



Oncor Forney 345/138-kV Switch Rebuild Project – ERCOT Independent Review

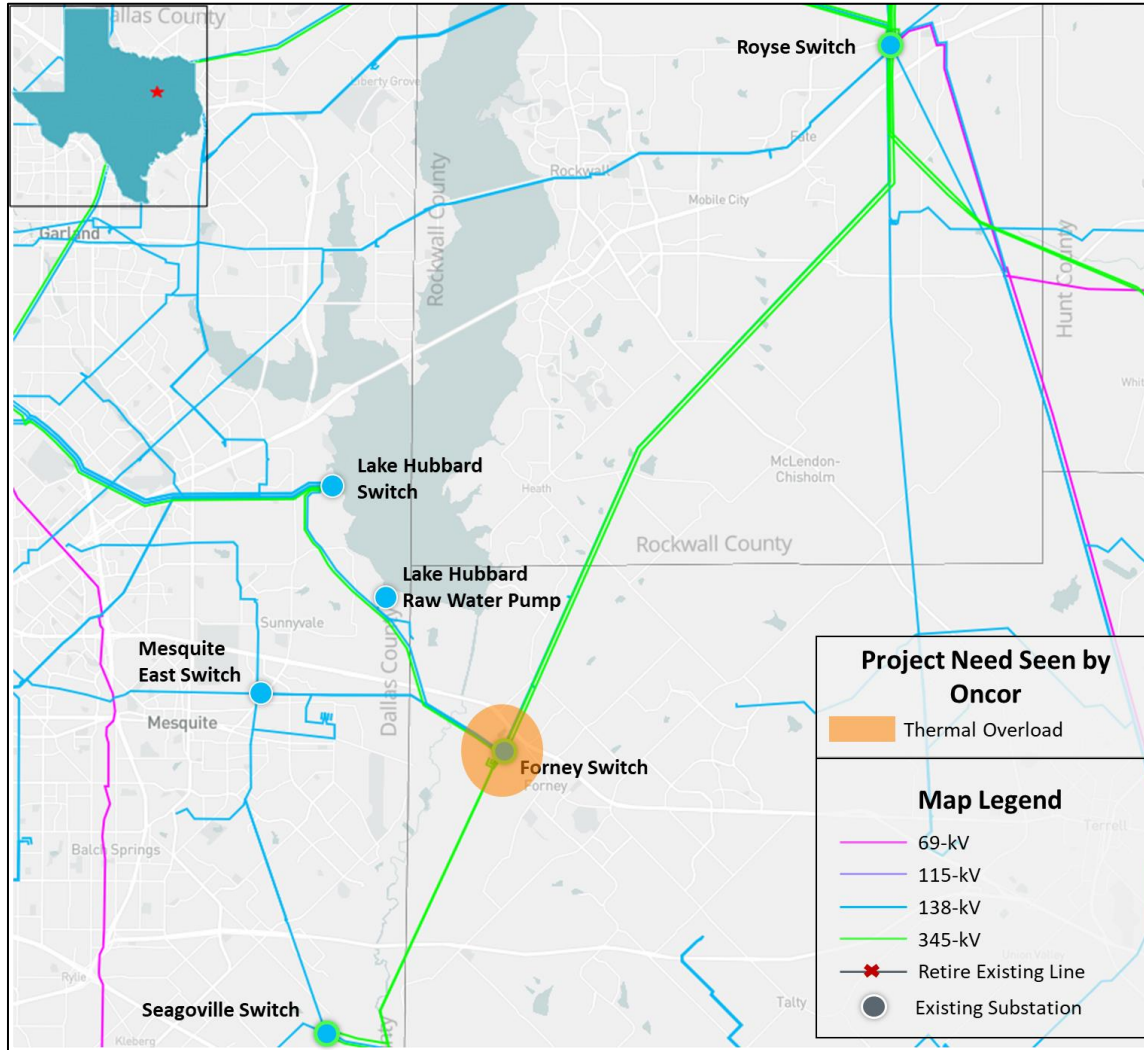
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RPG Meeting
December 16, 2024

Recap: Introduction

- Oncor submitted the Forney 345/138-kV Switch Rebuild Project for Regional Planning Group (RPG) review in July 2024
 - This Tier 1 project is estimated to cost \$103.5 million and will not require a Certificate of Convenience and Necessity (CCN)
 - Estimated In-Service Date (ISD) is December 1, 2025
 - Addresses post-contingency thermal overloads seen in steady state assessment
 - Replace aged infrastructure and address system reliability concerns in Dallas/Forth Worth Metroplex
- Oncor presented a project overview and ERCOT provided a project scope at the September 2024 RPG Meeting
 - <https://www.ercot.com/calendar/09252024-RPG-Meeting>
- ERCOT provided project updates at the November RPG Meeting:
 - <https://www.ercot.com/calendar/11122024-RPG-Meeting>
- This project is currently under ERCOT Independent Review (EIR)

Recap: Study Area Map with Violations seen by Oncor



Recap: Study Assumptions and Methodology Update

- Transmission Updates
 - RPG Projects in the area that have been approved or are being studied with ISDs prior to December 1, 2025 were added to the study base case if not already modeled in the case
 - See Appendix A for the updated list of transmission projects added
 - Transmission projects identified in the 2023 RTP in the study area that have not been approved by RPG were removed
 - See Appendix B for the updated list of transmission projects added
- Generation update
 - Additional 6.9(1) generation was added to based on the August 2024 GIS report
 - See Appendix C for updated list of generation projects added
 - All generation were dispatched consistent with the 2024 RTP methodology
- Loads update
 - Approximately 1,500 MW of confirmed loads in North and North Central Weather Zones were updated to create the study base case

Recap: Preliminary Results of Reliability Assessment – Need Analysis

- ERCOT conducted steady-state load flow analysis for the study base case according to the NERC TPL-001-5.1 and ERCOT Planning Criteria to identify project need

