EUC Working Group Transmission Plan Review
Al Braden 09-26-23

In the 2020 Generation Plan, Transmission was raised as roadblock to retiring gas units at Decker and Sand Hill before 2035. The study was required to see if moving the retirement dates up was possible.

It seems that the general issues and constraints will apply whether we retire the gas units at either 2030 or 2035. It depends on how fast we could upgrade the transmission system.

The Transmission Study presentation summarizes a vast amount of granular technical data into simplistic red/yellow/green boxes. Much of the underlying data is obscured. One of the biggest obstacles is holding the various models and scenarios in one's head while looking at the red/yellow/green results alongside specific data that is blurred out.

Study Link: https://services.austintexas.gov/edims/document.cfm?id=411192

EUC Presentation Video: https://austintx.new.swagit.com/videos/264096
Transmission Study presentation begins at 39:45 into the meeting.

Summary

Austin's transmission grid is highly focused to East where historic generation sources are located including, Fayette, South Texas Project, Decker, and Sand Hill. There is heavy interconnect and substation infrastructure around the 345 KV and 138 KV lines in the east. No significant AE connections exist to west, north and south where renewable energy is plentiful.

Congestion along the existing Dallas – Austin – San Antonio transmission axis is intense and growing. Nearly 900 KW in exports to the west and north of Austin also flow through this eastern infrastructure. Extensive voltage support is needed in central and western areas of AE territory that are remote from the eastern power import transformers.

Grid ties were built around Decker's former 700 MW gas steam generation and Sand Hill's current 250 MW combined cycle plant as well as the peakers. Shutting down remaining gas units leaves need for much greater importation – or batteries. The Transmission Study unfairly dismisses batteries. Localized utility, community, and commercial solar and especially batteries could mitigate import needs if implemented at scale.

An Energy Beltway is needed to provide import from west, south and north. It could take load from congested eastern transmission system and provide direct route for renewable sources into Austin. It's a generational kind of project that needs a new study now. We must identify optimum locations for transmission upgrades, substations, and voltage support now that will contribute to an ongoing/future Energy Beltway buildout.

Steady State & Stability Study Cases

Scenario	Description	Steady State Cases					Stability Cases			
		2023 WP	2024 SP	2026 HWLL *	2029 SP	2032 SP**	2024 SP	2025 HWLL	2028 SP	2032 SP***
Scenario 1	ERCOT Base Case	•	•	•	•	•	•	•	•	•
Scenario 2A	AE Decker Retirement (All 4 Units)	•	•	•	•	•	•	•	•	•
Scenario 2B	AE Sand Hill Retirement (All 8 Units)	•	•	•	•	•	•	•	•	•
Scenario 2	AE Generation Retirement (Decker and Sand Hill)	•	•	•	•	•	•	•	•	•
Scenario 3	Scenario 2 + External Gen Retirement	•	•	-	•	•	•	•	•	•
Scenario 4	Scenario 2 + AE high Load Growth	•	•	-	•	•	•	-	•	•
Scenario 5	Scenario 4 + AE High EV & DER	•	•	-	•	•	•	-	•	•
Scenario 6	Scenario 5 + High Solar in ERCOT	-	•	-	•	•	•	-	•	•
Scenario 7	Scenario 6 + Data Center Load	-	•	-	•	•	•	-	•	•
Scenario 8	Scenario 2 + High West to East Transfer in ERCOT	-	-	•	-	-	-	•	-	-
Sensitivity 1	Scenario 7 + Low Wind	-	•	-	•	•	•	-	•	•

WP: Winter Peak Load scenario
SP: Summer Peak Load scenario
HWLL: High Wind Light Load scenario

* 2026 HWLL case used instead of 2025 HWLL case
** 2032 SP case developed based on SSWG 2029 SP case
*** 2032 SP case developed based on DWG 2028 SP case

