Economic Impacts of 765kV Transmission Development in Support of Texas and Houston-Area Reliability

DREW A. KASSEL, PHD; JOSHUA D. RHODES, PHD; AND MICHAEL E. WEBBER, PHD

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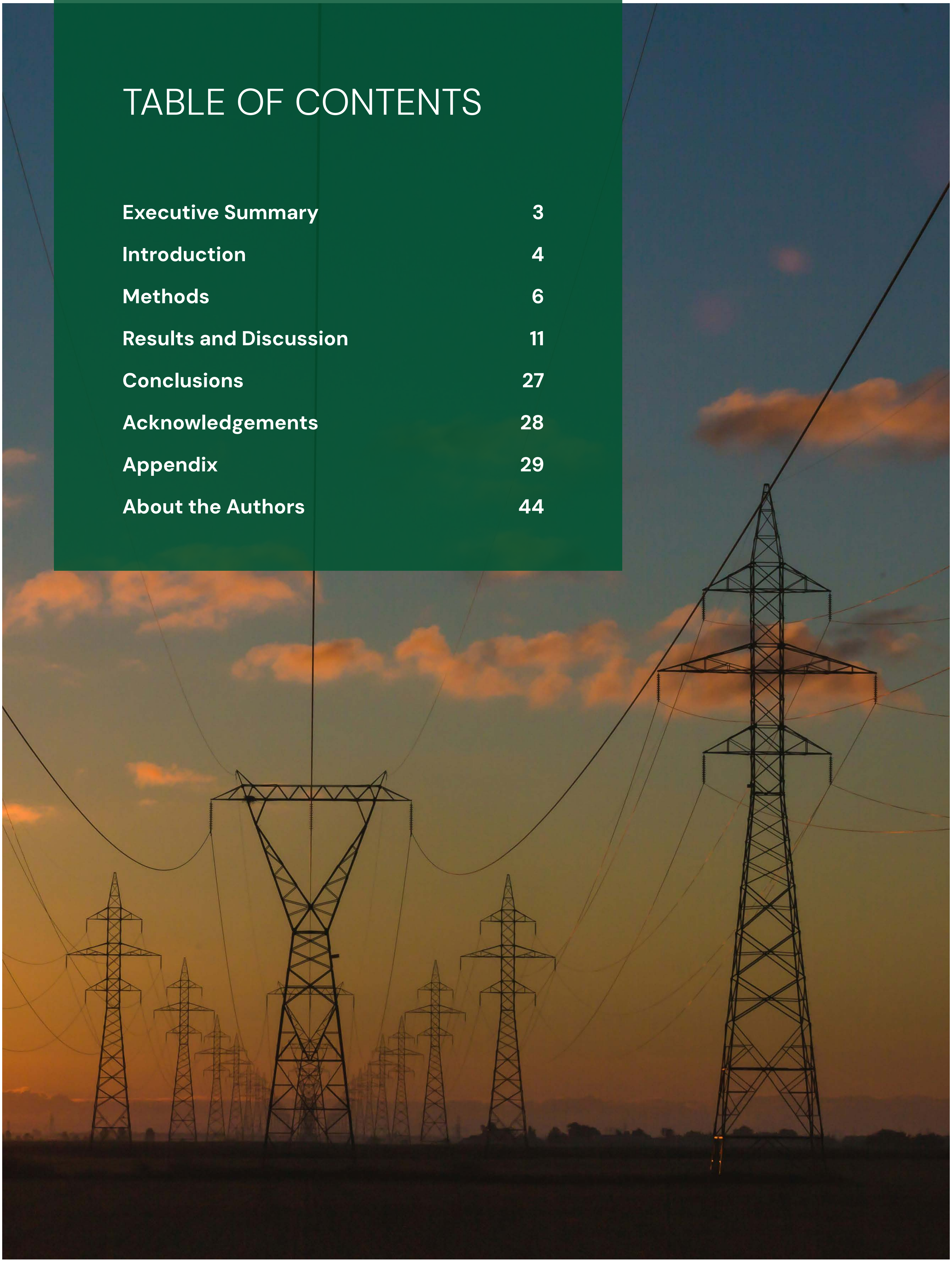

TABLE OF CONTENTS

Executive Summary

This report analyzes the electric grid and economic development impacts of the Strategic Transmission Expansion Plan (STEP) 765kV transmission backbone buildout in ERCOT. The first objective of this report is to assess the impacts of the entire 765kV buildout, both the western and eastern portions, as well as the identified lower voltage supporting transmission infrastructure (upgrades and new builds) needed to integrate the 765kV lines into the ERCOT system. The second objective is to quantify the impacts of the proposed 765kV lines that support the Houston region, namely the three 765kV lines that start at the Hillje substation. Using electric grid capacity expansion modeling and regional economic impact analysis, we evaluate how the western and eastern groups of lines could affect generation investment, renewable deployment, load-serving capability, job creation, tax revenues, and broader economic activity.

We find the following:

- The 765kV STEP lines incentivize capital investment in generation resources that can be placed more efficiently.
- The 765kV STEP lines allow the grid to serve more energy (~5-6 TWh more in 2031) under a constrained generation buildout, which could be worth **~$25-30 billion** in economic value because of the additional load served.
- The construction phase of the 765kV STEP lines and supporting projects could create **~100,000 jobs** and provide more than **$10 billion** in economic value for the region.
- Annual operation of the 765kV STEP lines and supporting projects could create **~3,000 jobs**, provide about **$400 million** in annual economic value for the region, and pay about **$300 million** in property taxes per year.
- The 765kV STEP lines promote development and deployment of new generation capacity, reducing the power sector's emissions of criteria air pollutants, lessening water demand for cooling, and potentially increasing the availability of natural gas for exports.

Introduction

This report evaluates the electric grid and economic development impacts of the Strategic Transmission Expansion Plan (STEP) 765kV transmission backbone buildout in ERCOT. The first part of this analysis considers the 16 transmission lines shown in Figure 1, as well as the identified lower voltage supporting transmission infrastructure (upgrades and new builds) needed to integrate the 765kV lines into the ERCOT system. The second part of the analysis focuses on the three 765kV lines that emanate from the Hillje substation in support of the Houston region, called COAST in this report.

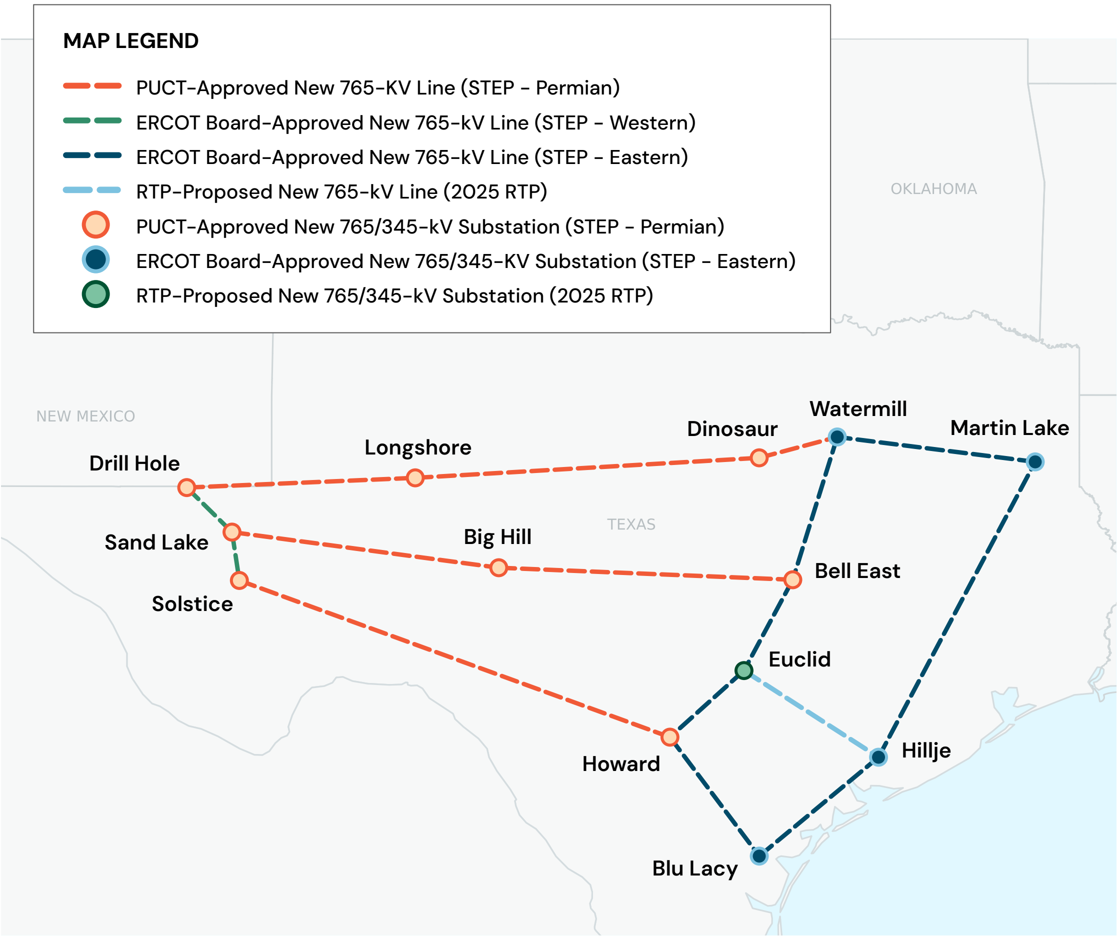

FIGURE 1
Map of the approximate routes of the new 765-kV infrastructure in ERCOT.[1] PUCT = Public Utility Commission of Texas, ERCOT = Electric Reliability Council of Texas, RTP = Regional Transmission Plan, STEP = Strategic Transmission Expansion Plan. Note that the supporting lines are not shown in this map.

1 Map recreated from map in https://www.ercot.com/files/docs/2026/05/07/7.-EIR_Recommendation_-Euclid-765-kV-Substation-and-Transmission-Line-Addition-RPG-May-2026.pdf

The proposed 765kV buildout represents a major expansion and upgrade of ERCOT's high-voltage transmission network, as the highest voltage lines in service today are 345kV. These projects are intended to enhance reliability, lower costs for consumers, improve the movement of power across the system, connect resource-rich areas with growing load centers, and support the grid's ability to serve future demand growth. Transmission investments materially change how the grid is operated, including where generation is built and how those generators are dispatched. As a result, transmission investment also impacts how much fuel the electricity sector consumes and how much load it can serve. In general, higher levels of transmission, especially for a grid experiencing growing demand, allow for a more efficient allocation of resources and higher levels of demand served. This report tests those assertions by evaluating the electric system impacts of the 765kV STEP lines as well as their broader economic development implications.

We analyzed these topics using two primary tools: GenX and JEDI. GenX is an open-source, configurable electricity capacity-expansion model developed by MIT and Princeton University's ZERO Lab. Its modular and transparent structure supports applications ranging from academic and technology research to public-policy, regulatory, and resource-planning analysis. GenX optimizes the deployment of new power plants, storage resources, and transmission infrastructure to meet electricity demand in a cost-optimal manner over time.[2] The GenX model used for this analysis has been extensively applied to studies of the ERCOT grid[3,4,5,6] and has also recently been used in regulatory proceedings in the Commonwealth of Virginia.[7]

The second tool used in this analysis is the Jobs and Economic Development Impacts model, or (JEDI). JEDI is a publicly available input-output screening model developed by the National Laboratory of the Rockies. It is used by state and county decision-makers, public utility commissions, project developers and owners, and researchers to estimate regional employment and economic activity associated with energy projects.[9,10,11] Specifically, JEDI was built to estimate the jobs, earnings, output, and tax impacts associated with energy infrastructure projects, including transmission line development. For this report, JEDI is used to estimate the regional economic development impacts associated with construction and ongoing operation of the 765kV transmission projects.

The sections that follow first provide a brief overview of these tools and then present the results of the grid modeling and economic impact analysis.

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2 MIT Energy Initiative and Princeton University ZERO lab. GenX: a configurable power system capacity expansion model for studying low-carbon energy futures n.d. https://github.com/GenXProject/GenX

3 ERCOT 2040: A Roadmap for Modernizing Texas' Electricity Infrastructure (https://static1.squarespace.com/static/652f1dc02732e6621adb2a3a/t/699f29e816b28a04f92bef9f/1772038632416/ERCOT+2040_JULY2023.pdf)

4 Impacts of Large, Flexible Data Center Operations on the Future of ERCOT (https://static1.squarespace.com/static/652f1dc02732e6621adb2a3a/t/654c19c6033d046d42530407/1699486150675/LANCIUM_IS_ERCOT_flexDC_FINAL_2021.pdf)

5 A Method for Assessing Economic, Environmental, and Reliability Tradeoffs of Connecting the Texas Grid to the Eastern and Western Grids (https://www.sciencedirect.com/science/article/pii/S0306261925017453?dgcid=rss_sd_all)

6 Quantifying the Impacts of Weather Year Selection on Power Sector Capacity Expansion Models (https://www.sciencedirect.com/science/article/pii/S0360544225046213)

7 Intervenor testimony of Dr. Nick Laws in Virginia SCC Case **PUR-2024-00184**.

8 https://www.nlr.gov/analysis/jedi/transmission-line

9 https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BA082649E-0000-C443-8B35-84A82ADD467D%7D&DocTitle=18_LSS_Exhibit+18_Socioeconomic+Effects_REDACTED

10 https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7B2010FE9D-0000-CC3C-A5C3-E13141ED790F%7D

11 https://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId=%7BD0FC0095-0000-CB22-9E84-74A899F80E27%7D

Methods

GenX electricity grid capacity expansion model

The GenX electricity grid capacity expansion model requires a structured set of inputs spanning six primary categories: fuel costs, generation resources, transmission infrastructure, generator availability profiles, policy constraints, and electricity demand. The model was structured into eight regions that align with the eight weather zones of ERCOT. Using these regions, we considered a 27-year model period from 2023 to 2050 with five model stages: 2026, 2031, 2036, 2041, and 2050. A visualization of the eight regions is shown in Figure 2.