Contingency Category	Voltage Violations	Thermal Violations	Unsolved Power Flow
N-0 (P0)	None	None	None
N-1 (P1, P2-1, P7)	None	None	None
G-1+N-1 (P3)*	None	None	None
X-1+N-1 (P6-2)**	None	1	None

* G-1: Forney CC1

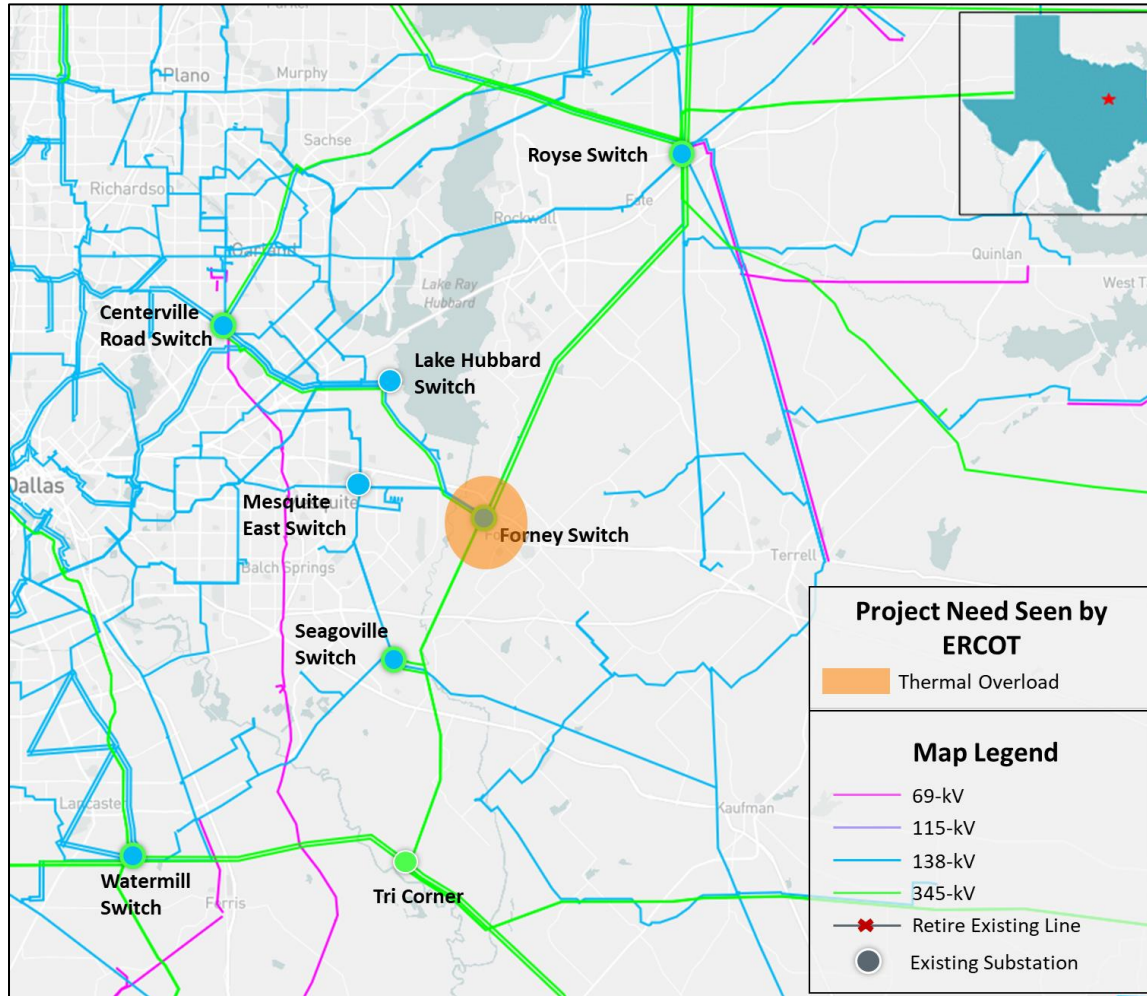
** X-1: Forney, Seagoville and Watermill 345/138-kV autotransformers

Recap: Preliminary Results of Planned Maintenance Outage Evaluation

- ERCOT conducted planned maintenance outage evaluation on the study base case
 - Load level in the North Central was scaled down to 81.3% of their summer peak loads in the study base case, respectively based on ERCOT load forecast and historical load, in order to mimic the off-peak load condition
 - N-2 contingencies were tested as a proxy for N-1-1. Any applicable violating contingencies were further tested with system adjustments
 - The transmission elements in the local area of the Forney 345/138-kV Switch Rebuild Project were monitored in the maintenance outage evaluation
- Planned maintenance outage analysis results