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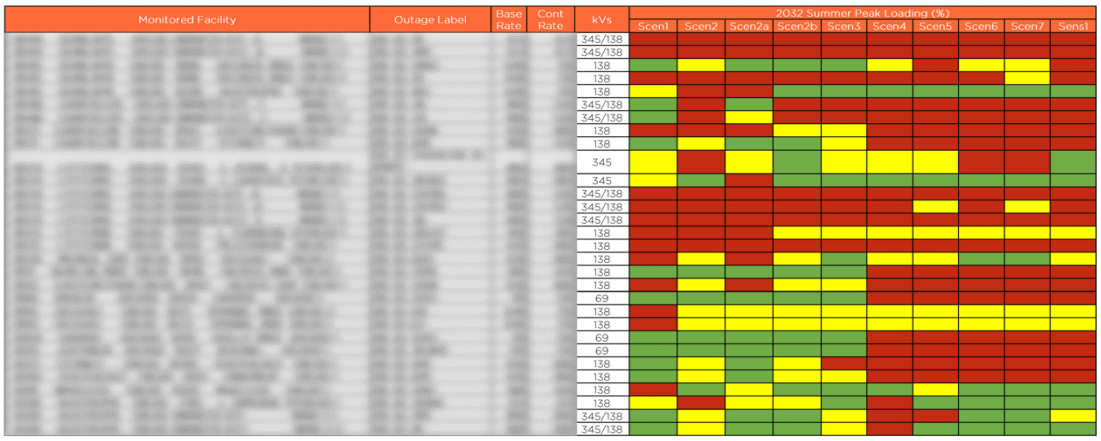
2032 Summer Peak Loading



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It seems there is serious trouble on the model in 2032 even in the Scenario 1 ERCOT Base Case. Fourteen of thirty boxes are in 'Red' overload already. Retiring all the gas units at Decker and Sand Hill maintains fourteen overloaded lines – though not all the same ones – and as a net result, shifts six greens to yellow – meaning up to 100% load.

Which ones are most significant? Which ones will need to be mitigated even in the base case for 2032? Which ones are easier than others to mitigate?

None of these scenarios model battery installations at Decker and Sand Hill to replace the gas units.

Proposed Mitigations Evaluated

1. A new 345 kV line from external system into Austin Energy 138 kV system via a new substation with a 345/138 kV auto transformer.
2. Conduct analysis to find which stations needed shunt capacitor banks and which stations need Dynamic reactive power (STATCOM) to provide voltage stability. Considering the need of reactive power in western part of Austin Energy system.
3. Assess placements and sizes of STATCOM and capacitor banks to achieve voltage stability, verifying with dynamic simulations
4. Replace the following 345/138 kV autotransformers:
   - Replace all existing 345/138 kV Auto Transformers to 1000 MVA and where applicable replace smaller 345/138 kV Auto Transformers with larger ones from existing stations.

Proposed Mitigations Evaluated

5. Develop necessary 138 kV reinforcements to alleviate thermal overloads and consider changes for balancing the 138 kV system for better thermal performance and redundant operations.
6. Evaluate effectiveness of having tap changers on the 345 kV side of the 345/138 kV transformers. Currently all of the adjustable taps on AE autotransformers are on the low side.
7. Consider converting some 138 kV lines to 345 kV as a potential solution to improve reliability, balancing the load on the 345/138 kV autotransformers and improving operational redundancy.
8. Evaluate effectiveness of 200 MW Battery Energy Systems.

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Summary and Recommendation

Case	Project 1: New 345-kV Source	Project 2/3: Reactive Power Support Sizing and Placement	Project 4: Replacement of Transformers	Project 5: 138 kV Reinforcements	Project 7: Tap Changers	Project 8: 138 to 345 kV Conversion	Project 9: BESS Options
2029 Summer Peak Scenario 2	Improves the balancing of the system and reduces flows in the south portion of the system and provides a new 345 kV source at the north portion of the system	Effective and much needed after generation retirements especially in the 2029 summer scenarios.	Effective, still needs a few additional line rebuilds to move the additional power into the Austin Energy system. A phased approach coupled with rebuilds based on growth areas may be a viable alternative.	Effective, but does not add additional capacity to the overall Austin Energy System.	Not Effective	Generally, helps with outages, but has a few thermal overloads under contingencies. It is tough to permit and re-build 138 kV lines and requires substantial easements in dense portions of the city.	Not a viable option when Battery Energy Storage is modeled under charging scenario.

