electricity delivery for both current and future demand.

ERCOT’s analysis concludes that the TX 765-kV STEP would provide significant economic and reliability benefits to the ERCOT System. Specifically, due to the greater efficiency of transmitting power at a higher voltage, the TX 765-kV STEP would provide the following benefits compared with the 345-kV option, as indicated in the table below:

| TX 765-kV STEP | vs | 345-kV Plan |
|---|--|--|
| 1,443 fewer miles <i>of existing system work</i> | Existing System Upgrades | - |
| - | New ROW | 434 fewer miles <i>of new ROW</i> |
| - | Estimated New Construction Costs | \$2.24B less construction cost |
| \$890M less <i>in outage-related construction costs</i> | Live/Hot Construction to Facilitate Existing Upgrades | - |
| \$229M/year <i>more consumer energy cost savings (annually)</i> | Estimated Consumer Energy Cost Savings | - |
| \$28M/year <i>more production cost savings for energy (annually)</i> | Estimated Production Cost Savings | - |
| 560 GWh/year <i>less energy losses (\$16.2M annual savings)</i> | Estimated System Loss Reduction | - |
| 600 to 3,000 MW <i>increases in power transfer capability</i> | Incremental Transfer Capability | - |

What’s next?

ERCOT filed the 345-kV vs. 765-kV comparison plan based on the 2024 RTP with the PUCT on January 24, 2025. The PUCT will review the analysis and decide the import path voltage level (345-kV or 765-KV) of the Permian Basin Reliability Plan by May 1, 2025.