Voltage Violations	Thermal Overloads	Unsolved Power Flow
None	None	None

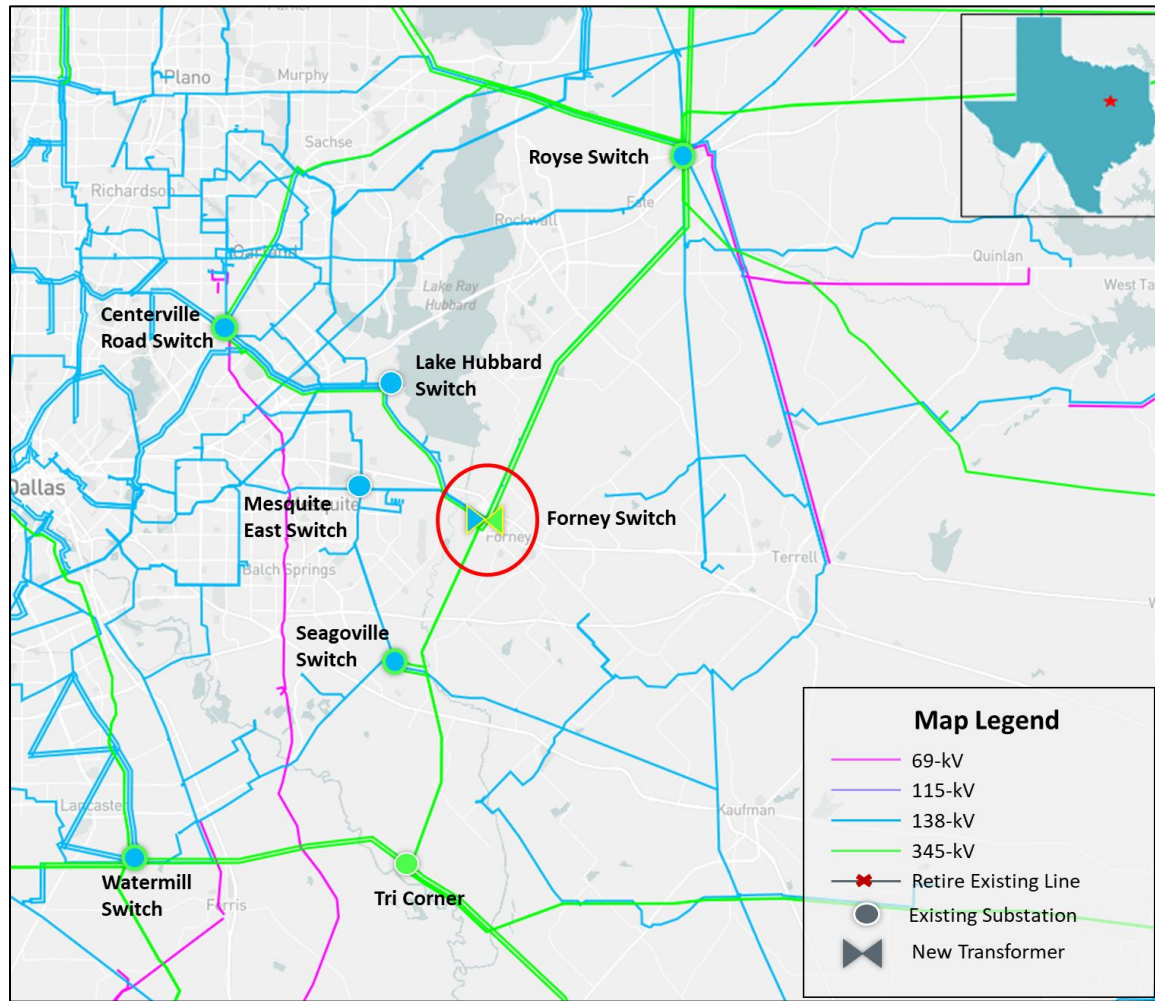
Recap: Study Area Map with Violations seen by ERCOT



Option 1 – Oncor Preferred Option

- Rebuild Forney 345/138-kV Switch by installing fifteen 345-kV, 5000 A breakers and ten 138-kV, 3200 A breakers in breaker-and-a-half bus arrangements;
- Install a second 345/138-kV autotransformer at Forney Switch with normal and emergency ratings of 700 MVA and 750 MVA respectively;
- Connect the Forney substation transformers to the Forney Switch to Mesquite East Switch 138-kV double-circuit transmission line;
- Install three blocks of 36.8 MVAr 138-kV capacitor banks; and
- Ensure all line terminal and associated equipment are rated to meet or exceed 5000 A for 345-kV and 3200 A for 138-kV.