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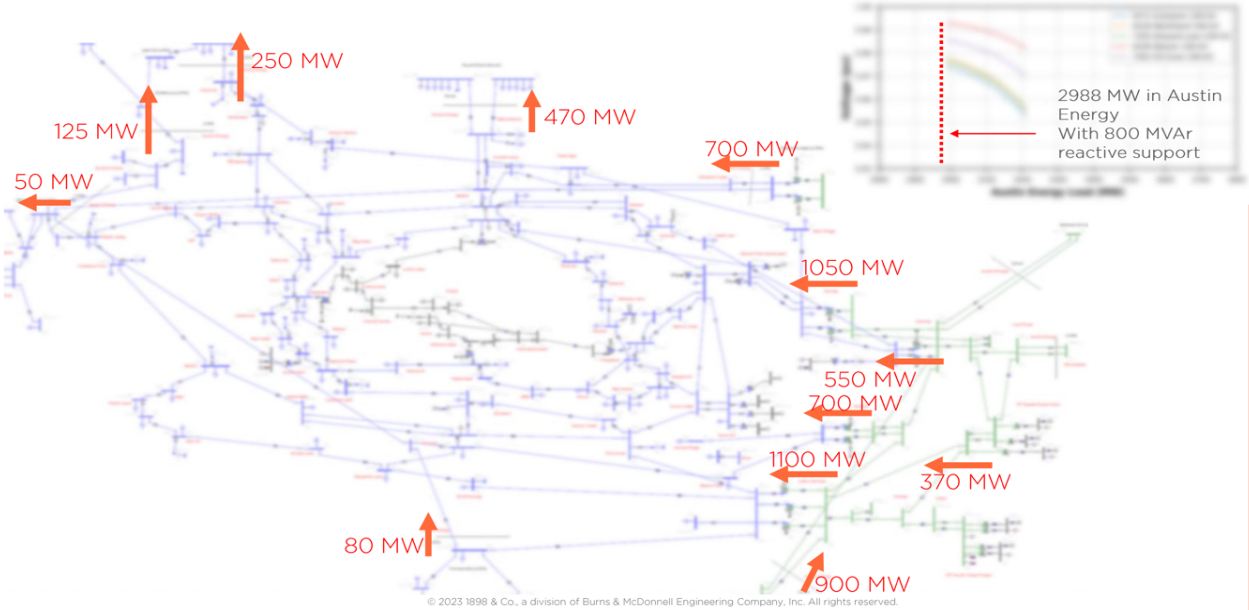
Austin Energy System Overview (2029 SP, Scenario 2 - Gen Retirements)