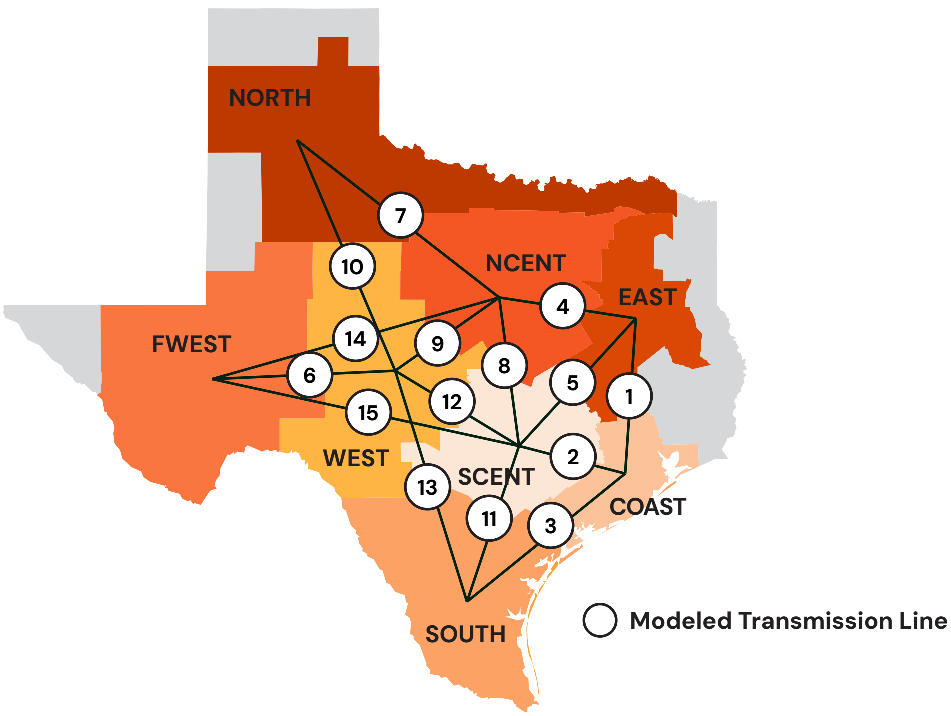


FIGURE 2

A visualization of the eight model regions that were used in capacity expansion analysis of the ERCOT service area. Note that these eight regions match the weather zones published by ERCOT as they provide publicly available information and data. FWEST = Far West, NCENT = North Central, SCENT = South Central.

For this work, we simulate the 765kV transmission lines as additions in carrying capacity of modeled lines that traverse their approximate corridors. Note that the lines in our model are an aggregation of the numerous lines that span the regions. For example, the Solstice to Howard line shown in Figure 1 is represented by line #15 in Figure 2 which spans from the Far West (FWEST) region to the South-Central (SCENT) region.

Our analysis leverages GenX to match electricity supply and demand in each region today and in future years. Future demand profiles are estimated using a ground up tool that processes recent historical demand profiles and projects how they will grow based on future population growth, electrification of heating, electrification of transportation, large load growth (including data centers, factories, etc.), and electrification of oil and gas operations.[12] For this analysis, we used weather year and electrification of heating profiles provided by Skiles et al.[13, 14] From the scaled base weather year, we then applied the effects of the above-mentioned demand drivers, such as large load centers, to continue growing and shaping the demand curves for our future analysis periods. A subset of these future periods is shown in Figure 3.

12 This methodology is like that used in Kassel et al: D.A. Kassel, G.P. Cliff, J.D. Rhodes, and M.E. Webber, "A method to assess the energy impacts of meeting ERCOT's uncertain future electricity demand," Progress in Energy. 8. https://iopscience.iop.org/article/10.1088/2516-1083/ae74ad.

13 M. J. Skiles, J. Shih, J. D. Rhodes, and M. E. Webber, "Assessing the potential for building sector retrofits to mitigate ERCOT electricity shortfalls during Winter Storm Uri," Energy and Buildings, vol. 344, p. 115964, 2025. https://www.sciencedirect.com/science/article/abs/pii/S0378778825006942.

14 To avoid any anomalies in the profiles due to the extreme weather that affected ERCOT in February 2021, we replaced the data from the week of the winter storm with the data from the following week. In other words, the profile from February 20th to February 27th is duplicated to also serve as the profile from February 13th to February 19th, which were the critical days of the storm. Additionally, we interpolated up to three hours on either end of the overlaid profile to create a smooth transition with the transplanted data.

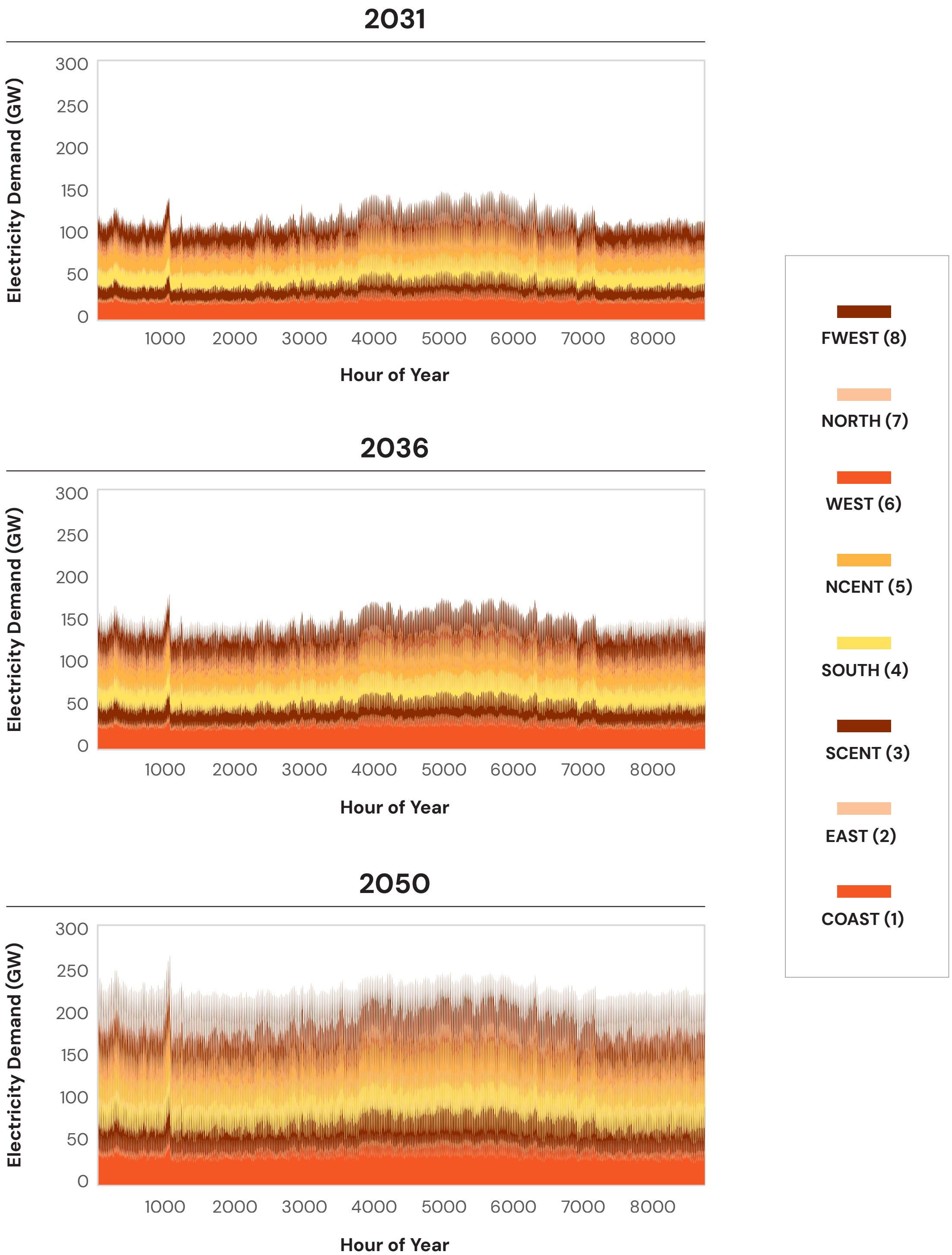


FIGURE 3

Resulting demand profiles for 8760 hours of each year for all 8 weather zones for analysis periods of 2031, 2036, and 2050. These profiles are generated via a demand growth tool that considers the effects of demand drivers on future demand, such as population growth, electrification of heating, electrification of transportation, large load growth, and electrification of oil and gas operations. There are some peaks in winter hours from electric heating during cold snaps, and a more general multi-month hump for warmer summer months. The load and overall consumption grow significantly from 2031 to 2050. FWEST = Far West, NCENT = North Central, SCENT = South Central.

We estimate that ERCOT peak demand will triple from today (~85.5 GW) by 2050 (~264.1 GW). Coincidently, we estimate the peak demand in the coastal region (which includes Houston) to grow by about 2.3x from 25 GW to close to 60 GW. The estimated peak demand growth for all ERCOT, as well as the coastal region, is found in Table 1.

AREA	2031	2036	2041	2050
ERCOT	149.2 GW	178.3 GW	211.1 GW	264.1 GW
COAST	32.6 GW	37.3 GW	43.6 GW	57.6 GW

TABLE 1
Table showing our estimated peak demand values for all ERCOT and the COAST region that includes Houston.

Jobs and Economic Development Impacts (JEDI) model

The transmission line version of the Jobs and Economic Development Impacts (JEDI) model allows users to estimate the economic development impacts associated with transmission line projects. As noted earlier, JEDI is a reference-standard tool developed the National Laboratory of the Rockies for this type of analysis. JEDI requires over 100 specialized input values that are concentrated in five main categories: general information, project description, right-of-way (ROW), financing, and tax parameters. Critical input values to the JEDI model are shown in Figure 4.

GENERAL INFORMATION

Project Location
Texas

Year of Installation
2030
(maximum in JEDI)

Transmission Line Type
Variable

Transmission Line Length (Miles)
Variable

Terrain Classification
Flat w/ access

Population Density Classification
Near town

PROJECT DESCRIPTION

Preconstruction Period
Variable

Construction Period
Variable

Circuits
Variable

New Substations
Variable

Positions Required for New Substations
Variable

Substation Upgrades
Variable

Grid System Voltage
345 kV

ROW

Share of Total Line Length
1%

Public/Private
Public / 99% Private

Width
200 ft

Private Cost
$150,000 per acre

Note: The $150k per acre is split:
$100k per acre for "Private Land Acquisition Payment"
$50k per acre split between the other 3 categories

FINANCING

Percentage Financed
57%

Years Financed
50 years

Interest Rate
4.3%

Return on Equity
9.65%

Repayment Term
50 years

TAX PARAMETERS

Local Property Tax Rate
2.1%

Assessed Value
100%

Taxable Value
100%

Property Tax Exemption
60%

Local Sales Tax Rate
8.25%

FIGURE 4
A visual presentation of critical input values needed by the JEDI tool. Note that some of the values are listed as "variable" as these are values that are likely to change when using JEDI to model different projects.

For many of these values, such as the local property tax rate, we assumed consistency across all projects. For others, such as the transmission line length (miles), we used the actual values for each project studied. Note that the parameters shown in Figure 4 are not comprehensive of all the JEDI inputs as additional inputs are needed to refine the cost of any given project.

Results and Discussion

This section includes the results and discussion of the two types of analysis, the grid impacts of the 765kV lines using GenX and the broader economic impacts using JEDI, for both the entire 765kV STEP backbone and the three lines that run to the Houston area.

Analysis of the entire 765kV STEP backbone

The first analysis sought to quantify the impacts of all the 765kV STEP lines as seen in Figure 1. To accomplish this, we leveraged the capacity expansion capabilities in GenX to simulate the development of the ERCOT grid with and without the 765kV STEP transmission lines. The objective was to assess how including the lines would influence the development of the grid in the future.

Our model includes annual limitations for how quickly transmission can be constructed to align with historical build rates. In the scenarios without considerations for the STEP lines, we do not allow the model to expand transmission carrying capacity through the year 2036. This constraint assumes that if we are not planning large scale transmission development now, it will take >10 years to plan, approve, and build transmission. However, in the scenarios that do consider the STEP lines, these lines are built into the grid topology by 2031, and the model can still elect to build even more transmission by 2041 as in the base case. In other words, the scenarios with the STEP lines have more transmission in the 2030s and have greater potential to expand transmission further in the 2040s.

For the two scenarios, we simulated cost-optimal generation capacity expansion through 2050. Figure 5 shows the model results with call outs for how the results differ between the two scenarios.

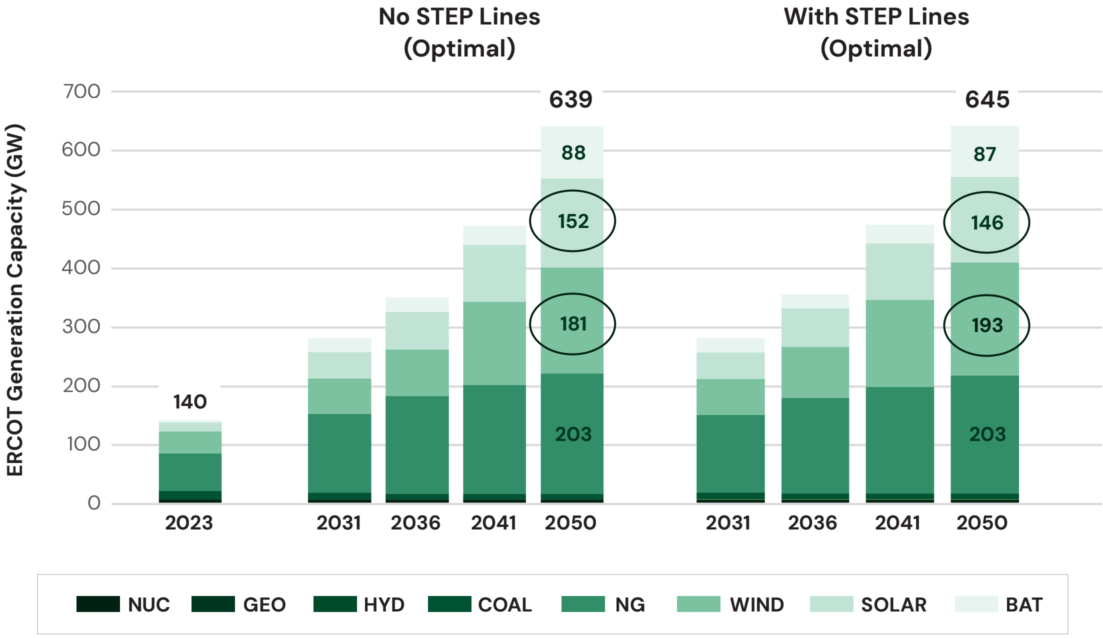


FIGURE 5
ERCOT-wide capacity expansion for two analysis scenarios showing differing buildouts of technology between the two scenarios. The scenario with the STEP lines allows for greater investment in generation capacity.