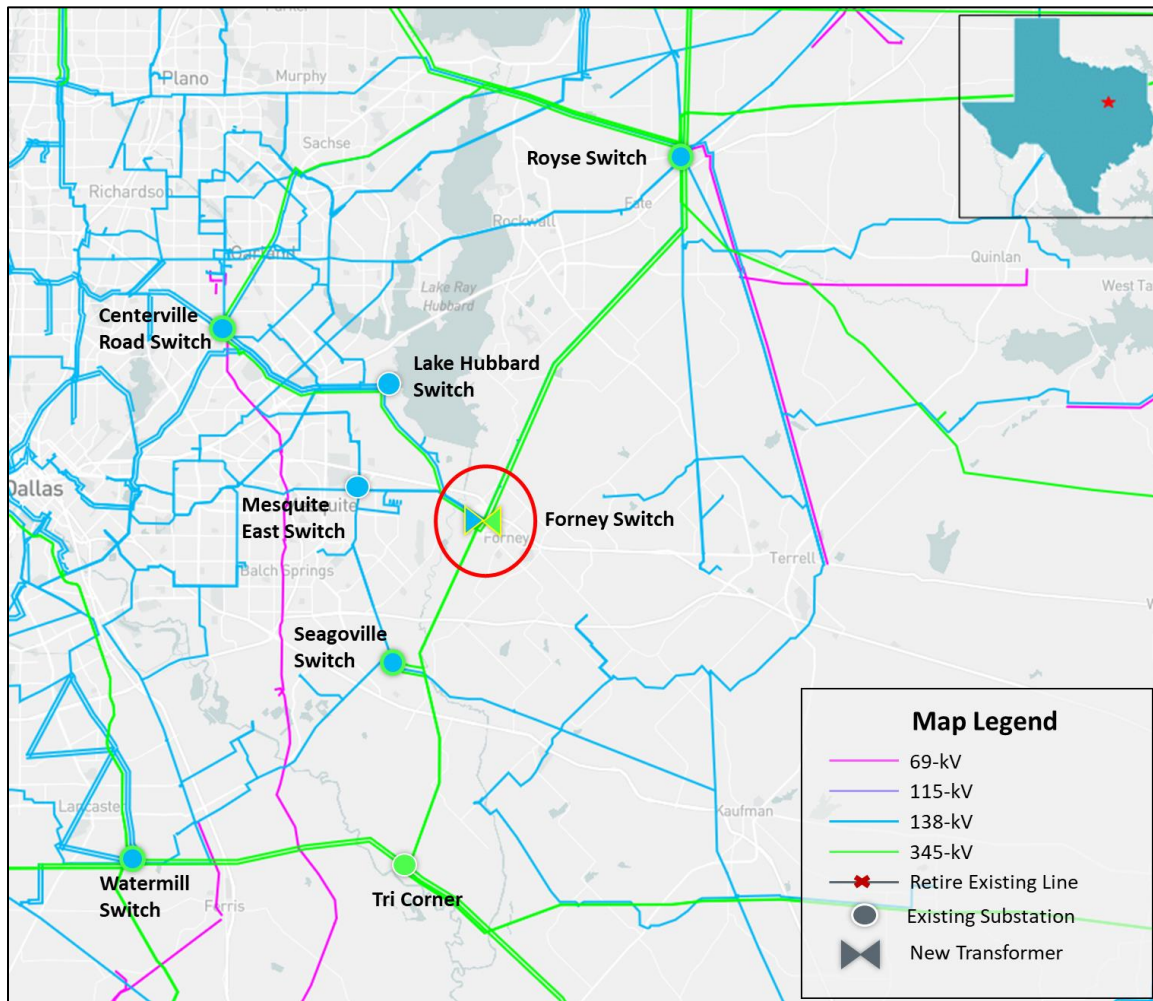
Option 1 – Oncor Preferred Option



Option 1A

- Rebuild Forney 345/138-kV Switch by installing fifteen 345-kV, 5000 A breakers and ten 138-kV, 3200 A breakers in breaker-and-a-half bus arrangements;
- Install a second 345/138-kV autotransformer at Forney Switch with normal and emergency ratings of 700 MVA and 750 MVA respectively;
- Connect the Forney substation transformers to the Forney Switch to Mesquite East Switch 138-kV double-circuit transmission line; and
- Ensure all line terminal and associated equipment are rated to meet or exceed 5000 A for 345-kV and 3200 A for 138-kV.

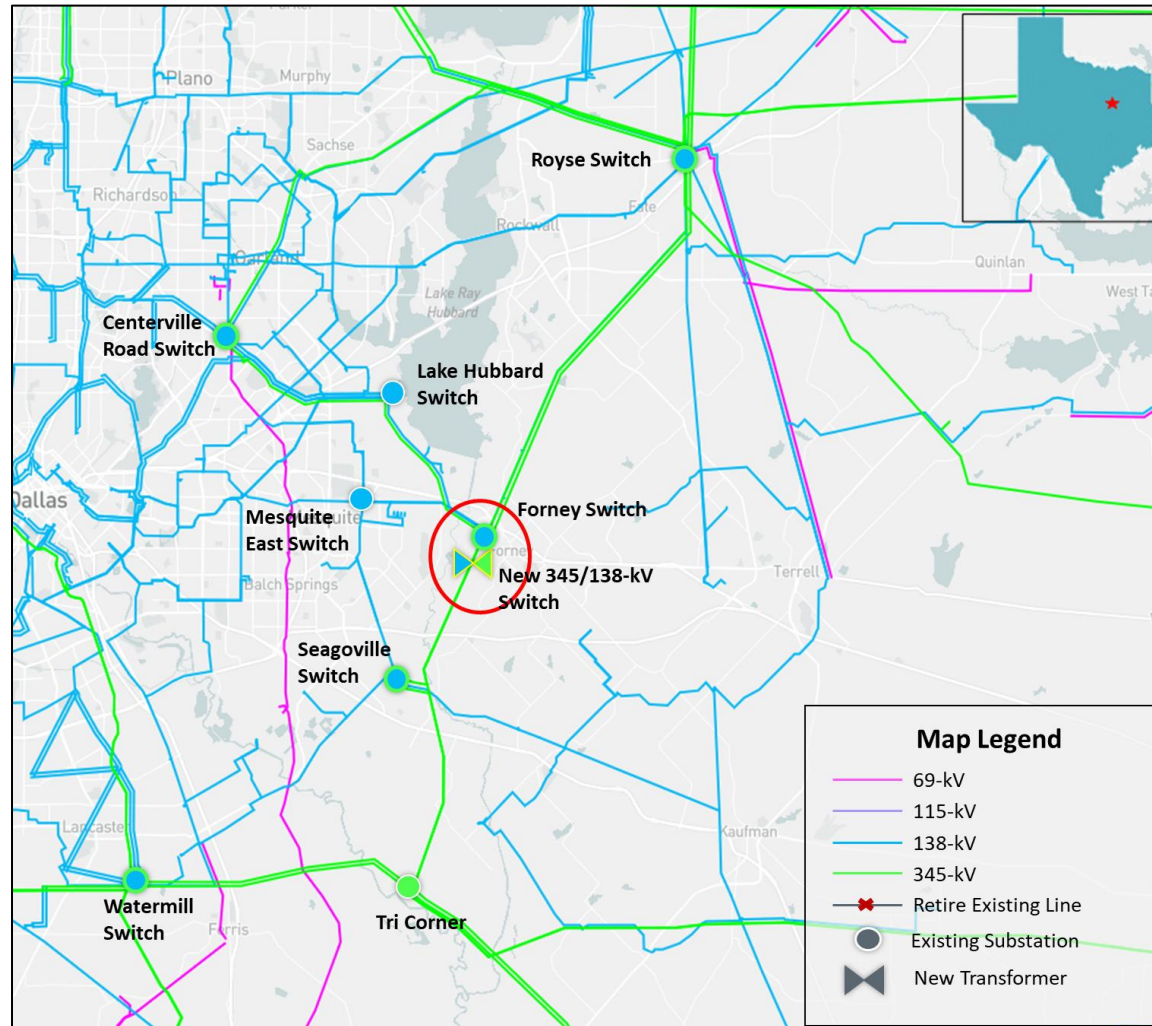
Option 1A



Option 2 – New 345/138-kV Switch

- Construct a new 345/138-kV Switch near Forney Switch;
- Loop Seagoville Switch to Forney Switch 345-kV Circuit 1 into the new 345-kV station;
- Install a 345/138-kV autotransformer at new 345/138-kV Switch with normal and emergency ratings of 700 MVA and 750 MVA respectively;
- Connect the 138-kV terminal of the autotransformer to the 138-kV Forney Switch.