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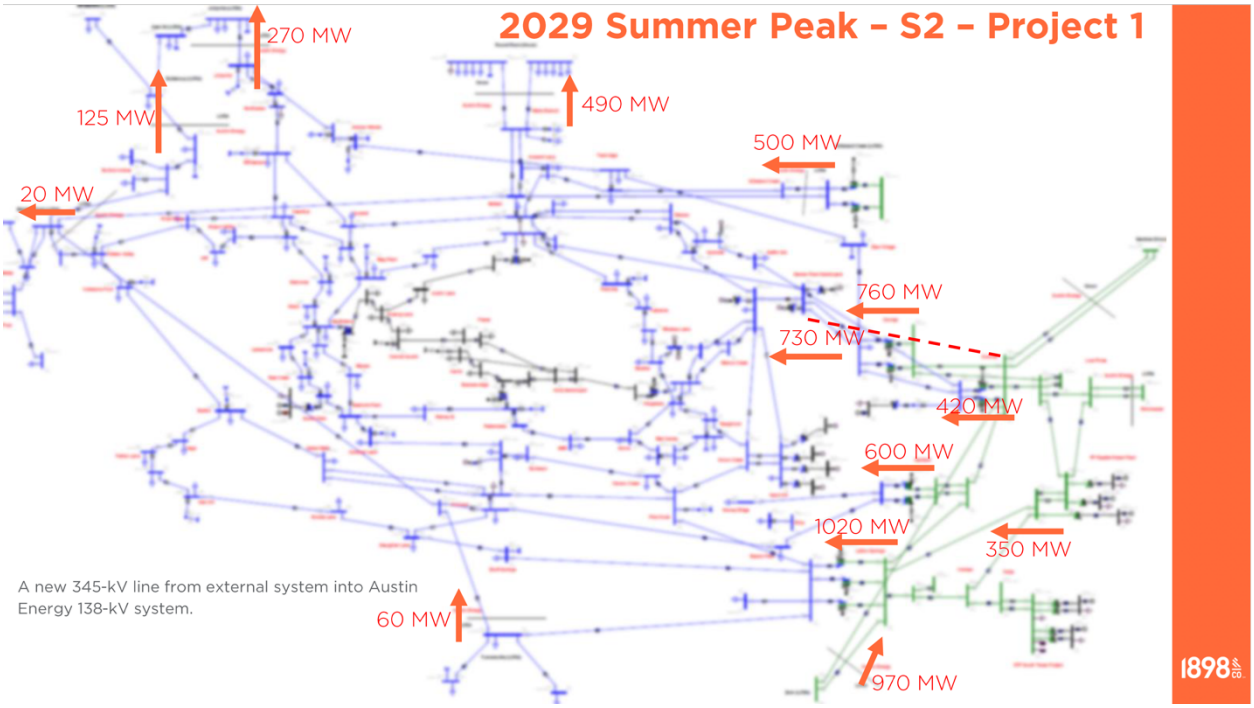
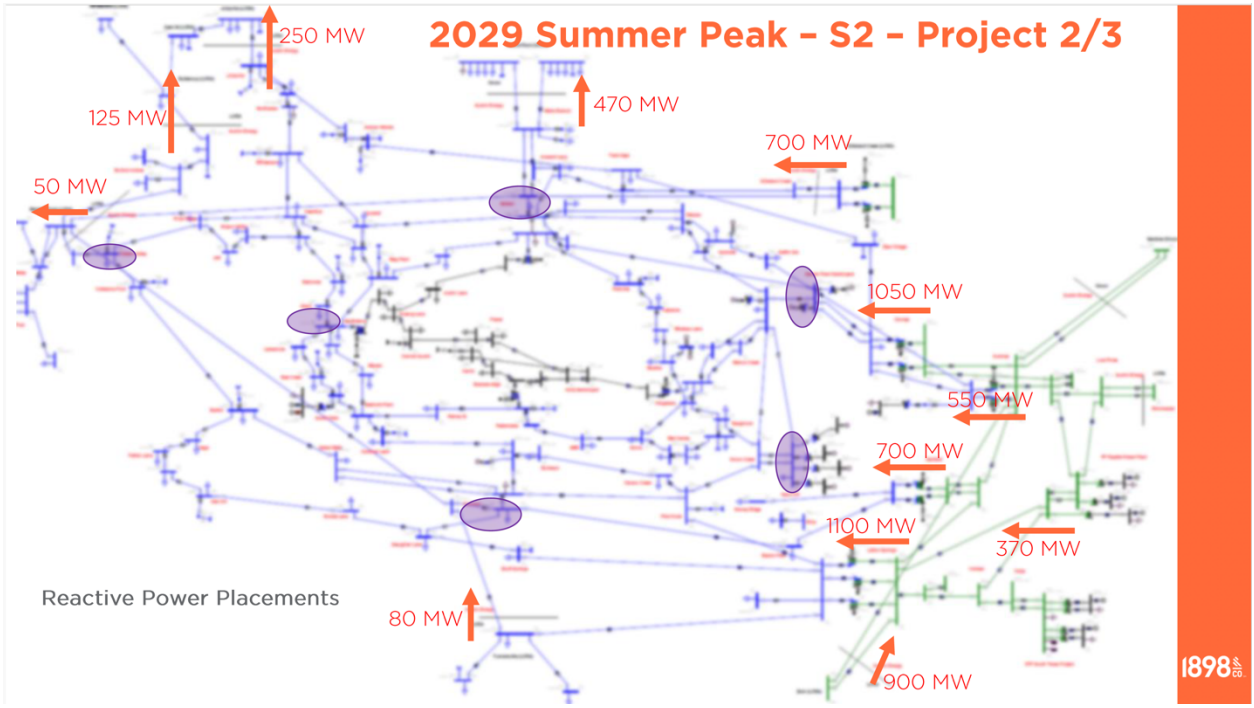
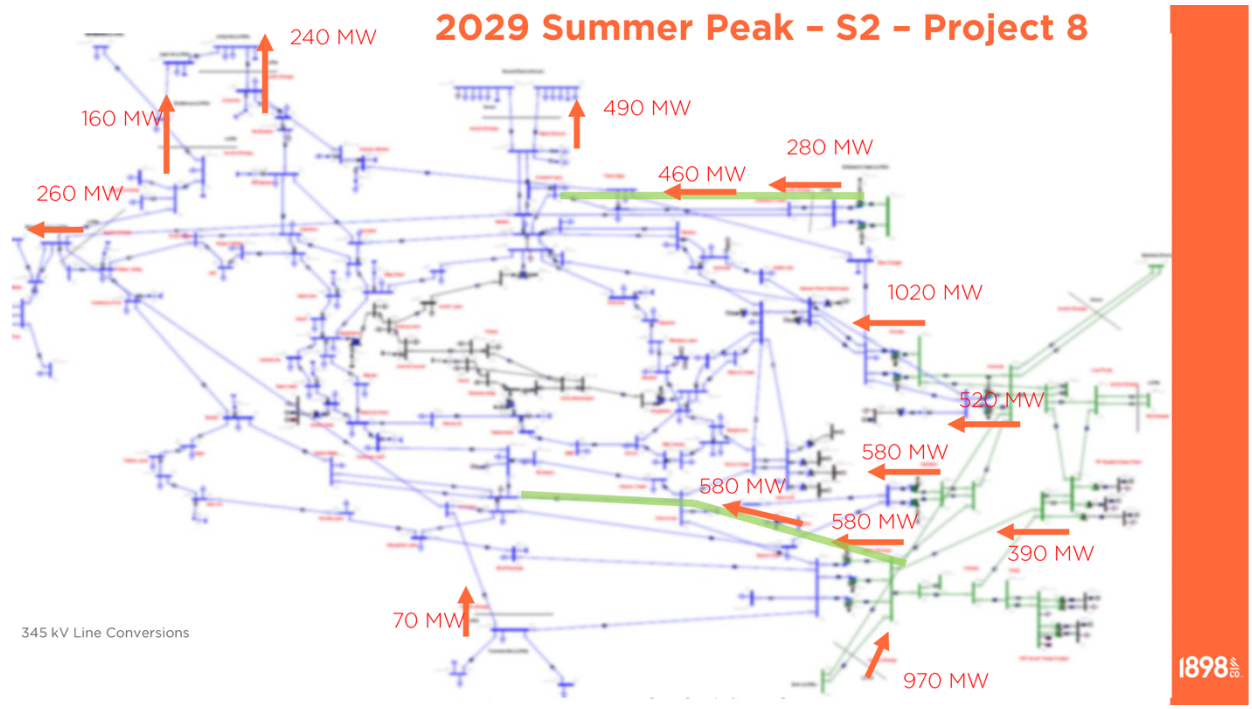
Current transmission system with gas retirements.



