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

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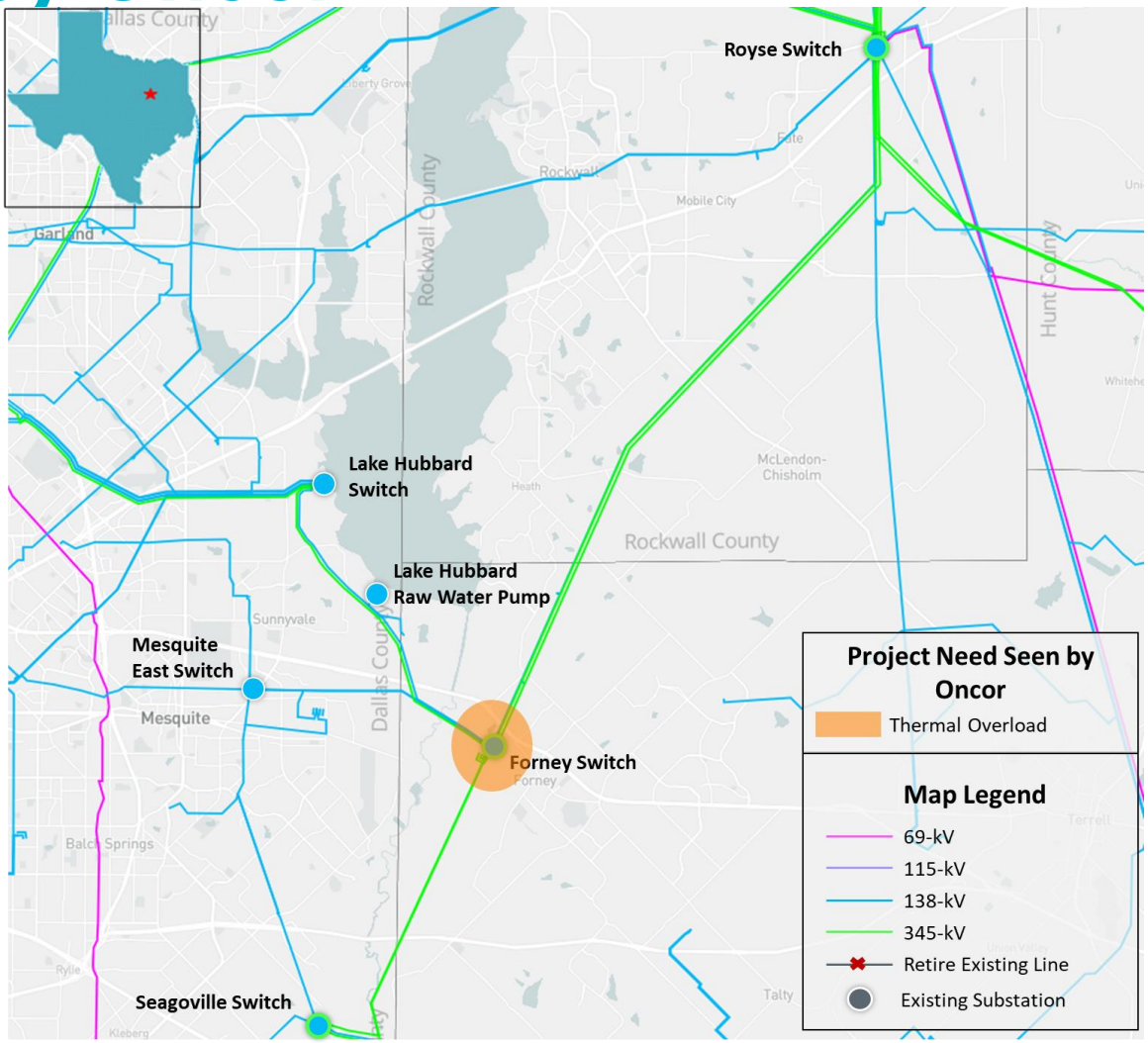
RPG Meeting
November 12, 2024