Our results show that including the STEP lines yields a slight increase in overall generation capacity that is built out by the model through 2050. The increase in capacity is largely driven from an increase in total wind capacity in the western and southern regions of Texas because the model can better optimize the placement of new resources. In general, the 765kV STEP lines enable the model to more efficiently place resources in regions where they can be best used. Figure 6 shows the expected change in generation resources for each region in ERCOT because of the new 765kV lines. The results are displayed as a difference between the baseline scenario (i.e., no 765kV STEP lines) and the scenario with the lines added.

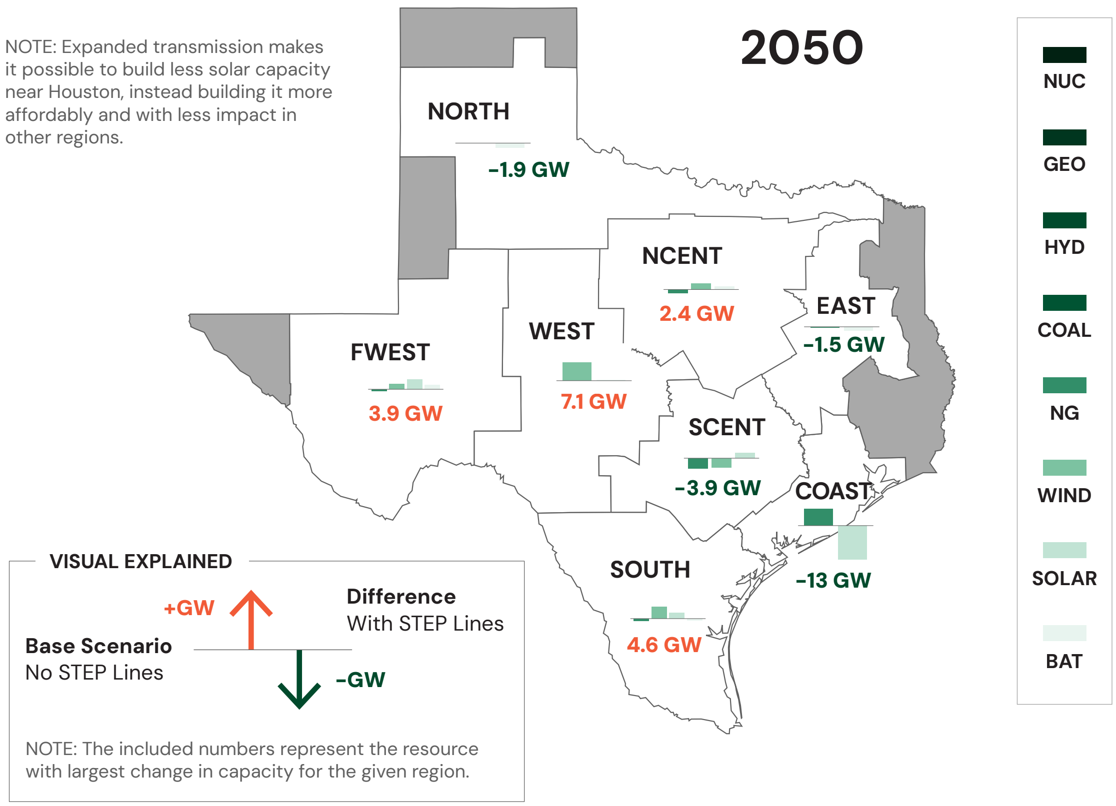


FIGURE 6

Model results showing the difference in generation capacity per model region in 2050. Note that the baseline scenario is the scenario without the 765kV STEP lines, and differences from the baseline are in results that include the 765kV STEP lines. For example, with the STEP lines, the Houston area (COAST) would build more natural gas generation capacity in the region but would build less solar generation capacity in the immediate vicinity because it elects to build solar more affordably in other regions.

We find that with the 765kV STEP lines, less solar generation capacity is needed in the crowded coastal region because it now can import more power from its neighbors. Instead of solar capacity in the coastal region, the model builds more solar resources in the south, south-central, and far-western regions that can then be more easily shared throughout the state. For example, Figure 6 shows that nearly 4 GW of additional solar gets built in the far-western region.

The more efficient utilization of resources is a function of the buildout of the transmission system. With access to the 765kV STEP lines, the model can expand the carrying capacity of the transmission network, including relieving congestion and import limits into congested regions, like the coastal region. Figure 7 shows the differences in network structure in the simulated 2050 and Table 2 provides the values for each line.

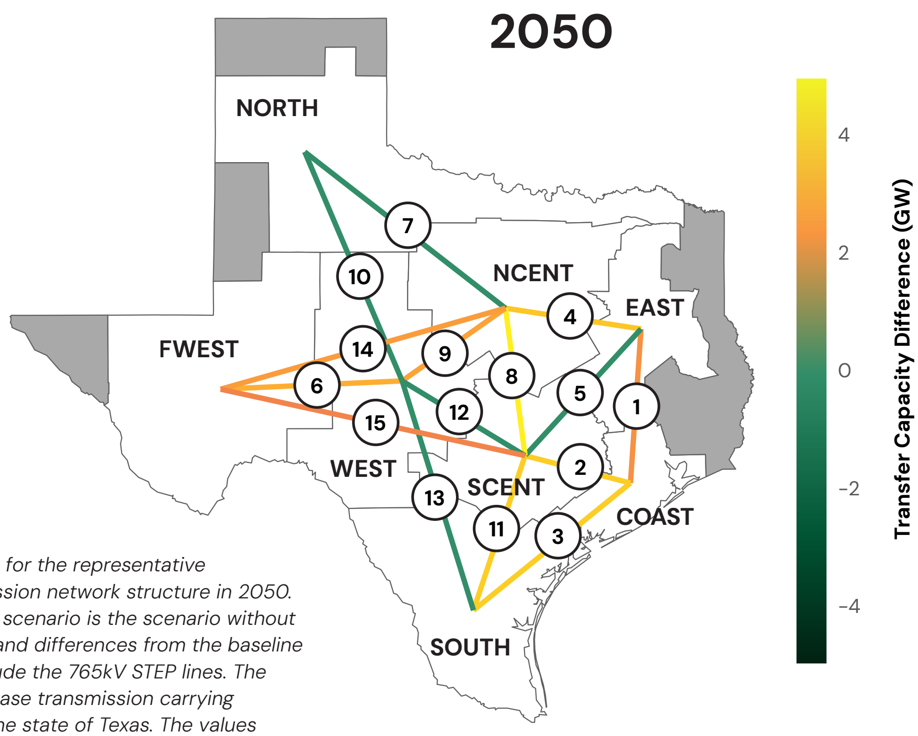


FIGURE 7
GenX modeling results for the representative differences in transmission network structure in 2050. Note that the baseline scenario is the scenario without the 765kV STEP lines, and differences from the baseline are in results that include the 765kV STEP lines. The 765kV STEP lines increase transmission carrying capacity throughout the state of Texas. The values indicated in the figure are shown in Table 2.

Line	No STEP Lines (GW)	With the STEP Lines (GW)	Difference (GW)
1	3.3	5.7	2.4
2	3.5	7.5	4.0
3	2.0	6.0	4.0
4	13.4	17.2	3.8
5	0.2	0.2	0.0
6	11.8	15.0	3.2
7	11.9	11.9	0.0
8	5.1	10.1	5.0
9	10.2	13.1	2.9
10	3.4	3.4	0.0
11	5.6	9.6	4.0
12	7.5	7.5	0.0
13	0.4	0.4	0.0
14	0.0	2.7	2.7
15	0.0	2.0	2.0

TABLE 2
Table showing the difference in the interzonal transmission line corridors between the two scenarios in 2050 illustrated in Figure 7.

All in all, this part of the analysis finds that the 765kV STEP lines allow for a more efficient distribution of generation resources while alleviating congestion across the ERCOT grid.

Analyzing the 765kV STEP lines under constrained generation development

The first part of this analysis assumed that the grid could grow at the pace needed to match the levels of demand shown in Figure 3. However, current firm demand queues are larger than supply queues. Thus, we next formatted the GenX analysis to answer a different question: If supply is constrained, can building the STEP lines allow more load to be served?

We find, under a future of constrained supply, the 765kV lines can serve ~5-6 TWh of additional energy in our scenario year 2031. This quantity of energy is equivalent to the annual energy use of approximately 500,000 homes.[15] Further, applying the current day-ahead system-wide offer cap in the ERCOT region of $5,000 per MWh[16, 17] the economic value of serving this quantity of additional energy would be between $25 billion and $30 billion.

To find out how much additional load the 765kV lines might be able to support, we fixed the buildout of generation resources in the ERCOT grid by 2031 such that only those resources currently (as of early 2026) in ERCOT's generator interconnection queue (GIS) could be built. This assumption is intended to replicate practical build limits, such as the multi-year backlog for new natural gas turbines. The resulting grid capacity mix under these constraints is shown in Figure 8 for two scenarios, one with the 765kV lines and one without.

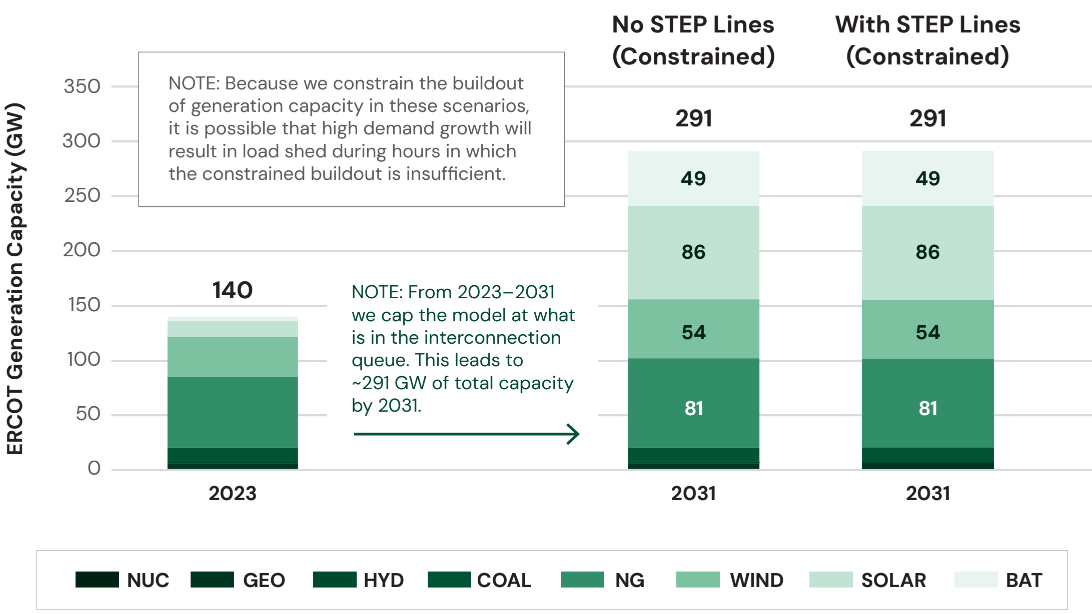


FIGURE 8

Capacity expansion for two analysis scenarios with strict build constraints. The constraints are put in place to allow for the completion of projects currently in the interconnection queue, but not to allow for additional projects from now until 2031. Both scenarios are similar because they both reach the upper limits of these build limitations.

15 Assuming a standard home consumes ~10,000 kWh per year.

16 When ERCOT transitioned to Real-Time Co-Optimization Plus Batteries in 2025, the system-wide offer cap was changed such that the Day-Ahead System-Wide offer cap (DASWCAP) was set to $5,000/MWh and the Real-Time System-Wide offer cap was set to $2,000/MWh. https://www.ercot.com/files/docs/2025/09/22/2025_09-Real-Time-Market-Operations.pdf

17 In ERCOT, the system-wide offer cap used to be the same as the value of lost load (VOLL), and both were set at $5,000/MWh. However, the two were recently decoupled and the planning VOLL used for the reliability-standard assessment has been set at $35,000/MWh.

In both scenarios, the model built out all the generation capacity as it could, which resulted in the same resulting power plant fleet in 2031. However, the scenario with the 765kV lines was able to move more energy more efficiently than the scenario without the lines. Thus, we found that the scenario with the 765kV lines was able to serve more load even though it had the same amount of generation resources. Figure 9 shows the total energy served in these two scenarios in our simulated 2031.

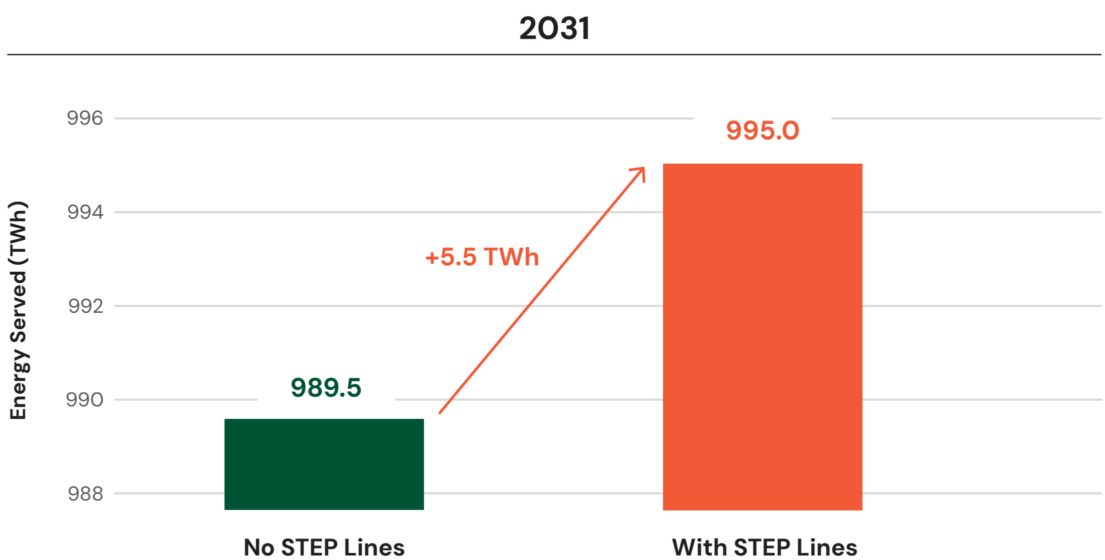


FIGURE 9
Total energy served by the ERCOT grid in our simulated 2031 for two analysis scenarios, both of which have the same constrained generation shown in Figure 8. In these scenarios, the 765kV STEP lines unlock congestion and enable more energy (~5.5 TWh) to be served.