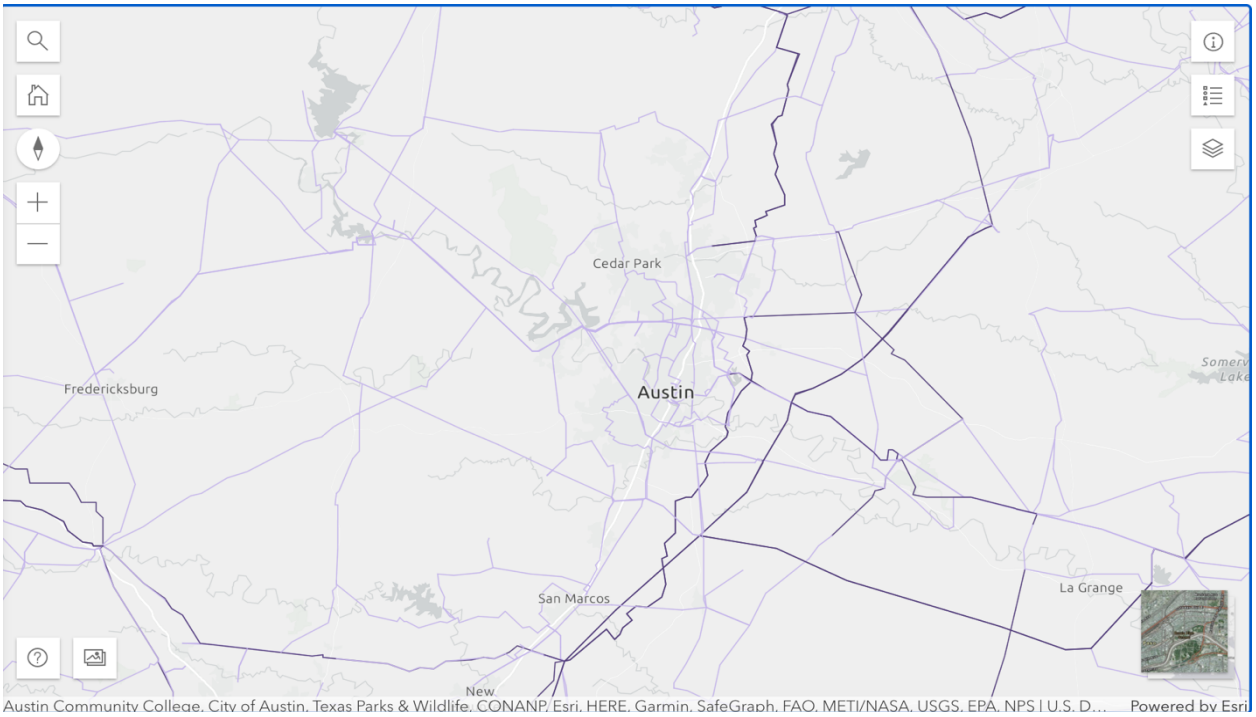
This scenario doubles down on imports from the east with a new 345 KV line.