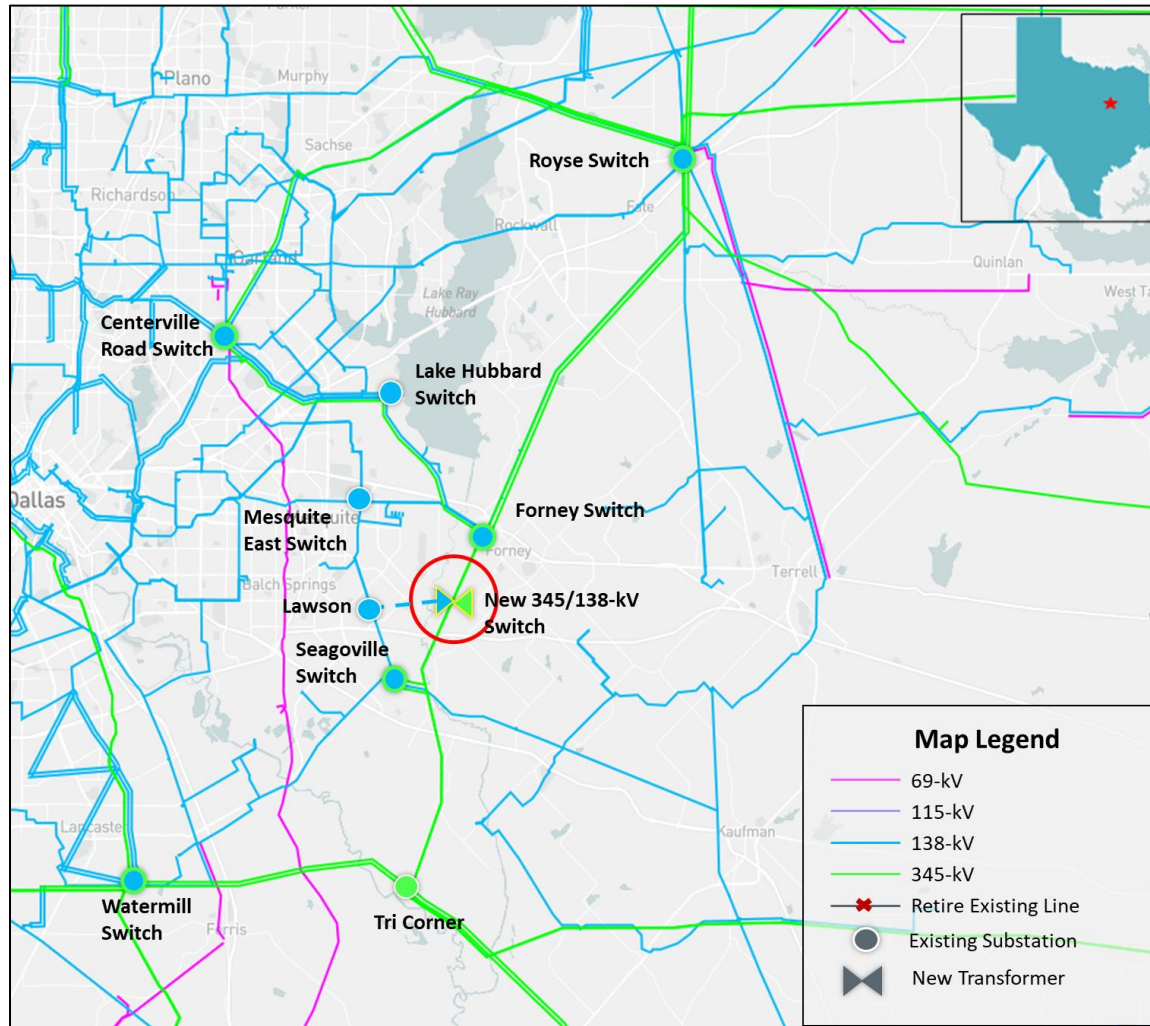
Option 2 – New 345/138-kV Switch



Option 3 – New 345/138-kV Switch

- Construct a new 345/138-kV Switch tapping between Forney Switch and Seagoville 345-kV transmission line, approximately 3.5-miles from Forney Switch;
- Install a 345/138-kV autotransformer at new 345/138-kV Switch with normal and emergency ratings of 700 MVA and 750 MVA respectively;
- Construct a new 138-kV transmission line from the new 345/138-kV Switch to Lawson with a Normal and emergency ratings of 478 MVA, approximately 2.5-mile.