Our results show that the scenario with the 765kV lines can serve significantly more energy than the scenario without the 765kV STEP lines (~5.5 TWh or equivalent to ~550,000 homes[15]). That is, we find that, for the same generation resources that we expect to materialize over the next five or so years, the model can serve more future energy with access to the 765kV lines.

The ability to serve more load in the future is valuable. Assuming a value of $5,000 per MWh of lost or unserved load, we find that the economic value of the additional energy served in the scenario with the 765kV STEP lines to be in the tens of billions of dollars per year. Figure 10 shows the economic value of this additional energy served, less the amortized costs of the increased transmission capacity, ultimately yielding a positive net value of over $25B in 2031.

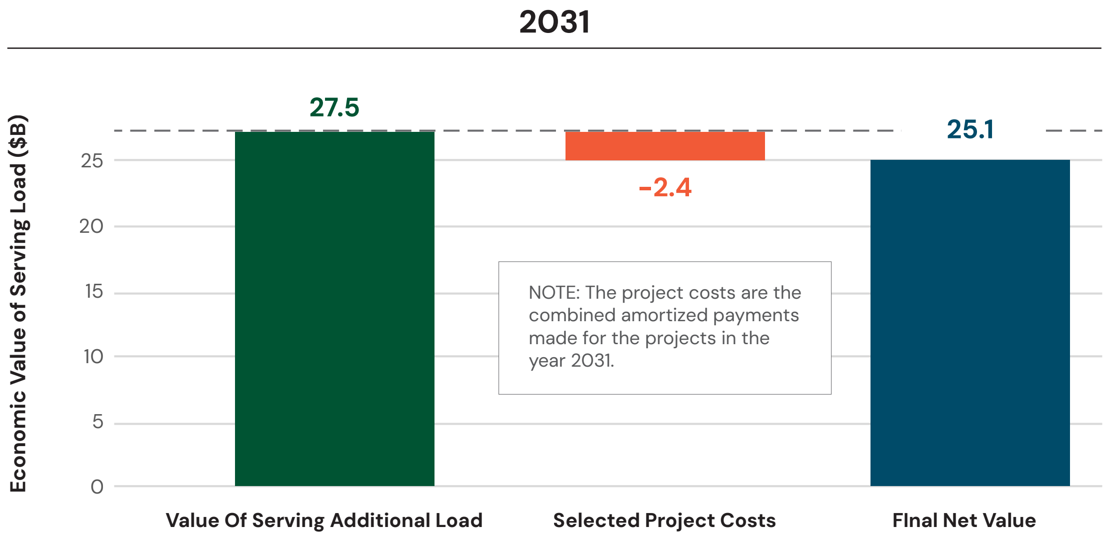


FIGURE 10

A waterfall chart showing the economics of the GenX results and isolating the payments of the 765kV lines and supporting projects. In this figure, we assume a value of lost or unserved load to be $5,000 per MWh and we apply that economic value to the additional load served as shown in Figure 9.

Assuming a value of lost or unserved load of $5,000 per MWh, and considering the costs of the transmission, we find a net value of over $25 billion in year 2031 alone. However, the value of load not served can vary over duration and customer class. Thus, Table 3 lists a range of possible values for the marginal value of load not served in the future. These values are used to depict a range of the economic activity that would be enabled by the serving of the additional load that the 765kV lines allow.

Value of Unserved Energy Proxy	Value of unserved energy [$/MWh]	Value of Serving 5.5 TWh [$B]	Amortized Costs [$B]	Net Value of Serving 5.5 TWh [$B]
ERCOT DASWCAP	5,000	27.5	2.4	25.1
Texas GDP[18]	5,500	30.3	2.4	27.9
ERCOT VOLL[19]	35,000	192.5	2.4	190.1
Brattle[20, 21] **(Extrapolated)**	900	5.0	2.4	2.6

TABLE 3

Range of possible values for load not served. It is expected that the marginal value of serving of the additional load that the 765kV lines allow is within this range.

18 To calculate the VOLL using Texas GDP, we took the Texas GDP ~$2.9T and divided by the total TWh consumed in Texas in 2025, ~520 TWh. ($2.9T / 520 TWh = ~5,500 $/MWh)

19 https://www.ercot.com/files/docs/2024/09/10/ERCOT-Trending-Topic-Reliability-Standard.pdf

20 https://www.brattle.com/wp-content/uploads/2024/09/Value-of-Lost-Load-Study-for-the-ERCOT-Region.pdf

21 The extrapolated value is calculated by taking the time varying values of lost load in the Brattle report and extrapolating them to a year (8,760 hours) using a power curve.

Broader economic impacts of the 765kV STEP lines

Serving additional load is not the only economic impact of the 765kV STEP lines. The construction and operation of the lines also promote economic activity via direct construction, operational expenses, materials, labor, tax payments, etc. To assess this additional economic activity spurred by the 765kV lines, we used the JEDI model. In short, JEDI considers how much money is spent on a project, where it goes, and how the broader economy and supporting supply chains benefit from the payments made for a given project.

Critical outputs that JEDI returns are costs, jobs, earnings, output, value added, and property taxes. The costs are the capital put into the project. Jobs are how many full-time equivalent (FTE) employment opportunities are created or required by the project. Earnings are how much of the investment goes to workers' income. Output is a measure of the total economic activity spurred by the project including labor compensation, materials, equipment, services, and taxes. Value added is the net contribution to Gross Domestic Product (GDP) by the project's construction and operation. Lastly, property taxes are a part of the annual operations costs that we isolate. JEDI returns many of these parameters split between construction and installation values versus annual operation values.[22]

In addition to the 765kV lines, there are also new or upgraded smaller voltage lines that are needed to support these lines. These are the projects mentioned in the STEP reports[23] from ERCOT and are aggregated as:

649
miles of new 345-kV lines

1,098
miles of upgrades to existing 345-kV lines

324
miles of new 138-kV lines

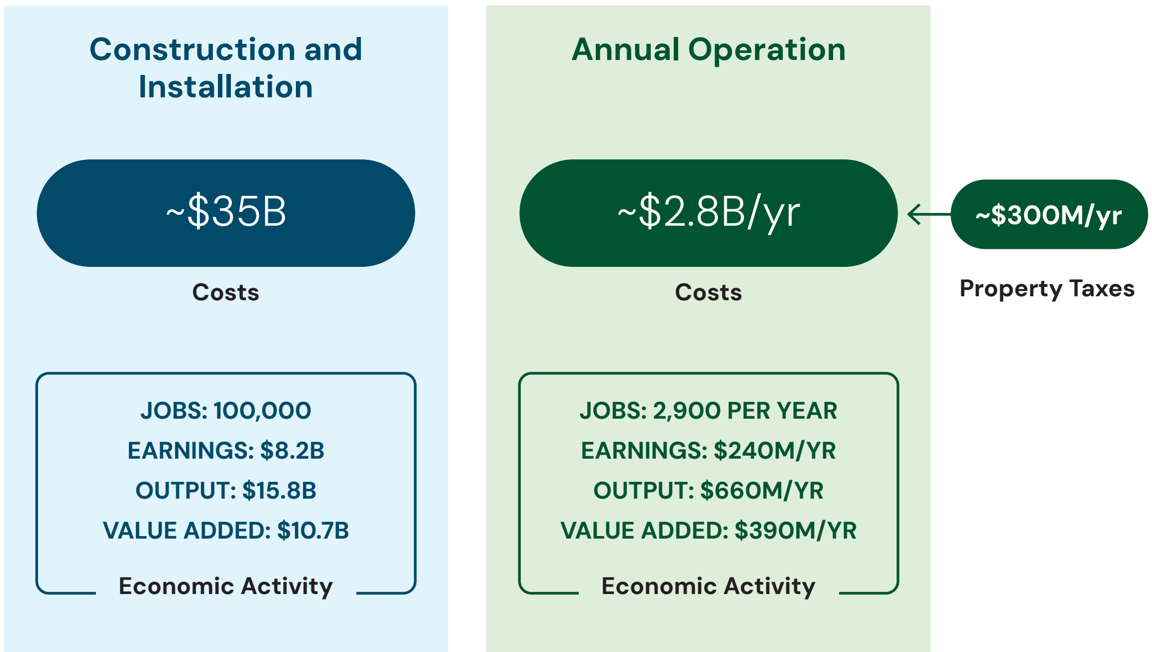
1,287
miles of upgrades to existing 138-kV lines

22 It is worth noting that JEDI returns results in 2012 dollars and so we scaled the values to 2025 dollars with a 41% scaling factor from accumulated inflation . U.S. Bureau of Labor Statistics, CPI Inflation Calculator, https://www.bls.gov/

23 https://www.ercot.com/files/docs/2025/01/27/2024-regional-transmission-plan-rtp-345-kv-plan-and-texas-765-kv-strategic-transmission-expans.pdf

The aggregate JEDI results for all the STEP projects, including their lower voltage supporting lines, are shown in Figure 11 while the individual values for each project are in the appendix.

STEP PROJECTS



NOTE: The reported activity includes the onsite, supply chain, and induced economic impacts. The impacts are estimated using economic multipliers derived from IMPLAN.* These values do not include all CAPEX and OPEX for the factories, data centers, etc. that can be built b/c of the lines enabling more served load.

FIGURE 11
JEDI simulation results for all projects of the 765 kV STEP lines and their lower voltage supporting lines show significant job creation and economic value added.

Our results indicate that the construction of the projects would create ~100,000 jobs and provide ~$10.7 billion in economic value for the region. The annual operation of the projects would create ~2,900 jobs per year and ~$390 million per year in economic value while also paying ~$300 million in property taxes each year. It is worth noting that these are values simply from the construction and operation of the line and as such they do not consider all the factories, data centers, etc. that can be built because of the lines enabling more load.

Focused analysis of Hillje lines and supporting projects of the Houston area

The second part of this analysis is similar in structure to the first piece but focused in on the Houston region. This section seeks to quantify the impacts of a specific subset of the 765kV backbone: the three lines that begin at the Hillje substation (Hillje-XX) outside of the Houston area. To accomplish this, we again used GenX to simulate the development of the ERCOT grid with and without the specific Hillje-XX transmission lines seen in Figure 1. However, for this analysis we also included the western portion of the 765kV lines in the baseline analysis as they are further along in the review process than the lines in the eastern portion. The objective was to assess how including the specific Hillje-XX lines would influence the development of the grid in the future alongside the western STEP lines, which are further along in the process and will likely be constructed first.[24]

For this section of the analysis, our model again includes annual limitations on how fast it can build transmission that generally align with historical build rates. In the scenarios without considerations for the Hillje-XX lines, we do not allow the model to expand transmission carrying capacity through the year 2036. This assumes that if we are not planning large scale transmission development now, it will take >10 years to plan, approve, and build transmission. However, in the scenarios that do consider the lines, these lines are built into the grid topology by 2031, and the model can still elect to build even more transmission by 2041 as in the base case. In other words, the scenarios with the lines have more transmission in the 2030s and have greater potential to expand transmission further in the 2040s.

For the two scenarios, we simulated cost-optimal generation capacity expansion through 2050. Figure 12 shows the model results with call outs for how the results differ between the two scenarios.

24 Thus, while the previous analysis compared all the 765kV lines vs. none of the 765kV lines, this analysis has the western portion of the STEP lines in both scenarios, which the second scenario in this part also including the Hillje lines. Therefore, because these two analyses have different baselines, it is important to not consider one scenario comparison as a direct extension of the other.

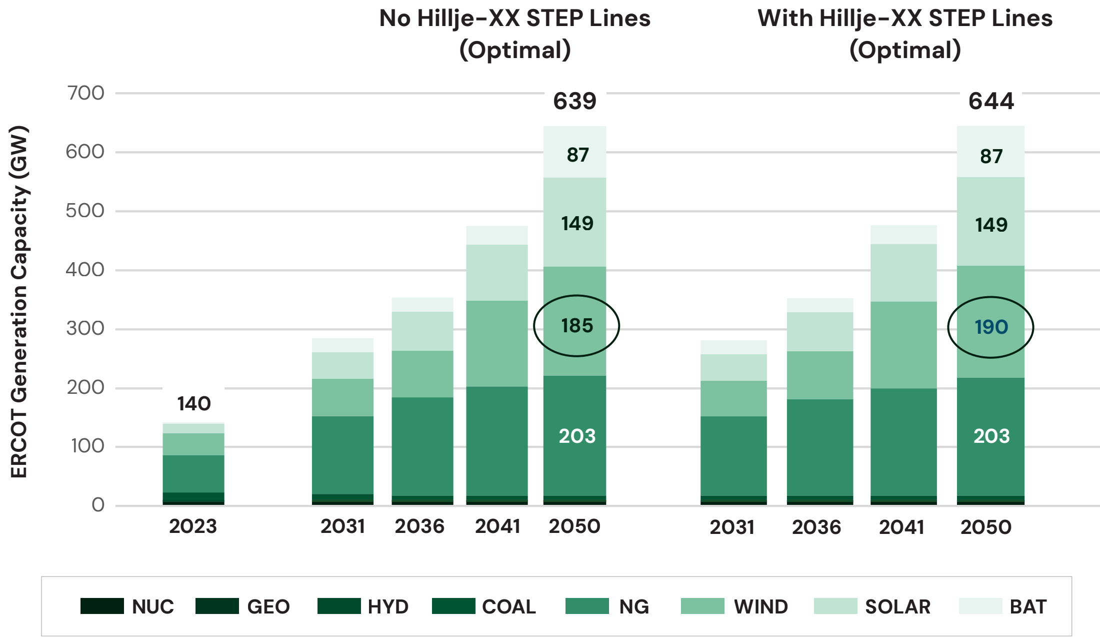


FIGURE 12

ERCOT-wide capacity expansion for two analysis scenarios. In the scenario with the Hillje-XX STEP lines, the model builds a more optimal capacity mix as it can better optimize the dispatch resources.