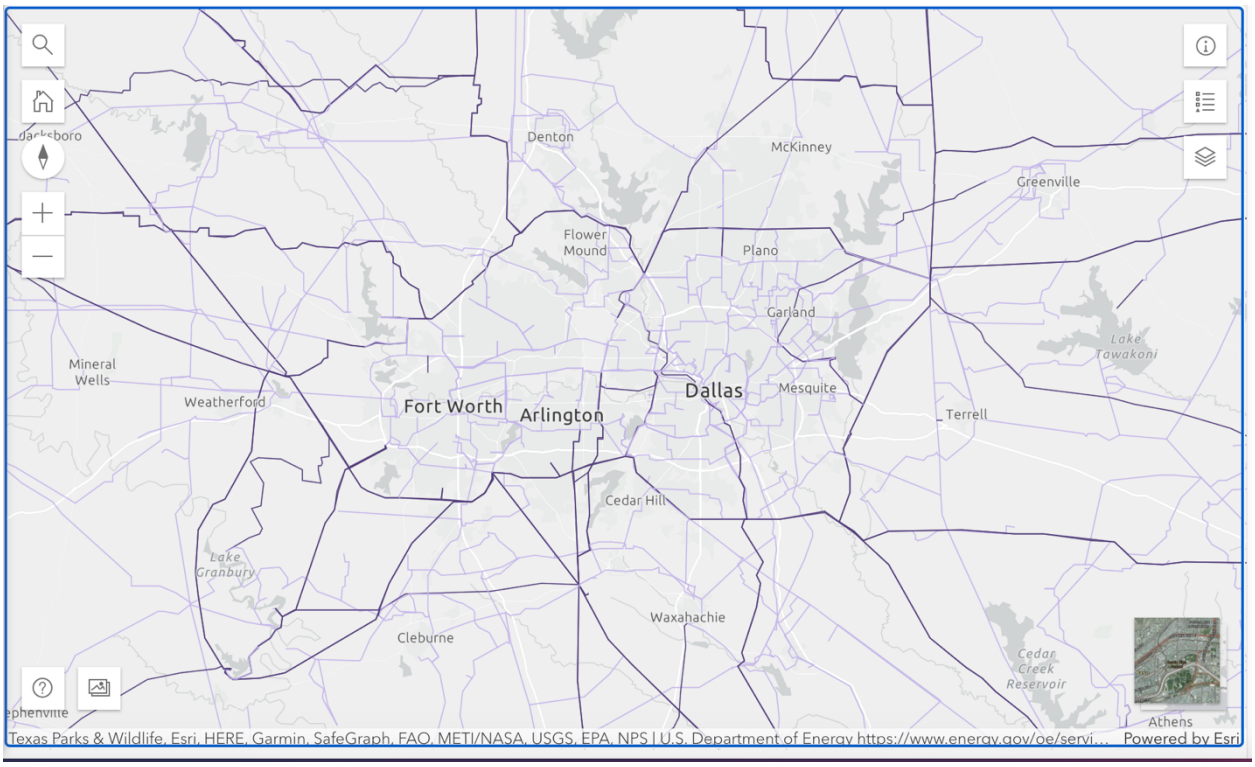
Voltage support elements needed in western areas of service territory due to exclusive power import from east.