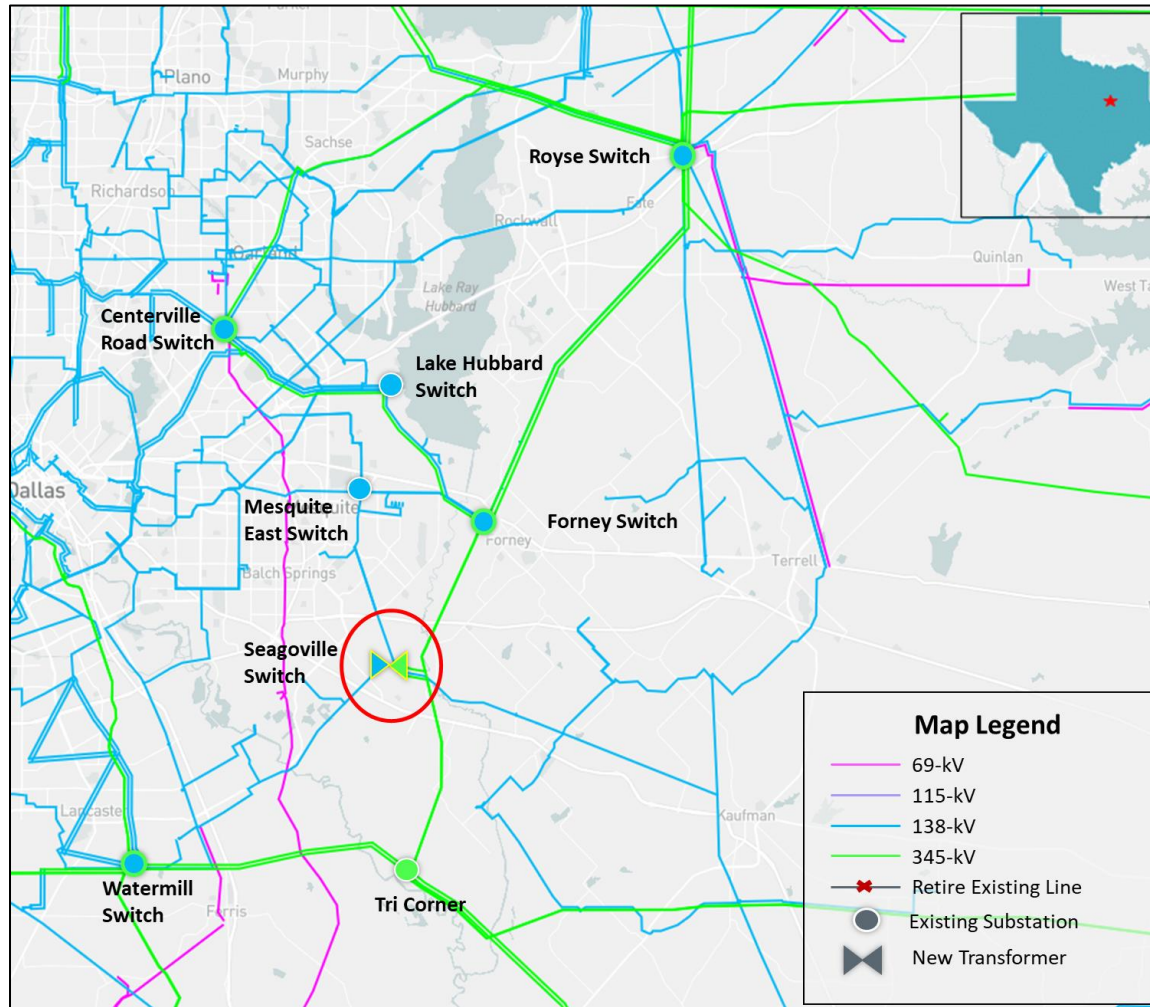
Option 3 – New 345/138-kV Switch



Option 4 – Additional Transformer at Seagoville

- Rebuild Seagoville 345/138-kV Switch;
- Install a second 345/138-kV autotransformer at Seagoville Switch with normal and emergency ratings of 700 MVA and 750 MVA respectively.

Option 4 – Additional Transformer at Seagoville



Results of Reliability Assessment – Options

Option	N-1		G-1+N-1		X-1+N-1	
	Thermal Violations	Voltage Violations	Thermal Violations	Voltage Violations	Thermal Violations	Voltage Violations
1	None	None	None	None	None	None
1A	None	None	None	None	None	None
2	None	None	None	None	None	None
3	None	None	None	None	None	None
4	None	None	None	None	1	None

* G-1: Forney CC1

** X-1: Forney, Seagoville and Watermill 345/138-kV autotransformers

- Option 1, Option 1A, Option 2 and Option 3 are short-listed for further evaluation

Results of Planned Maintenance Outage Evaluation

- ERCOT conducted planned maintenance outage evaluation on the short-listed options
 - Load level in the North Central Weather Zone were scaled down to 81.3% of their summer peak loads in the study base case, respectively based on ERCOT load forecast and historical load, in order to mimic the off- peak load condition
 - N-2 contingencies were tested as a proxy for N-1-1. Any applicable violating contingencies were further tested with system adjustments
 - The transmission elements in the local area of the Forney 345/138-kV Switch Rebuild Project were monitored in the maintenance outage evaluation
- Planned maintenance outage analysis results

Option	Voltage Violations	Thermal Overloads	Unsolved Power Flow
1	None	None	None
1A	None	None	None
2	None	None	None
3	None	None	None

Long-Term Load-Serving Capability Assessment

- Assumptions
 - Adjusted load up in the study area, excluding Flexible Loads in the area
 - Adjusted conforming load down outside of the North and North Central Weather Zones to balance power
 - Based on N-1 contingency
- Findings
 - All Options show significant additional transfer capability

Option	Incremental Load-Serving Capability(~MW)
1	1572
1A	1559
2	1494
3	1405

Cost Estimate and Feasibility Assessment

- Transmission Service Providers (TSPs) performed feasibility assessments and provided cost estimates for the options
 - Based on inputs from Oncor, Option 2 is deemed infeasible due to physical space limitations

Option	Cost Estimates (~\$M)	CCN Required (~miles)	Feasibility
1	~103.5	0	Yes
1A	~100.4	0	Yes
2	N/A*	N/A*	No
3	~76.6**	3.2	Yes

* Cost Estimates and CCN mileage was not provided because the option is infeasible

** The estimated cost do not include the right of way (ROW) Costs

Comparison of Short-Listed Options

	Option			
	1	1A	2	3
Meets ERCOT and NERC Reliability Criteria	Yes	Yes	Yes	Yes
Improves Operational Flexibility	Yes	Yes	Yes	Yes
Improves Long-Term Load-Serving Capability	Yes	Yes	Yes	Yes
Replaces Aging Infrastructure	Yes	Yes	No	No
Require CCN (miles)	No	No	No	Yes
Cost Estimate* (\$M)	~\$103.5	~\$100.4	N/A*	~\$76.6**
Feasible	Yes	Yes	No	Yes

* The cost estimates were not provided because the option was deemed infeasible by Oncor