Our results show a slight increase in overall generation capacity that is built out by the model through 2050. The increase in capacity is largely driven from an increase in capacity in the southern and north-central regions of Texas because the model can better optimize the utilization of that capacity. In general, the Hillje-XX STEP lines enable the model to more efficiently place resources in regions where they can be best used. Figure 13 shows the expected change in generation resources for each region in ERCOT because of the new Hillje-XX lines. The results are displayed as a difference between the baseline scenario (i.e., no Hillje-XX lines) and the scenario with the lines added.

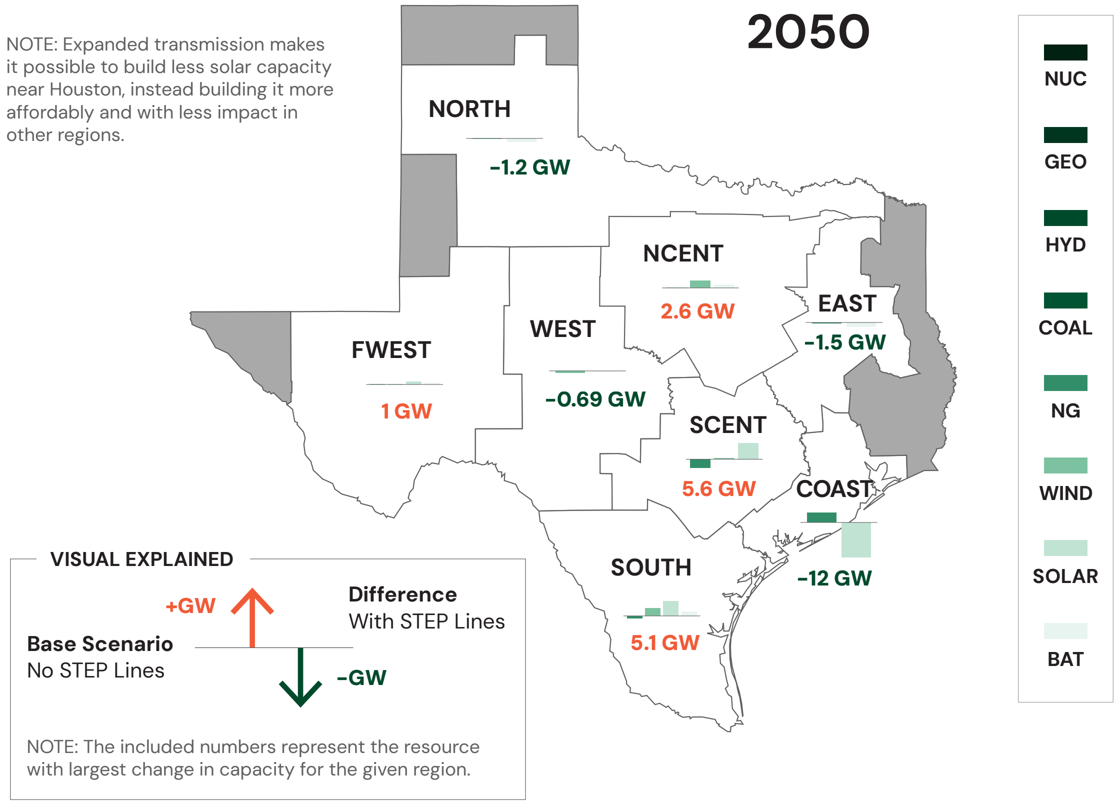


FIGURE 13

Model results showing the difference in generation capacity per model region in 2050. Note that the baseline scenario is one without Hillje-XX STEP lines, and differences from the baseline are from the results that include the Hillje-XX STEP lines. For example, with the STEP lines, the Houston area (COAST) would build less solar generation capacity in the immediate vicinity, instead building it more affordably in other regions.

We find that with the Hillje-XX STEP lines, less solar generation capacity is needed in the crowded coastal region because it can import more power from its neighbors. Instead of solar capacity in the coastal region, the model builds more solar resources in the south and south-central regions that is higher-performing and can be more easily shared with the coastal region. For example, Figure 13 shows that nearly 5 GW of additional solar gets built in the southern region and another 5-6 GW gets built in the south-central region.

Thus, the results are directionally similar as the first analysis and show that the more efficient placement of resources is a function of not only the three Hillje-XX 765kV lines, but also the buildout of the rest of the transmission system. With access to the new lines, the model could have also expanded the carrying capacity of the rest of the network. However, the buildout of the rest of the network was consistent across the two scenarios. Figure 14 shows the differences in network structure in the simulated 2050 and the difference in the capacity of the lines are shown in Table 4.

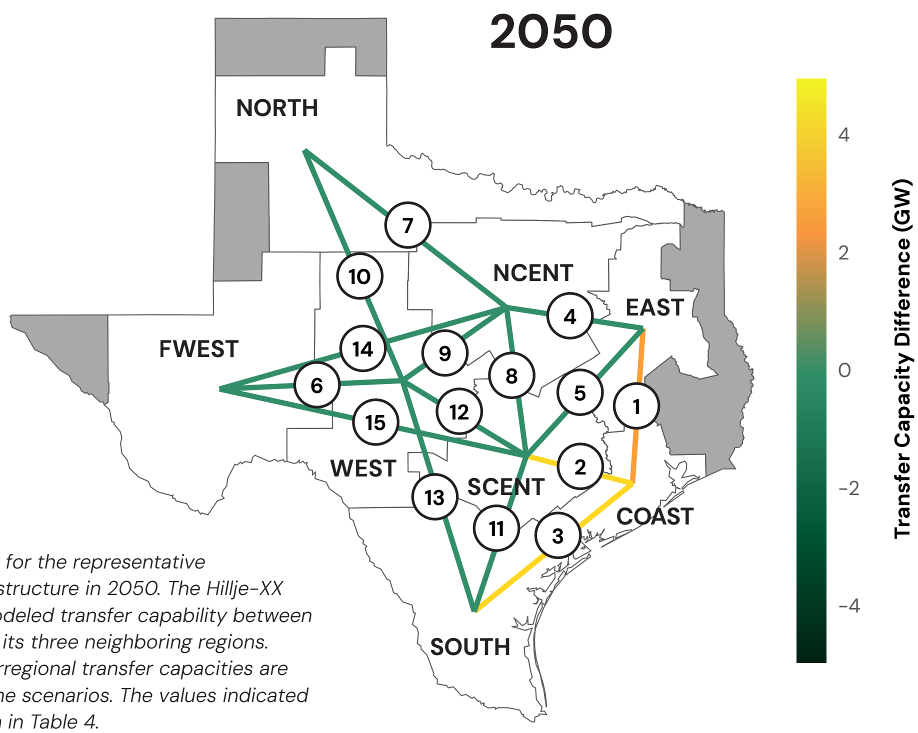


FIGURE 14
GenX modeling results for the representative transmission network structure in 2050. The Hillje-XX STEP lines increase modeled transfer capability between the COAST region and its three neighboring regions. All other modeled interregional transfer capacities are unchanged between the scenarios. The values indicated in the figure are shown in Table 4.

Line	No Hillje-XX Lines (GW)	W/ Hillje-XX Lines (GW)	Difference (GW)
1	3.3	5.7	2.4
2	3.5	7.5	4.0
3	2.0	6.0	4.0
4	13.4	13.4	0.0
5	0.2	0.2	0.0
6	15.0	15.0	0.0
7	11.9	11.9	0.0
8	5.1	5.1	0.0
9	13.1	13.1	0.0
10	3.4	3.4	0.0
11	5.6	5.6	0.0
12	7.5	7.5	0.0
13	0.4	0.4	0.0
14	2.7	2.7	0.0
15	2.0	2.0	0.0

TABLE 4
Table showing the difference in the interzonal transmission line corridors between the two scenarios in 2050 illustrated in Figure 14.

Like the previous analysis, we find that the Hillje-XX lines allow for a more efficient distribution of generation resources while alleviating congestion across the ERCOT grid.

The first part this Hillje-XX analysis assumed that the grid could grow at the pace needed to match the levels of demand shown in Figure 3. However, current firm demand queues are larger than supply queues. Thus, we next formatted the GenX analysis to answer a different question: If supply is constrained, can building the Hillje-XX lines allow more load to be served?

We find that ~3-4 TWh of additional energy could be served in our scenario year 2031. This quantity of energy is approximately equivalent to the annual energy use of 350,000 homes[15]. Again, applying the current day-ahead system-wide offer cap in the ERCOT region of $5,000 per MWh, we find the value of serving this quantity of additional energy would be between $15 billion and $20 billion.

To find out how much additional load the Hillje-XX lines would be able to support, we again fixed the buildout of the ERCOT grid by 2031 such that only generation resources currently (as of early 2026) in the ERCOT generator interconnection queue (GIS) could be built. This assumption is intended to replicate practical build limits, such as the multi-year backlog for natural gas turbines. The resulting grid capacity mix under these constraints is shown in Figure 15 for two scenarios, one with the Hillje-XX lines and one without.

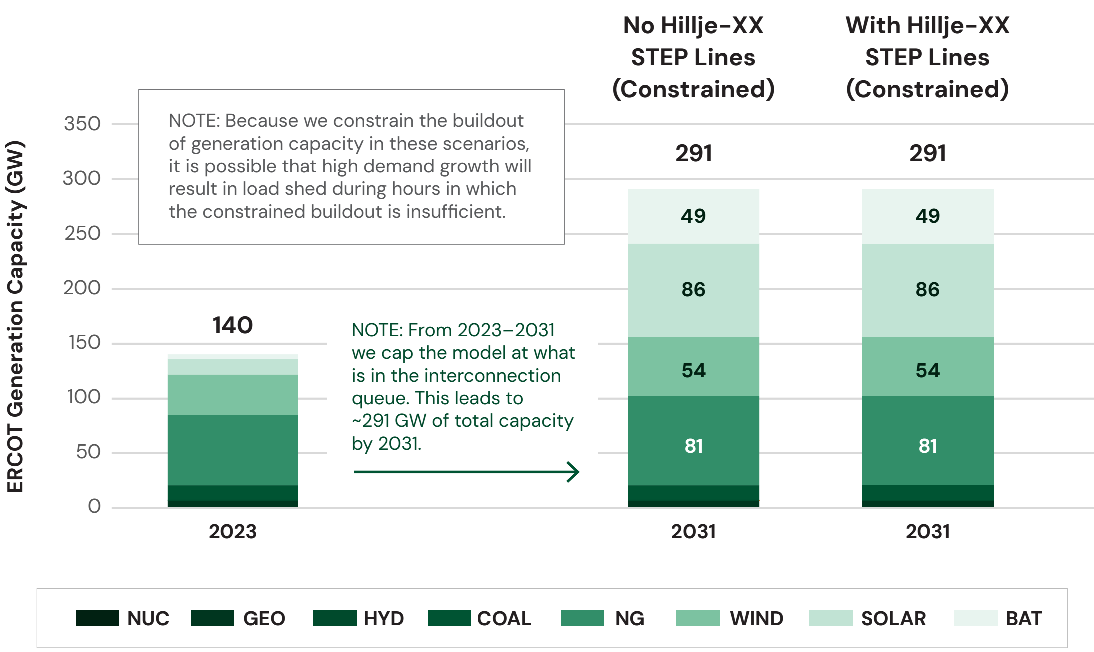


FIGURE 15
Capacity expansion for two analysis scenarios with strict build constraints. The constraints are put in place to allow for the completion of projects currently in the interconnection queue, but not to allow for additional projects. Both scenarios are similar because they both reach the upper limits of these build limitations.

In both scenarios, the model again built out as much generation capacity as it could, which resulted in the same resulting power plant fleet in 2031. However, the scenario that included the Hillje-XX lines was able to more energy between regions than the scenario without them. Thus, we found that the scenario with the Hillje-XX lines was able to serve more load even though it had the same amount of generation resources. Figure 16 shows the total energy served in these scenarios over the course of a simulated year 2031.

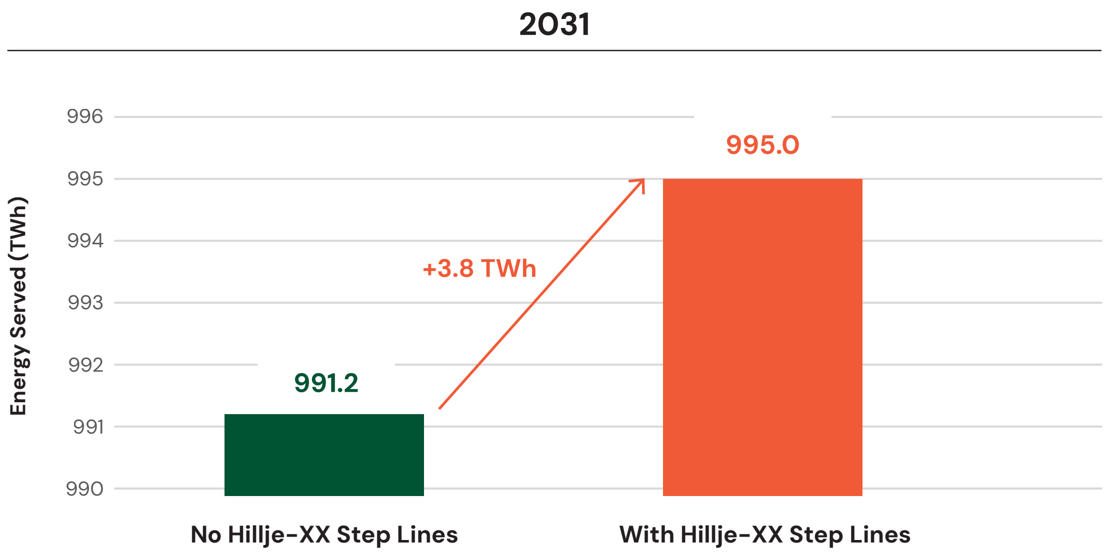


FIGURE 16
Total energy served by the power grid in a simulated year 2031 for two analysis scenarios. The Hillje-XX STEP lines unlock congestion and enable more energy (~3.8 TWh) to be served.

Our results indicate that the scenario that includes the Hillje-XX lines can serve significantly more energy in the scenario without the Hillje-XX STEP lines (~3.8 TWh or equivalent to ~380,000 homes[15]). That is, we find that, for the same generation fleet, the model can serve more future demand with access to the Hillje-XX lines.