Scenario to upgrade feeds from east farther into north and south sides of service territory. Could provide half of Energy Beltway. Add a western feeder to complete loop.



A new study should evaluate the goal of building toward an energy beltway around Austin like Texas' other large cities. It should inform our near-term high voltage connections, transformers and substation builds so as to contribute to this eventual beltway architecture.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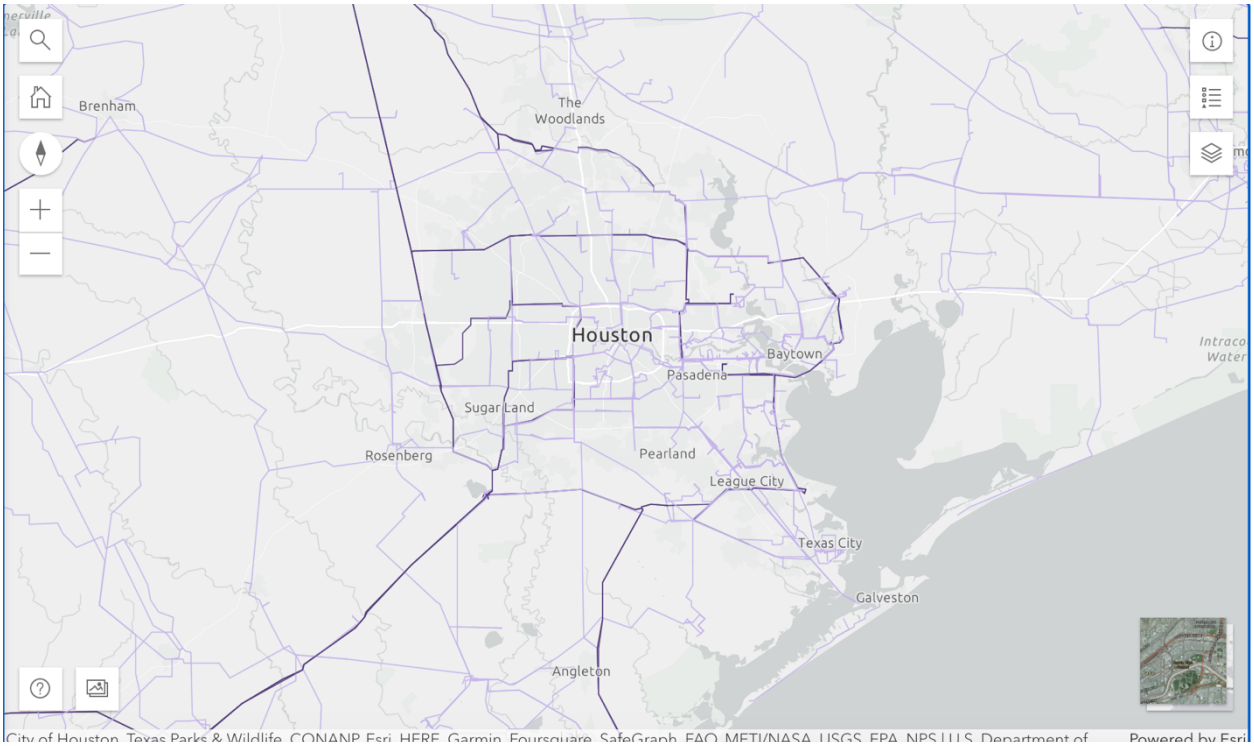
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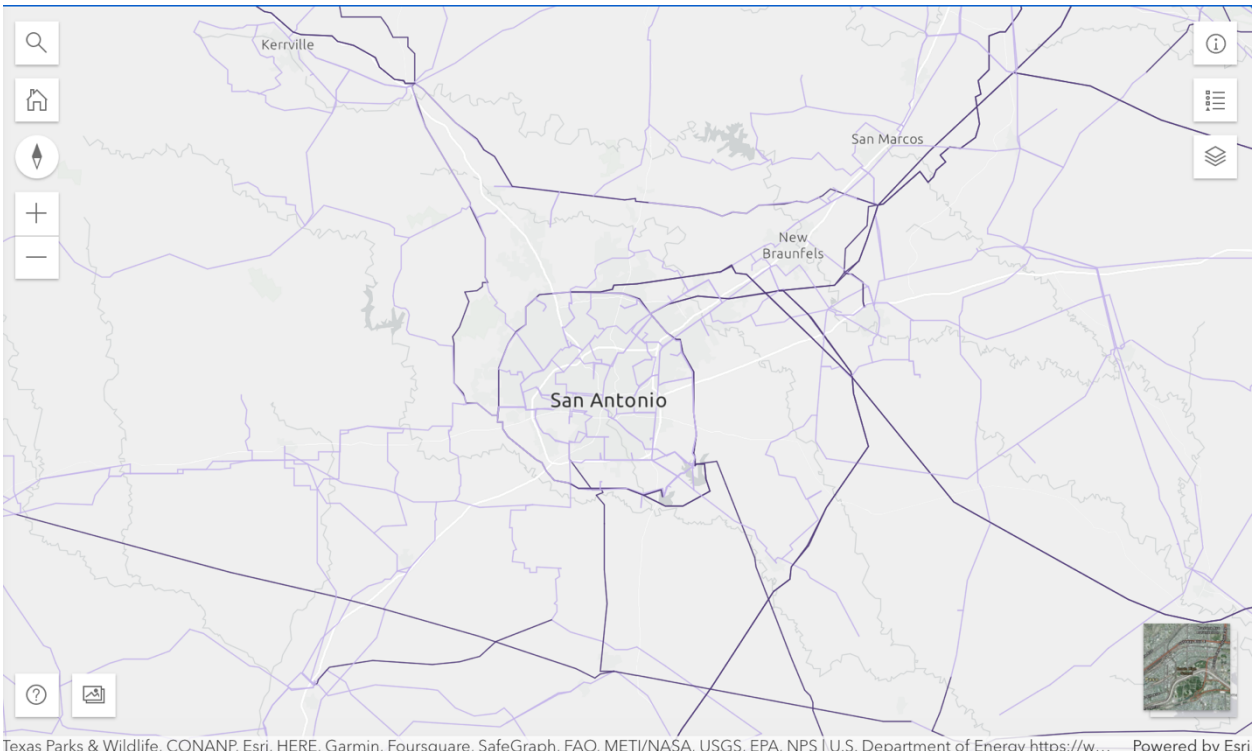
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1. What does AE recommend based on this Transmission Study? Is it any different than their pre-study ongoing transmission plans? Can the study's software/database be used to model battery deployment in our load zone at Decker and Sand Hill and other options?