** The estimated cost does not include cost related to new CCN or land acquisition

- Based on feedback from Oncor, Option 2 was deemed as not feasible
- Option 3 does not address the aging infrastructure issue

ERCOT Preferred Option

- Option 1A was selected as the preferred option because it:
 - Addresses reliability violations
 - Is the least cost option that addresses the aging infrastructure issue
 - Improves long-term load-serving capability and does not require a CCN

Sensitivity Analyses

- Generation Addition Sensitivity Analysis

- ERCOT performed a generation addition sensitivity by adding new the generation listed below to the preferred option case. The additional resources were modeled following the 2024 RTP methodology. ERCOT determined relevant generators do not impact the preferred option

GINR	Unit Name	Fuel Type	Projected COD	Capacity (~MW)	County
24INR0472	Amador Storage	BAT	12/31/2025	102.58	Van Zandt

- Load Scaling Sensitivity Analysis

- ERCOT performed a load scaling sensitivity and concluded that the load scaling did not have a material impact on project need

Additional Analyses

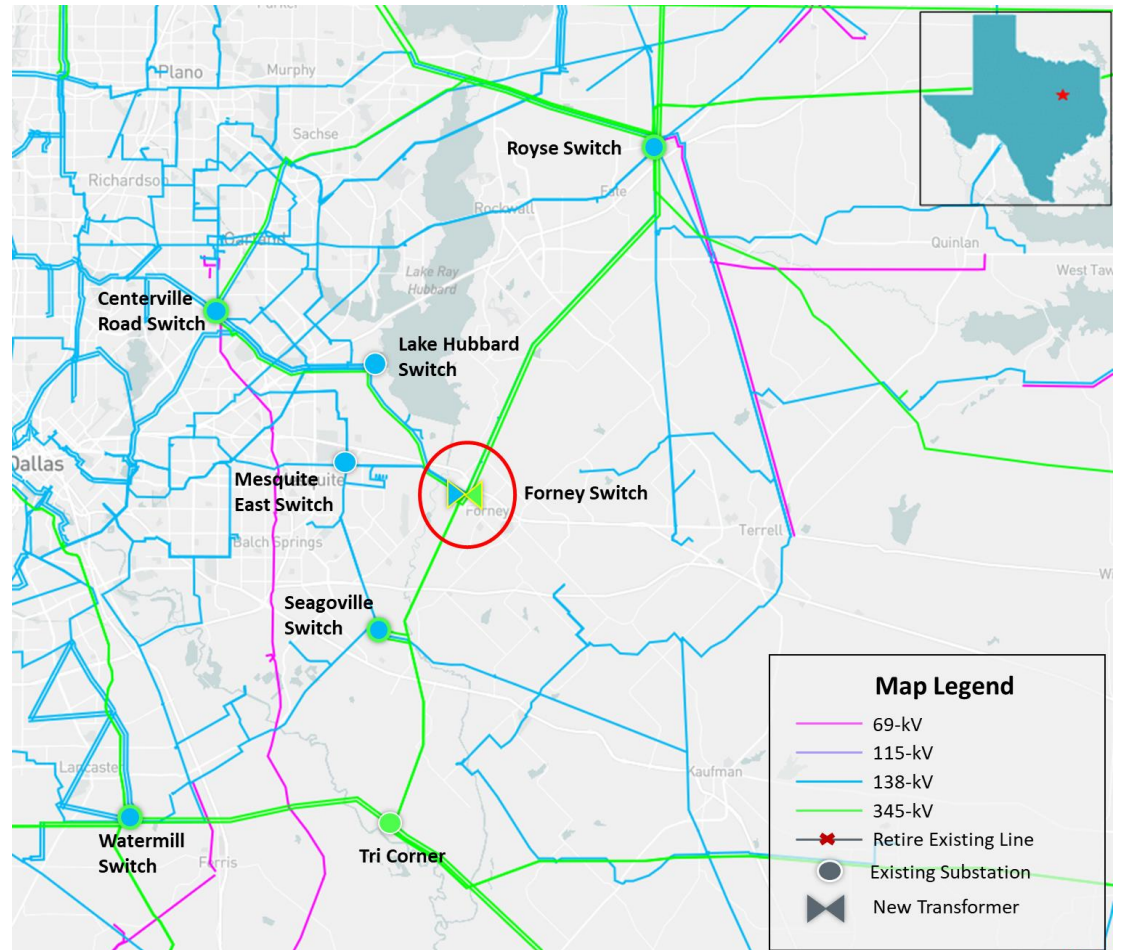
- Congestion Analysis
 - Congestion analysis was performed for the preferred option using the 2023 RTP 2028 economic case
 - The preferred option did not result in any significant congestion within the study area
- Subsynchronous Resonance (SSR) Assessment
 - Subsynchronous Resonance (SSR) Assessment was conducted for the preferred option
 - ERCOT found no adverse SSR impacts to the existing and planned generation resources at the time of this study

ERCOT Recommendation

- ERCOT recommends Option 1A
 - Estimated Cost: approximately \$100.4 million
 - Expected ISD: December 2025
 - The completion date may change depending on material acquisition, outage coordination, construction, or other project related requirements.

ERCOT Recommended – Option 1A Map

- Rebuild Forney 345/138-kV Switch by installing fifteen 345-kV, 5000 A breakers and ten 138-kV, 3200 A breakers in breaker-and-a-half bus arrangements;
- Install a second 345/138-kV autotransformer at Forney Switch with normal and emergency ratings of 700 MVA and 750 MVA respectively;
- Connect the Forney substation transformers to the Forney Switch to Mesquite East Switch 138-kV double-circuit transmission line; and
- Ensure all line terminal and associated equipment are rated to meet or exceed 5000 A for 345-kV and 3200 A for 138-kV.



Next Steps and Tentative Timeline

- Tentative timeline
 - EIR report to be posted in the MIS in December 2024
 - EIR recommendation to TAC in January 2025
 - EIR recommendation to R&M in February 2025
 - Seek ERCOT Board of Directors endorsement in February 2025

Thank you!