The ability to serve more load in the future is valuable. Again assuming $5,000/MWh of lost or unserved load, we can calculate an economic value to the additional energy served in the scenario with the Hillje-XX STEP lines to be in the billions of dollars. Figure 17 shows the economic value of energy served, less the annual amortized cost of the Hillje-XX lines (and their supporting lines), ultimately yielding a net value of approximately $18B.

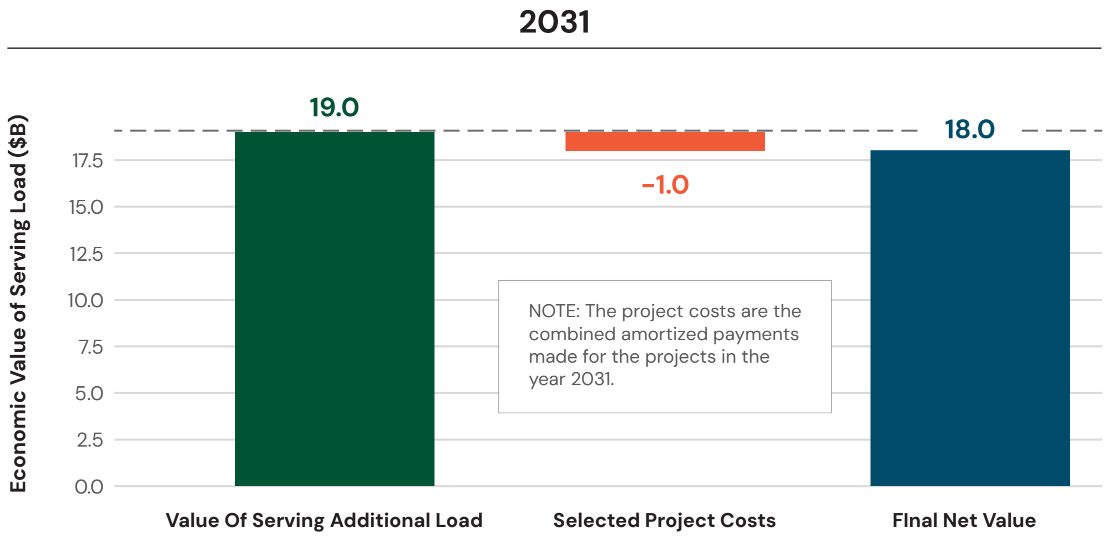


FIGURE 17

A waterfall chart showing the economics of the GenX results and isolating the payments of the Hillje-XX STEP lines and supporting projects. In this figure, we assume a value of lost or unserved load to be $5,000 per MWh and we apply that economic value to the additional load served as shown in Figure 16.

Assuming a value of lost or unserved load of $5,000 per MWh, and considering the costs of the transmission, we find a net value of over $18 billion in year 2031 alone. However, the value of load not served can vary over duration and customer class. Thus, using the same range of values as in Table 3, Table 5 lists a range of possible values for the marginal value of load not served in the future. These values are used to depict a range of the economic activity that would be enabled by the serving of the additional load that the Hillje-XX lines allow.

Value of Unserved Energy Proxy	Value of Unserved Energy [$/MWh]	Value of Serving 3.8 TWh	Amortized Costs [$B]	Net Value of Serving 3.8 TWh [$B]
ERCOT DASWCAP	5,000	19.0	1.0	18
Texas GDP[18]	5,500	20.9	1.0	19.9
ERCOT VOLL[19]	35,000	133.0	1.0	132.0
Brattle[20, 21] **(Extrapolated)**	900	3.4	1.0	2.4

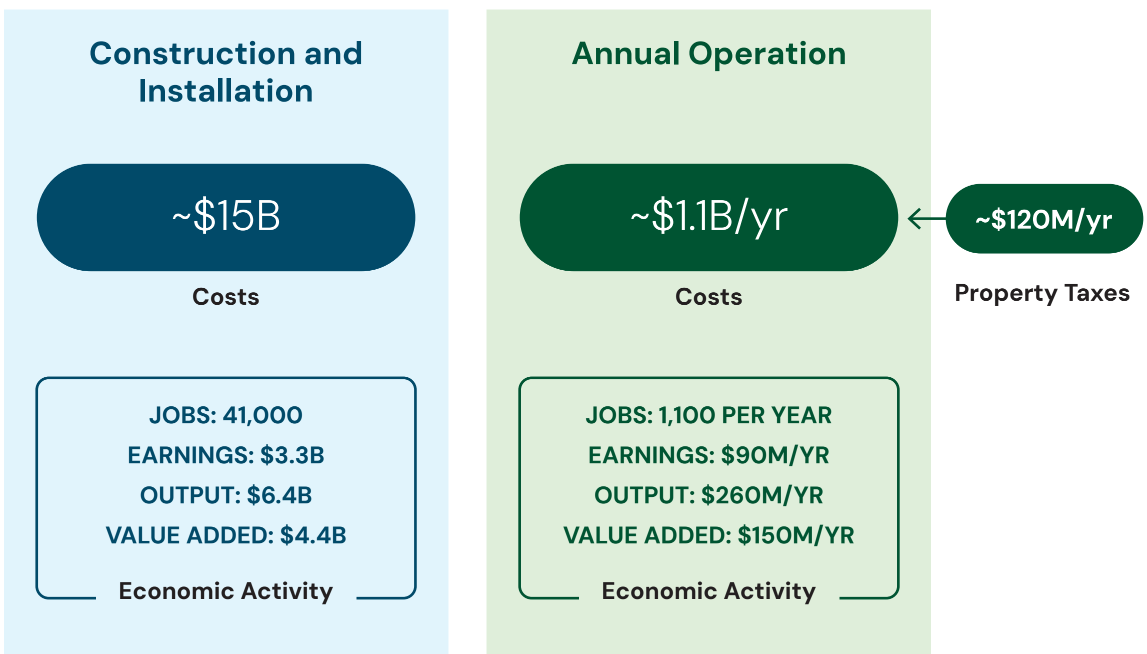
TABLE 5

Range of values for lost load. It is expected that the marginal value for future unserved energy will fall somewhere in the middle of this range.

Broader economic impacts of the Hillje-XX 765kV STEP lines

Serving additional load is not the only economic impact of the Hillje-XX 765kV STEP lines. The construction and operation of the lines also promote economic activity via materials, labor, tax payments, etc. Therefore, we again used the JEDI model to analyze these impacts. High level JEDI model results for the aggregated Hillje-XX 765kV STEP lines as well as supporting projects near the Houston area are shown in Figure 18, the values of the individual components can be found in the appendix.

HILLJE-XX LINES AND SUPPORTING PROJECTS



NOTE: The reported activity includes the onsite, supply chain, and induced economic impacts. The impacts are estimated using economic multipliers derived from IMPLAN.* These values do not include all CAPEX and OPEX for the factories, data centers, etc. that can be built b/c of the lines enabling more served load.

FIGURE 18
JEDI simulation results for the Hillje-XX 765kV transmission lines and all supporting projects near the Houston area. The results show significant job creation and economic value added from these projects.

Our results show that the construction of the projects would create ~41,000 jobs and provide ~$4.4 billion in economic value for the region. The annual operation of the projects would create ~1,100 jobs per year and ~$150 million per year in economic value while also paying ~$120 million in property taxes each year.

Conclusions

This analysis finds that the proposed 765 kV transmission buildout could provide significant benefits to ERCOT and the broader Texas economy, including to the Houston region. Our conclusions are that the projects have the potential to:

- **Enable more efficient generation investment.**
  By expanding the grid's ability to move power across regions, the 765 kV projects allow new generation resources to be developed in locations where they are most cost-effective and most valuable to the system. This helps reduce operating costs, lower fuel consumption, and support a more reliable and efficient long-term buildout of the ERCOT grid.

- **Provide lasting local benefits through ongoing operations and tax revenues.**
  Once in service, the projects would continue to support employment, contribute to local economies, and generate recurring property tax revenues for surrounding communities. These benefits would continue beyond the initial construction period.

- **Create substantial regional economic benefits during construction.**
  Construction of the transmission lines and supporting infrastructure would create jobs, support local supply chains, and stimulate economic activity across the region. These near-term impacts represent a major economic development benefit associated with the buildout.

- **Increase ERCOT's ability to serve future load growth.**
  The added transmission capability allows ERCOT to serve more electricity demand with the same level of generation resources. This is particularly important as Texas experiences rapid growth from industrial development, commercial real estate, data centers, electrification of oil and gas operations, and other large loads.

- **Support smart energy development.**
  By improving deliverability from resource-rich areas to major load centers, the 765 kV projects enable greater development of resources that reduces power-sector natural gas demand, which can increase the amount of gas available exports allowing the Texas economy to consume more electricity and sell more natural gas to other regions.

- **Reduce the water impacts from the power sector.**
  Reduced reliance on water-cooled generation resources can free up scarce water resources for other, higher value uses, such as farming and manufacturing.

This analysis finds that the proposed 765 kV transmission buildout would be a positive investment for ERCOT by improving grid efficiency, supporting future load growth, enabling cleaner and more diverse generation development, reducing fuel and water use, and delivering meaningful economic benefits to communities across the region.

Acknowledgements

This analysis was performed for CenterPoint Energy. We thank Drs. Charles R. Upshaw and F. Todd Davidson for their thoughtful review.

APPENDIX A

GenX Results – Complete analysis of entire 765kV backbone

This section summarizes the GenX model results for the model scenarios with and without the 765kV STEP backbone.

CAPACITY EXPANSION

Technology	2023	2026	2031	2036	2041	2050
Nuclear	5.1	5.1	5.1	5.1	5.1	5.1
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0
Hydro	0.6	0.6	0.6	0.6	0.6	0.6
Coal	14.3	14.3	11.6	9.8	9.8	9.8
Natural Gas	63.5	67.9	133.5	165.2	184.1	203.4
Wind	37.1	40.9	60.2	79.3	141.6	180.6
Solar	15.5	37.0	44.4	64.1	96.8	151.5
Batteries	3.4	17.1	24.1	24.1	32.3	88.1

TABLE A3
Capacity expansion (in GW) without the 765kV STEP lines.

Technology	2023	2026	2031	2036	2041	2050
Nuclear	5.1	5.1	5.1	5.1	5.1	5.1
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0
Hydro	0.6	0.6	0.6	0.6	0.6	0.6
Coal	14.3	14.3	11.6	9.8	9.8	9.8
Natural Gas	63.5	67.9	133.1	164.1	183.3	202.6
Wind	37.1	40.9	61.9	87.3	149.3	193.2
Solar	15.5	37.0	45.1	66.0	95.9	146.5
Batteries	3.4	17.1	24.1	24.1	32.8	87.4

TABLE A4
Capacity expansion (in GW) with the 765kV STEP lines.

REGIONAL CAPACITY

Region	Type	No 765kV STEP lines	With the 765kV STEP lines	Difference
COAST (1)	NGCC	23.4	25.9	2.5
COAST (1)	NGCT	15.3	19.3	3.9
EAST (2)	NGCC	2.2	1.9	-0.3
SCENT (3)	NGCC	21.4	18.8	-2.6
SCENT (3)	NGCT	8.3	7.0	-1.3
SOUTH (4)	NGCC	17.1	16.3	-0.8
SOUTH (4)	NGCT	2.1	2.0	-0.1
NCENT (5)	NGCC	20.1	18.3	-1.8
NCENT (5)	NGCT	6.9	7.3	0.4
FWEST (8)	NGCC	16.5	16.1	-0.5
FWEST (8)	NGCT	3.5	3.2	-0.3

TABLE A5
New natural gas capacity (in GW) built by region by 2050 for the two scenarios. Note that if a region is not shown, its values are 0.

Region	Type	No 765kV STEP lines	With the 765kV STEP lines	Difference
COAST (1)	Solar PV	29.7	16.6	-13.1
SCENT (3)	Solar PV	20.7	22.7	2.0
SOUTH (4)	Solar PV	24.9	27.1	2.1
FWEST (8)	Solar PV	33.7	37.5	3.9

TABLE A6
New solar capacity (in GW) by region in 2050 for the two scenarios. Note that if a region is not shown, its values are 0.

Region	Type	No 765kV STEP lines	With the 765kV STEP lines	Difference
SCENT (3)	Wind	17.0	13.5	-3.5
SOUTH (4)	Wind	26.2	30.8	4.6
NCENT (5)	Wind	24.0	26.4	2.4
WEST (6)	Wind	24.8	31.9	7.1
NORTH (7)	Wind	28.2	28.2	0.1
FWEST (8)	Wind	19.5	21.5	2.0

TABLE A7
New wind capacity (in GW) by region in 2050 for the two scenarios. Note that if a region is not shown, its values are 0.

TRANSMISSION EXPANSION

Line	Start Zone	End Zone	2023	2026	2031	2036	2041	2050
1	COAST (1)	EAST (2)	3,300	3,300	3,300	3,300	3,300	3,300
2	COAST (1)	SCENT (3)	3,500	3,500	3,500	3,500	3,500	3,500
3	COAST (1)	SOUTH (4)	2,000	2,000	2,000	2,000	2,000	2,000
4	EAST (2)	NCENT (5)	13,400	13,400	13,400	13,400	13,400	13,400
5	EAST (2)	SCENT (3)	200	200	200	200	200	200
6	FWEST (8)	WEST (6)	11,800	11,800	11,800	11,800	11,800	11,800
7	NCENT (5)	NORTH (7)	8,900	8,900	8,900	8,900	11,900	11,900
8	NCENT (5)	SCENT (3)	5,100	5,100	5,100	5,100	5,100	5,100
9	NCENT (5)	WEST (6)	10,200	10,200	10,200	10,200	10,200	10,200
10	NORTH (7)	WEST (6)	3,400	3,400	3,400	3,400	3,400	3,400
11	SCENT (3)	SOUTH (4)	5,600	5,600	5,600	5,600	5,600	5,600
12	SCENT (3)	WEST (6)	4,500	4,500	4,500	4,500	7,500	7,500
13	SOUTH (4)	WEST (6)	400	400	400	400	400	400
14	FWEST (8)	NCENT (5)	0	0	0	0	0	0
15	FWEST (8)	SCENT (3)	0	0	0	0	0	0

TABLE A8
Transmission carrying capacity expansion (in MW) for each line in the scenario without the 765kV STEP lines.