2. Can the gas phase out be moved up to 2030 if the relevant study recommendations are implemented by that time? What are the costs and timelines?

3. What is the AE cost and timeline for addressing the technical voltage support and distribution needs inside the AE network as currently configured? How much of that is already budgeted and planned as ongoing capital expenditures? How much of that could be mitigated by power imports from the west?

4. How is ERCOT addressing the congestion now and on what timescale?

5. Battery storage was dismissed in the study as unsuitable 'under charging scenario'.

   This makes no sense as charging would be during off-peak conditions, pre-staging power in our load zone for peak times. How much of our congestion could be mitigated by battery storage at Decker and/or Sand Hill under these conditions? What are the technical and economic risks/benefits of a progressive battery build out from 200 MW to 1,000 MW with 2 or 4-hour ratings between now and 2030?

6. How much of our power import needs could be addressed by an aggressive local utility solar, community solar, and commercial solar program augmented with local batteries over a range of 100 to 1000 MW? How much could the IRA support that?

7. How much of our power import needs could be reduced by aggressive use of the IRA to fund energy efficiency upgrades – especially heat pump HVAC and heat pump hot water - in low-income and median income households over a range of 50 to 250 MW?

8. What are the potential impacts of vehicle electrification EV/Van/Truck/Bus on our required power import and how can it be mitigated/enhanced with DM and V2G technology by 2030?

Conclusion

We need a new study of our transmission topography with a view to creating more transmission coming in from the west – as well as south and north – supported by significant local solar, battery deployment, and demand management in our load zone.