Stakeholder comments also welcomed through:

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Appendix A – Transmission Projects

- List of transmission projects added to study base case

RPG/TPIT No	Project Name	Tier	Project ISD	County
22RPG021	Tawakoni Area Transmission Project	Tier 2	June-24	Hunt
23RPG006	North Lake 138 kV Switch Rebuild	Tier 4	May-24	Dallas
23RPG017	Watermill 345/138-kV Switch Project	Tier 3	May-25	Dallas
23RPG020	Hackberry Switch to DFW D East 2 138-kV Double-Circuit Line Section Project	Tier 3	Dec-25	Dallas
23RPG033	Watermill to Seagoville 138 kV Line Project	Tier 3	Dec-25	Dallas
24RPG005	Montfort Switch to Shankle Switch 138-kV Line Project	Tier 3	Dec-25	Ellis, Navarro
75628	Poetry 345 kV Switch	Tier 4	Oct-24	Kaufman
71976	Watermill 138 kV Switch	Tier 3	Dec-24	Dallas
78167	Add 2nd autotransformer at Trumbull	Tier 4	Nov-25	Ellis
71980	Watermill 345 kV Switch	Tier 3	Dec-25	Dallas
78367	Oncor_ME_Montfort-Shankle 138 kV Line	Tier 3	Dec-25	Navarro

Appendix B – Transmission Projects

- List of transmission projects removed from the study base case

TPIT No	Project Name	County
2023-NC18	Tri Corner (2432) to Seagoville Switch (2433) to Forney Switch (2437) 345-kV Line Upgrade	Dallas
2023-NC38	Watermill 345/138-kV Transformer Upgrade	Dallas
2023-NC41	Watermill 138-kV Area Upgrades	Dallas
2023-NC42	Waxahachie Area 69-kV and 138-kV Line Upgrades	Ellis
2023-NC43	Wilmer 138/69-kV Transformer Upgrade	Dallas

Appendix C – New Generation Projects to Add

GINR	Project Name	Fuel	Projected COD	Capacity (~MW)	County
19INR0110	Azalea Springs Solar	SOL	05/31/2025	181.0	Angelina
20INR0203	Pine Forest Solar	SOL	12/01/2025	301.5	Hopkins
20INR0208	Signal Solar	SOL	03/15/2025	51.8	Hunt
20INR0222	Tyson Nick Solar	SOL	08/01/2025	90.5	Lamar
21INR0240	La Casa Wind	WIN	03/22/2025	148.4	Stephens
21INR0368	Eliza Solar	SOL	12/20/2024	151.7	Kaufman
21INR0379	Ash Creek Solar	SOL	01/31/2025	417.7	Hill
21INR0511	Wolf Ridge Repower	WIN	08/31/2024	121.5	Cooke
21INR0515	Roadrunner Crossing Wind II SLF	WIN	10/31/2024	126.7	Eastland
22INR0260	Eliza Storage	OTH	02/17/2025	100.4	Kaufman
22INR0526	Pine Forest BESS	OTH	10/29/2025	200.74	Hopkins
22INR0554	Platinum Storage	OTH	03/03/2025	309.5	Fannin
22INR0555	TE Smith Storage	OTH	07/15/2025	125.4	Rockwall
23INR0026	Baker Branch Solar	SOL	09/30/2024	469.4	Lamar
23INR0030	Langer Solar	SOL	03/01/2027	249.8	Bosque
23INR0070	Chillingham Solar	SOL	10/18/2024	352.4	Bell
23INR0114	True North Solar	SOL	12/05/2024	238.8	Falls
23INR0118	Blevins Solar	SOL	07/01/2025	271.6	Falls
23INR0119	Blevins Storage	OTH	07/01/2025	181.3	Falls
23INR0195	Desert Willow BESS	OTH	02/03/2025	154.4	Ellis
23INR0296	Trojan Solar SLF	SOL	02/28/2026	153.0	Cooke

Appendix C – New Generation Projects to Add (cont.)

GINR	Project Name	Fuel	Projected COD	Capacity (~MW)	County
23INR0299	Anole BESS	OTH	05/30/2025	247.1	Dallas
23INR0349	Tokio Solar	SOL	08/25/2025	170.5	McLennan
23INR0367	Fewell Solar	SOL	09/09/2025	203.5	Limestone
23INR0403	Connolly Storage	OTH	09/06/2024	125.4	Wise
23INR0469	Big Elm Storage	OTH	11/10/2025	100.8	Bell
24INR0010	Pinnington Solar	SOL	10/15/2025	666.1	Jack
24INR0015	Five Wells Solar	SOL	09/15/2024	322.8	Bell
24INR0023	Compadre Solar	SOL	12/25/2024	406.1	Hill
24INR0038	SP Jaguar Solar	SOL	06/01/2026	300.0	McLennan
24INR0039	SP Jaguar BESS	OTH	06/30/2025	314.3	McLennan
24INR0138	Midpoint Storage	OTH	08/30/2025	51.3	Hill
24INR0139	Midpoint Solar	SOL	08/30/2025	99.8	Hill
24INR0140	Gaia Storage	OTH	07/31/2025	76.8	Navarro
24INR0141	Gaia Solar	SOL	07/31/2025	152.7	Navarro
24INR0198	Two Forks BESS	OTH	07/01/2027	309.0	Cooke
24INR0295	Lucky Bluff BESS SLF	OTH	10/15/2025	100.8	Erath
24INR0312	Wigeon Whistle BESS	OTH	09/23/2024	122.9	Collin
24INR0315	Black Springs BESS SLF	OTH	10/15/2025	120.7	Palo Pinto
24INR0631	Radian Storage SLF	OTH	12/31/2024	160.25	Brown
25INR0105	Diver Solar SLF	SOL	06/30/2026	225.6	Limestone
25INR0231	Apache Hill BESS	OTH	11/15/2026	201.2	Hood