Line	Start Zone	End Zone	2023	2026	2031	2036	2041	2050
1	COAST (1)	EAST (2)	3,300	3,300	5,700	5,700	5,700	5,700
2	COAST (1)	SCENT (3)	3,500	3,500	7,500	7,500	7,500	7,500
3	COAST (1)	SOUTH (4)	2,000	2,000	6,000	6,000	6,000	6,000
4	EAST (2)	NCENT (5)	13,400	13,400	17,200	17,200	17,200	17,200
5	EAST (2)	SCENT (3)	200	200	200	200	200	200
6	FWEST (8)	WEST (6)	11,800	11,800	15,000	15,000	15,000	15,000
7	NCENT (5)	NORTH (7)	8,900	8,900	8,900	8,900	11,900	11,900
8	NCENT (5)	SCENT (3)	5,100	5,100	10,100	10,100	10,100	10,100
9	NCENT (5)	WEST (6)	10,200	10,200	13,100	13,100	13,100	13,100
10	NORTH (7)	WEST (6)	3,400	3,400	3,400	3,400	3,400	3,400
11	SCENT (3)	SOUTH (4)	5,600	5,600	9,600	9,600	9,600	9,600
12	SCENT (3)	WEST (6)	4,500	4,500	4,500	4,500	7,500	7,500
13	SOUTH (4)	WEST (6)	400	400	400	400	400	400
14	FWEST (8)	NCENT (5)	0	0	2,700	2,700	2,700	2,700
15	FWEST (8)	SCENT (3)	0	0	2,000	2,000	2,000	2,000

TABLE A9
Transmission carrying capacity expansion (in MW) for each line in the scenario with the 765kV STEP lines.

APPENDIX B

JEDI Results – Complete analysis of entire 765kV backbone

This section summarizes the main inputs and outputs of the JEDI model for the 765kV STEP lines.

JEDI INPUT ASSUMPTIONS

Line #	Voltage (kV)	Length (miles)	Development and Preconstruction (years)	Construction (months)	Circuits
Hillje – Martin Lake	765	293	3	18	1
Hillje – Blu Lacy	765	143	3	18	1
Hillje – Euclid	765	132	3	18	1
Drill Hole – Sand Lake	765	58	3	18	1
Sand Lake – Solstice	765	47	3	18	1
Drill Hole – Longshore	765	185	3	18	1
Longshore – Dinosaur	765	257	3	18	1
Dinosaur – Watermill	765	78	3	18	1
Watermill – Martin Lake	765	152	3	18	1
Sand Lake – Big Hill	765	210	3	18	1
Big Hill – Bell East	765	233	3	18	1
Solstice – Howard	765	370	3	18	1
Howard – Blu Lacy	765	139	3	18	1
Watermill – Bell East	765	133	3	18	1
Bell East – Euclid	765	99	3	18	1
Euclid – Howard	765	71	3	18	1
345 kV New Build	345	649	3	18	1
345 kV Upgrades	345	1098	3	18	1
138 kV New Build	138	324	3	18	1
138 kV Upgrades	138	1287	3	18	1

TABLE B1
A subset of the input assumptions for all project lines modeled with JEDI.

JEDI OUTPUTS: CONSTRUCTION AND INSTALLATION

Line #	Cost ($MM)	Jobs	Earnings ($MM)	Output ($MM)	Value Added ($MM)
Hillje – Martin Lake	2178.5	5145	413.7	790.7	542.6
Hillje – Blu Lacy	1173.3	3075	247.0	460.6	319.8
Hillje – Euclid	1113.9	2997	242.9	447.8	312.7
Drill Hole – Sand Lake	411.6	653	52.2	109.3	71.9
Sand Lake – Solstice	337.6	446	35.7	79.1	50.6
Drill Hole – Longshore	1354.6	3272	263.7	509.7	347.4
Longshore – Dinosaur	1839.3	4535	365.5	705.6	481.4
Dinosaur – Watermill	663.0	1401	112.9	220.4	149.6
Watermill – Martin Lake	1296.2	3280	263.5	492.5	341.6
Sand Lake – Big Hill	1492.5	3301	267.2	555.7	364.5
Big Hill – Bell East	1665.5	3665	296.7	617.0	404.7
Solstice – Howard	2546.6	5797	469.1	974.0	639.3
Howard – Blu Lacy	1182.8	2828	228.7	432.4	298.1
Watermill – Bell East	1134.3	2674	216.6	410.5	282.7
Bell East – Euclid	839.5	1778	143.4	279.5	189.8
Euclid – Howard	607.3	1189	96.7	191.6	129.0
345 kV New Build	3711.1	7295	583.0	1197.4	794.4
345 kV Upgrades	6109.5	26811	2204.0	4137.4	2838.2
138 kV New Build	1332.3	1691	131.8	321.8	198.5
138 kV Upgrades	3997.4	19373	1580.3	2902.9	2016.3

TABLE B2
Summary results for construction and installation for each project from JEDI.

JEDI OUTPUTS: ANNUAL OPERATION

Line	Costs ($MM)	Jobs	Earnings ($MM)	Output ($MM)	Value Added ($MM)	Property Taxes ($MM)
Hillje – Martin Lake	179.2	173	14.4	39.8	23.1	18.3
Hillje – Blu Lacy	96.3	92	7.6	21.2	12.3	9.9
Hillje – Euclid	91.4	87	7.2	20.0	11.7	9.4
Drill Hole – Sand Lake	33.8	33	2.7	7.6	4.4	3.4
Sand Lake – Solstice	27.8	27	2.3	6.2	3.7	2.8
Drill Hole – Longshore	111.4	108	8.9	24.8	14.4	11.4
Longshore – Dinosaur	151.4	147	12.1	33.7	19.6	15.5
Dinosaur – Watermill	54.4	52	4.2	12.0	6.9	5.6
Watermill – Martin Lake	106.3	101	8.3	23.4	13.5	10.9
Sand Lake – Big Hill	123.0	120	9.9	27.4	15.9	12.5
Big Hill – Bell East	137.1	133	11.0	30.6	17.8	14.0
Solstice – Howard	209.8	205	16.9	47.0	27.4	21.4
Howard – Blu Lacy	97.0	92	7.6	21.3	12.4	9.9
Watermill – Bell East	92.9	88	7.3	20.4	11.8	9.5
Bell East – Euclid	68.8	65	5.4	15.1	8.7	7.1
Euclid – Howard	49.8	47	3.9	11.0	6.3	5.1
345 kV New Build	307.5	310	25.7	70.1	41.0	31.2
345 kV Upgrades	506.8	514	42.4	115.8	68.0	51.3
138 kV New Build	107.4	121	10.0	26.5	15.7	11.2
138 kV Upgrades	327.1	394	32.7	84.3	50.6	33.6

TABLE B3
Summary economic results for annual operation for each project from JEDI.

APPENDIX C

GenX Results – Specialized analysis of Hillje lines and supporting projects

This section summarizes the GenX model results for the model scenarios with and without the Hillje-XX 765kV lines.

CAPACITY EXPANSION

Technology	2023	2026	2031	2036	2041	2050
Nuclear	5.1	5.1	5.1	5.1	5.1	5.1
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0
Hydro	0.6	0.6	0.6	0.6	0.6	0.6
Coal	14.3	14.3	11.6	9.8	9.8	9.8
Natural Gas	63.5	67.9	133.1	164.7	184.0	203.2
Wind	37.1	40.9	61.8	81.0	145.3	184.8
Solar	15.5	37.0	44.9	65.2	95.5	149.1
Batteries	3.4	17.1	24.1	24.1	30.9	86.8

TABLE C3
Capacity expansion (in GW) without the Hillje-XX 765kV lines.

Technology	2023	2026	2031	2036	2041	2050
Nuclear	5.1	5.1	5.1	5.1	5.1	5.1
Geothermal	0.0	0.0	0.0	0.0	0.0	0.0
Hydro	0.6	0.6	0.6	0.6	0.6	0.6
Coal	14.3	14.3	11.6	9.8	9.8	9.8
Natural Gas	63.5	67.9	133.1	164.5	183.5	202.7
Wind	37.1	40.9	61.9	82.3	147.2	189.6
Solar	15.5	37.0	45.1	65.4	97.0	148.9
Batteries	3.4	17.1	24.1	24.1	31.8	86.9

TABLE C4
Capacity expansion (in GW) with the Hillje-XX 765kV lines.

REGIONAL CAPACITY

Region	Type	No 765kV lines	With the new 765kV lines	Difference
COAST (1)	NGCC	23.3	25.8	2.5
COAST (1)	NGCT	15.4	16.2	0.9
EAST (2)	NGCC	2.2	2.0	-0.2
SCENT (3)	NGCC	21.4	18.5	-2.9
SCENT (3)	NGCT	9.9	9.7	-0.2
SOUTH (4)	NGCC	17.2	16.4	-0.8
SOUTH (4)	NGCT	1.7	1.7	0.0
NCENT (5)	NGCC	19.5	19.3	-0.1
NCENT (5)	NGCT	7.0	7.2	0.2
FWEST (8)	NGCC	16.1	16.1	0.0
FWEST (8)	NGCT	3.1	3.2	0.1

TABLE C5
New natural gas capacity (in GW) built by region by 2050 for the two scenarios. Note that if a region is not shown, its values are 0.

Region	Type	No 765kV lines	With the new 765kV lines	Difference
COAST (1)	Solar PV	29.5	17.6	-11.9
SCENT (3)	Solar PV	17.8	23.4	5.6
SOUTH (4)	Solar PV	21.7	26.7	5.1
FWEST (8)	Solar PV	37.6	38.6	1.0

TABLE C6
New solar capacity (in GW) by region in 2050 for the two scenarios. Note that if a region is not shown, its values are 0.

Region	Type	No 765kV lines	With the new 765kV lines	Difference
SCENT (3)	Wind	17.1	17.6	0.4
SOUTH (4)	Wind	27.4	30.0	2.7
NCENT (5)	Wind	18.4	20.9	2.6
WEST (6)	Wind	33.5	32.8	-0.7
NORTH (7)	Wind	28.0	27.8	-0.2
FWEST (8)	Wind	19.6	19.6	0.0

TABLE C7
New wind capacity (in GW) by region in 2050 for the two scenarios. Note that if a region is not shown, its values are 0.

TRANSMISSION EXPANSION

Line	Start Zone	End Zone	2023	2026	2031	2036	2041	2050
1	COAST (1)	EAST (2)	3,300	3,300	3,300	3,300	3,300	3,300
2	COAST (1)	SCENT (3)	3,500	3,500	3,500	3,500	3,500	3,500
3	COAST (1)	SOUTH (4)	2,000	2,000	2,000	2,000	2,000	2,000
4	EAST (2)	NCENT (5)	13,400	13,400	13,400	13,400	13,400	13,400
5	EAST (2)	SCENT (3)	200	200	200	200	200	200
6	FWEST (8)	WEST (6)	11,800	11,800	15,000	15,000	15,000	15,000
7	NCENT (5)	NORTH (7)	8,900	8,900	8,900	8,900	11,900	11,900
8	NCENT (5)	SCENT (3)	5,100	5,100	5,100	5,100	5,100	5,100
9	NCENT (5)	WEST (6)	10,200	10,200	13,100	13,100	13,100	13,100
10	NORTH (7)	WEST (6)	3,400	3,400	3,400	3,400	3,400	3,400
11	SCENT (3)	SOUTH (4)	5,600	5,600	5,600	5,600	5,600	5,600
12	SCENT (3)	WEST (6)	4,500	4,500	4,500	4,500	7,500	7,500
13	SOUTH (4)	WEST (6)	400	400	400	400	400	400
14	FWEST (8)	NCENT (5)	0	0	2,700	2,700	2,700	2,700
15	FWEST (8)	SCENT (3)	0	0	2,000	2,000	2,000	2,000

TABLE C8
Transmission carrying capacity expansion (in MW) for each line in the scenario without the Hillje-XX 765kV lines. Line 14 is not shown in Figure 2 because its starting capacity is 0 MW.

Line	Start Zone	End Zone	2023	2026	2031	2036	2041	2050
1	COAST (1)	EAST (2)	3,300	3,300	5,700	5,700	5,700	5,700
2	COAST (1)	SCENT (3)	3,500	3,500	7,500	7,500	7,500	7,500
3	COAST (1)	SOUTH (4)	2,000	2,000	6,000	6,000	6,000	6,000
4	EAST (2)	NCENT (5)	13,400	13,400	13,400	13,400	13,400	13,400
5	EAST (2)	SCENT (3)	200	200	200	200	200	200
6	FWEST (8)	WEST (6)	11,800	11,800	15,000	15,000	15,000	15,000
7	NCENT (5)	NORTH (7)	8,900	8,900	8,900	8,900	11,900	11,900
8	NCENT (5)	SCENT (3)	5,100	5,100	5,100	5,100	5,100	5,100
9	NCENT (5)	WEST (6)	10,200	10,200	13,100	13,100	13,100	13,100
10	NORTH (7)	WEST (6)	3,400	3,400	3,400	3,400	3,400	3,400
11	SCENT (3)	SOUTH (4)	5,600	5,600	5,600	5,600	5,600	5,600
12	SCENT (3)	WEST (6)	4,500	4,500	4,500	4,500	7,500	7,500
13	SOUTH (4)	WEST (6)	400	400	400	400	400	400
14	FWEST (8)	NCENT (5)	0	0	2,700	2,700	2,700	2,700
15	FWEST (8)	SCENT (3)	0	0	2,000	2,000	2,000	2,000

TABLE C9
Transmission carrying capacity expansion (in MW) for each line in the scenario with the Hillje-XX 765kV lines. Line 14 is not shown in Figure 2 because its starting capacity is 0 MW.

APPENDIX D

JEDI Results - Specialized analysis of Hillje lines and supporting projects

This section summarizes the main inputs and outputs of the JEDI model for the Hillje-XX 765kV lines as well as the supporting projects that are mostly contained within the coastal zone.

PROJECT MAP

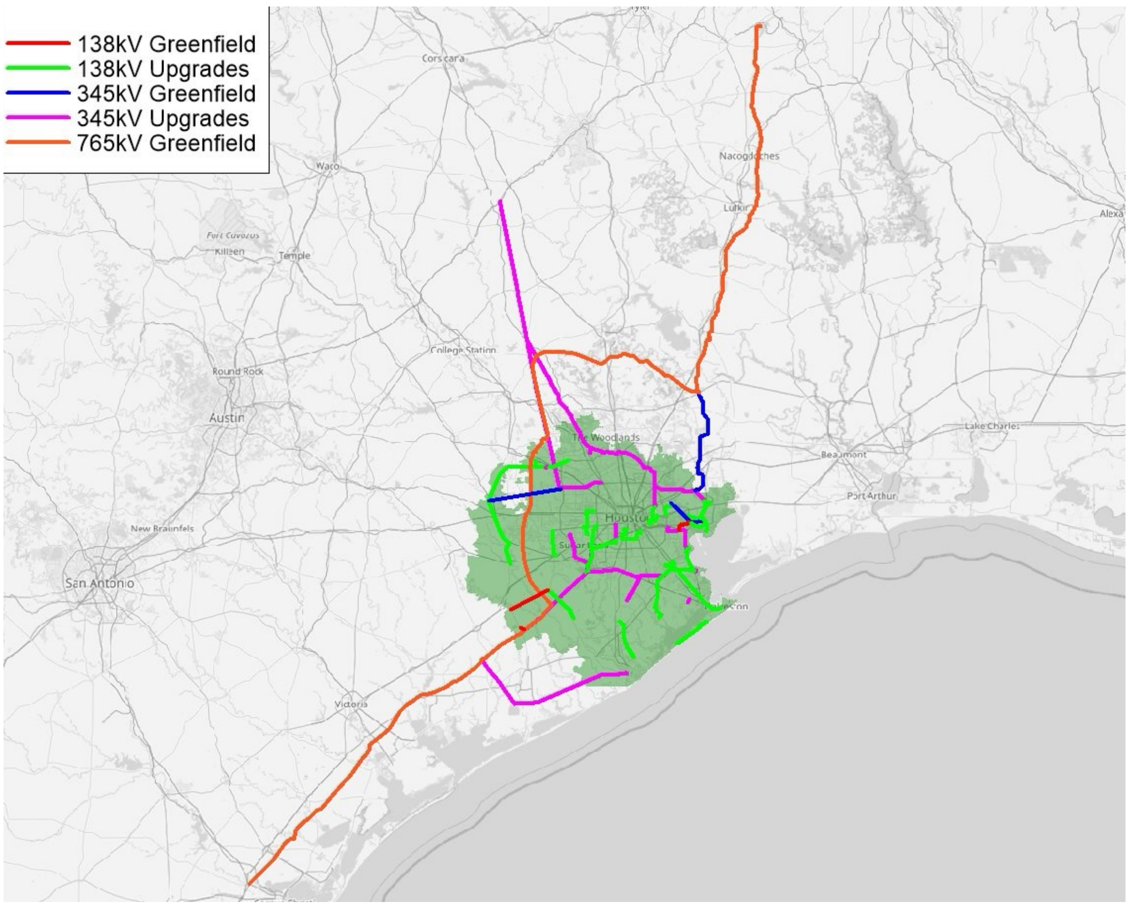


FIGURE D1
Project map of the 765kV Eastern STEP lines as well as the supporting projects in the Houston region.

JEDI INPUT ASSUMPTIONS

Line #	Voltage (kV)	Length (miles)	Dev. & Precon. (yrs)	Construction (months)	Circuits	New Substations	Upgraded Substations
1	765	342	3	24	1	2	0
2	765	125	3	24	1	2	0
5	138	8.9	2.5	12	1	0	0
6	138	10	2	12	1	0	0
7	138	7.6	2	12	1	0	0
8	345	40.1	2.5	12	1	0	0
9	138	28.5	1.5	12	1	0	0
10	69	10.8	2.5	18	1	0	0
11	345	9.6	1	6	1	0	0
12	138	25.2	2	8	1	0	0
13	138	9.3	2	12	1	0	0
14	138	9	2	6	1	0	0
15	138	50	3	12	1	1	0
17	345	53.15	2	12	2	0	0
18	345	150.57	3	24	2	0	0
19	345	80	2.5	12	1	0	0
20	345	50	2	12	1	0	0
21	345	41	3	24	1	1	0
22	345	43.3	2	12	2	0	0
23	345	11	3	18	1	0	0
24	138	24.2	3	18	1	0	1
25	345	25	2	12	2	0	0
26	345	31	2	12	1	0	0
27	345	17	2	8	2	0	0
28	345	25.03	2	8	1	0	0
29	345	26	2.5	12	1	0	0
30	345	19.69	2	8	1	0	0
31	345	15.1	1.5	6	1	0	0
32	345	19.5	1.5	6	1	0	0
33	345	7.51	1.5	6	1	0	0
34	138	24.8	1.5	6	1	0	0
35	345	9.42	2	6	1	0	0
36	345	9.42	1.5	6	1	1	0
37	138	8.68	1.5	12	1	0	0
38	138	8.07	1.5	6	1	0	0
39	765	131	3	18	1	2	0

TABLE D2
A subset of the input assumptions for all project lines modeled with JEDI. Note that Line #1 is Hillje to Martin Lake and Line #2 is Hillje to Blu Lacy and that the numbering of these lines is not the same as the numbering of the lines in Figure 2. The rest of the lines correspond to the supporting lines shown in Project Map. In the data provided, Lines #3 and #4 were substations and are not modeled here.

JEDI OUTPUTS: CONSTRUCTION AND INSTALLATION

Line #	Cost ($MM)	Jobs	Earnings ($MM)	Output ($MM)	Value Added ($MM)
1	2550.7	6049	487.2	931.0	638.9
2	1157.6	2762	222.8	418.1	289.3
5	71.9	163	13.1	26.6	17.8
6	81.8	204	16.5	32.9	22.0
7	69.1	187	15.2	29.6	20.0
8	506.2	1790	145.2	270.4	187.0
9	165.0	308	24.7	52.3	34.1
10	167.8	639	52.2	99.3	67.7
11	119.9	326	26.5	51.3	34.8
12	111.4	133	10.4	25.5	15.7
13	86.0	246	20.0	38.6	26.2
14	81.8	218	17.6	34.5	23.3
15	228.4	325	25.8	59.8	37.6
17	1191.5	4968	404.2	749.4	518.0
18	1046.2	2396	192.6	387.3	258.7
19	712.1	2044	166.4	326.1	219.8
20	700.8	2538	207.3	387.8	267.2
21	676.8	2577	209.8	392.1	270.0
22	456.8	1391	113.1	217.1	147.8
23	303.2	1216	99.3	183.4	127.0
24	225.6	698	56.5	109.1	74.2
25	370.8	1361	111.0	210.7	144.0
26	297.5	868	70.8	139.6	93.8
27	256.6	892	72.8	139.2	94.8
28	253.8	704	57.5	113.5	76.1
29	207.3	490	39.8	79.1	53.0
30	203.0	563	46.0	90.7	60.9
31	193.2	606	49.6	97.9	65.6
32	162.2	375	30.5	60.3	40.6
33	156.5	552	45.3	88.0	59.2
34	145.2	273	22.0	47.5	30.7
35	142.4	454	37.1	71.8	48.6
36	95.9	197	16.2	32.1	21.6
37	62.0	130	10.4	21.6	14.2
38	55.0	95	7.6	16.1	10.6
39	1101.2	2444	198.9	397.5	266.2

TABLE D3
Summary results for construction and installation for each project from JEDI. Note that Line #1 is Hillje to Martin Lake and Line #2 is Hillje to Blu Lacy and that the numbering of these lines is not the same as the numbering of the lines in Figure 2. The rest of the lines correspond to the supporting lines shown in Project Map. In the data provided, Lines #3 and #4 were substations and are not modeled here.

JEDI OUTPUTS: ANNUAL OPERATION

Line #	Cost ($MM)	Jobs	Earnings ($MM)	Output ($MM)	Value Added ($MM)	Property Taxes ($MM)
1	201.5	203	16.8	46.5	27.1	21.4
2	91.7	89	7.3	20.7	12.0	9.6
5	5.8	6	0.6	1.4	0.8	0.6
6	6.5	7	0.6	1.6	0.8	0.7
7	5.6	6	0.4	1.3	0.7	0.6
8	39.5	37	3.1	8.9	5.1	4.2
9	13.1	14	1.1	3.1	1.8	1.4
10	13.1	13	1.0	3.0	1.7	1.4
11	9.4	9	0.7	2.1	1.3	1.0
12	8.5	10	0.8	2.1	1.3	1.0
13	6.9	7	0.6	1.6	1.0	0.7
14	6.5	7	0.6	1.6	0.8	0.7
15	18.3	20	1.7	4.5	2.7	1.9
17	92.4	84	6.9	20.2	11.6	10.0
18	82.8	84	6.9	19.3	11.3	8.8
19	56.0	55	4.5	12.8	7.3	6.0
20	54.6	51	4.2	12.1	6.9	5.9
21	52.7	49	4.1	11.6	6.6	5.7
22	35.8	34	2.8	8.0	4.7	3.8
23	23.5	22	1.8	5.2	3.0	2.5
24	17.8	17	1.4	4.1	2.4	1.9
25	28.9	27	2.3	6.3	3.7	3.1
26	23.4	23	1.8	5.4	3.1	2.5
27	20.0	19	1.6	4.5	2.5	2.1
28	19.9	19	1.6	4.5	2.5	2.1
29	16.4	16	1.4	3.8	2.1	1.7
30	15.9	15	1.3	3.7	2.1	1.7
31	15.1	15	1.3	3.4	2.0	1.6
32	12.8	13	1.0	3.0	1.7	1.4
33	12.1	12	1.0	2.7	1.6	1.3
34	11.6	12	1.0	2.7	1.6	1.2
35	11.1	11	0.8	2.5	1.4	1.2
36	7.6	8	0.7	1.8	1.0	0.8
37	4.9	5	0.4	1.3	0.7	0.5
38	4.5	5	0.4	1.1	0.7	0.5
39	86.7	86	7.1	19.9	11.6	9.2

TABLE D4
Summary economic results for annual operation for each project from JEDI. Note that Line #1 is Hillje to Martin Lake and Line #2 is Hillje to Blu Lacy and that the numbering of these lines is not the same as the numbering of the lines in Figure 2. The rest of the lines correspond to the supporting lines shown in Project Map. In the data provided, Lines #3 and #4 were substations and are not modeled here.

About the Authors

DREW A. KASSEL, PHD

Dr. Drew Kassel is an Energy Analyst with IdeaSmiths, and a Postdoctoral Fellow with the Webber Energy Group at the University of Texas at Austin. In these roles, he consults and conducts research on large-scale energy systems and electric power infrastructure with a particular focus on electricity demand growth, transmission expansion, demand flexibility, and pathways for powering the emerging AI era. His research examines strategies for improving grid reliability and resilience under increasingly probable extreme weather events through the use of robust capacity expansion models and infrastructure planning tools, particularly within the Electric Reliability Council of Texas (ERCOT). His work also explores the role of grid interconnections, distributed energy resources, and utility- and distributed-scale energy storage systems in future grid development scenarios. Prior to joining the Webber Energy Group as a Postdoctoral Fellow in January 2026, Dr. Kassel completed his PhD at the University of Texas at Austin in November 2025. During his doctoral studies, he focused on big-picture energy systems research and the long-term evolution of electric power systems under conditions of rapid demand growth and changing reliability needs. Dr. Kassel holds a B.S. in Mechanical Engineering from the University of Wisconsin–Madison, where he also completed a certificate in Engineering Thermal Energy Systems. Immediately following his graduation in May 2021, he moved to Texas to pursue graduate studies at the University of Texas at Austin.

JOSHUA D. RHODES, PHD

Joshua D. Rhodes, Ph.D. is a Research Scientist and Lecturer at The University of Texas at Austin, a non-Resident Fellow at Columbia University, a Founding Partner and CTO of IdeaSmiths LLC, a former commissioner on the City of Austin Electricity Utility Commission, and a Co-host of The Energy Capital Podcast. He has authored over 125 scientific articles, columns, op-eds, journal publications, and reports which have been cited over 2,500 times and he has given over 120 keynotes, panel presentations, podcast interviews, and other talks. His current area of work is in how energy systems power our modern lives, with a particular focus on new supplies and demands of electricity. He holds a double bachelors in Mathematics and Economics from Stephen F. Austin State University, a masters in Computational Mathematics from Texas A&M University, a masters in Architectural Engineering from The University of Texas at Austin and a Ph.D. in Civil Engineering from The University of Texas at Austin. He enjoys mountain biking, backpacking, and a good cup of coffee.

MICHAEL E. WEBBER, PHD

Dr. Michael E. Webber is the Sid Richardson Chair in the LBJ School of Public Affairs and the Cockrell Family Chair #16 in engineering at the University of Texas at Austin. In addition to his role as a faculty member, Webber served three years (2021—2024) as CTO of Energy Impact Partners (a $5 billion venture fund) and for three years prior to that (2018—2021) in Paris, France as the Chief Science & Technology Officer at ENGIE, one of the world's largest energy companies. Webber's works spans research and education at the convergence of engineering, policy, and commercialization on topics related to innovation, energy, and the environment. Among many executive advisory roles, he serves on the board of GTI Energy (an industry consortium formerly known as the Gas Technology Institute). Webber has more than 600 publications, including five full-length general interest books, and holds 6 patents. His essays have been published in The New York Times, The Wall Street Journal, Washington Post, and Scientific American. His 2019 book Power Trip: the Story of Energy has an award-winning 12-part companion series spread out over two seasons that aired on PBS, Amazon Prime, AppleTV, and in-flight entertainment on American Airlines. The series had more than 10,000 broadcasts in the USA and has been distributed in thirty countries, reaching 10 million viewers. His 2016 book Thirst for Power: Energy, Water and Human Survival has an accompanying documentary released nationally on PBS. In 2024 Webber was honored with the Energy Thought Leader: Higher Education award by the American Energy Society and a three-year term as a Fulbright Technical Specialist by the U.S. State Department. He was selected in 2018 as a member of the 4th class of the Presidential Leadership Scholars, which is a leadership training program organized by Presidents Bush and Clinton. Webber holds a B.S. and B.A. from UT Austin, and M.S. and Ph.D. in mechanical engineering from Stanford University.

IdeaSmiths LLC

IdeaSmiths has a deep and broad understanding of energy systems. With access to an industry-leading partner team and an extended bench of energy expertise, we provide rigorous analysis, technical due diligence, prototyping, communications, strategic advisory support, and expert witness work. IdeaSmiths has been operating since 2013 and has grown to include a network of collaborators and experts who provide us with expanded technical expertise and bandwidth to take on a variety of projects.

rhodes@ideasmiths.net