Introduction

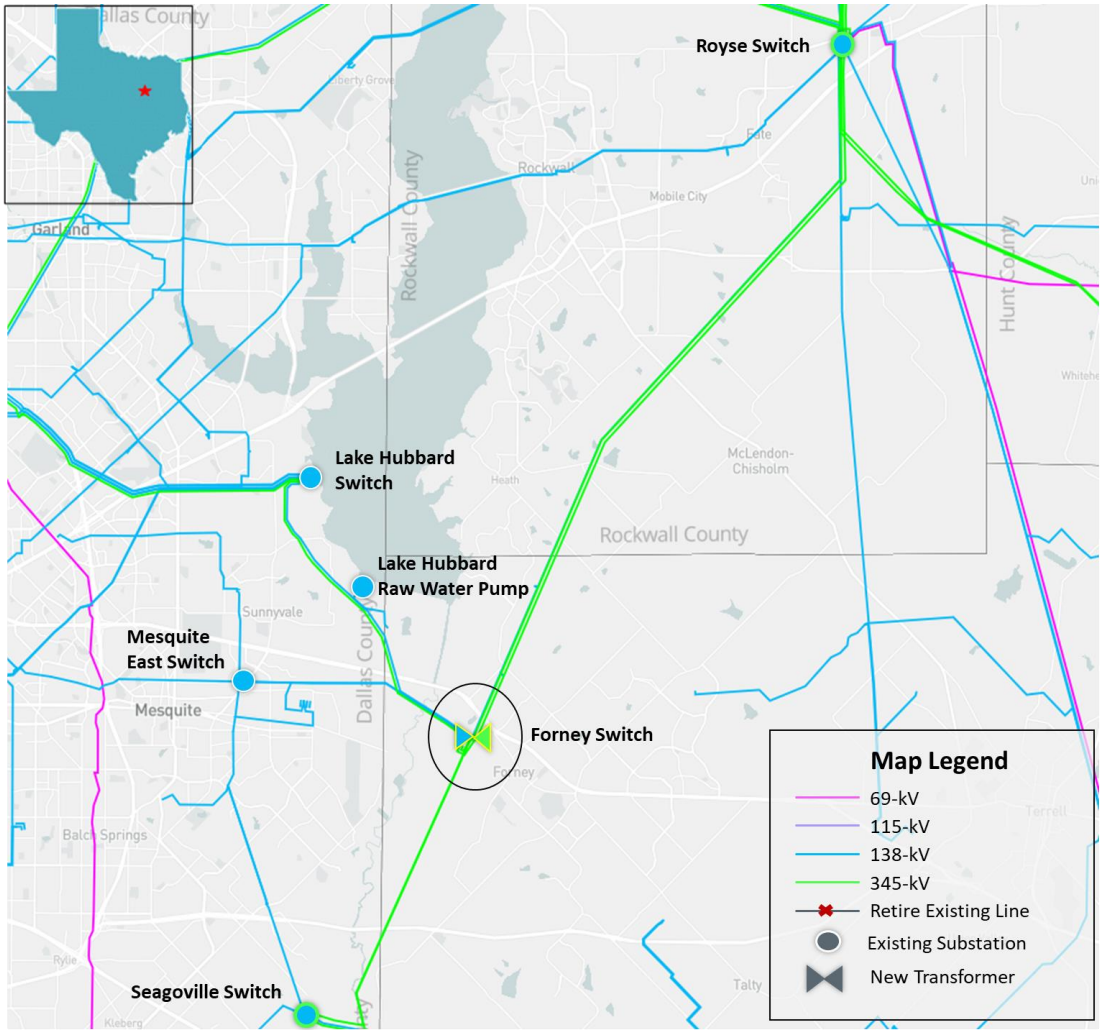
- Oncor submitted the Forney 345/138-kV Switch Rebuild Project for Regional Planning Group (RPG) review in July 2024
  - This Tier 1 project is estimated to cost $103.5 million and will not require a Certificate of Convenience and Necessity (CCN)
  - Estimated in-service date is December 1, 2025
  - Addresses Post-contingency thermal overloads seen in steady state assessment
  - Replace aged infrastructure to improve operational flexibility and system reliability concerns in Dallas/Forth Worth Metroplex
- ERCOT presented study scope for this ERCOT Independent Review (EIR) at the September RPG Meeting:
  - https://www.ercot.com/calendar/09252024-RPG-Meeting
- This project is currently under ERCOT Independent Review (EIR)

Recap - Study Area Map with Violations seen by Oncor



Recap - Project Proposed by Oncor

- 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 nameplate rating of 750 MVA;
- Connect the Forney substation transformers to the Forney Switch – Mesquite East Switch 138-kV double-circuit 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.



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

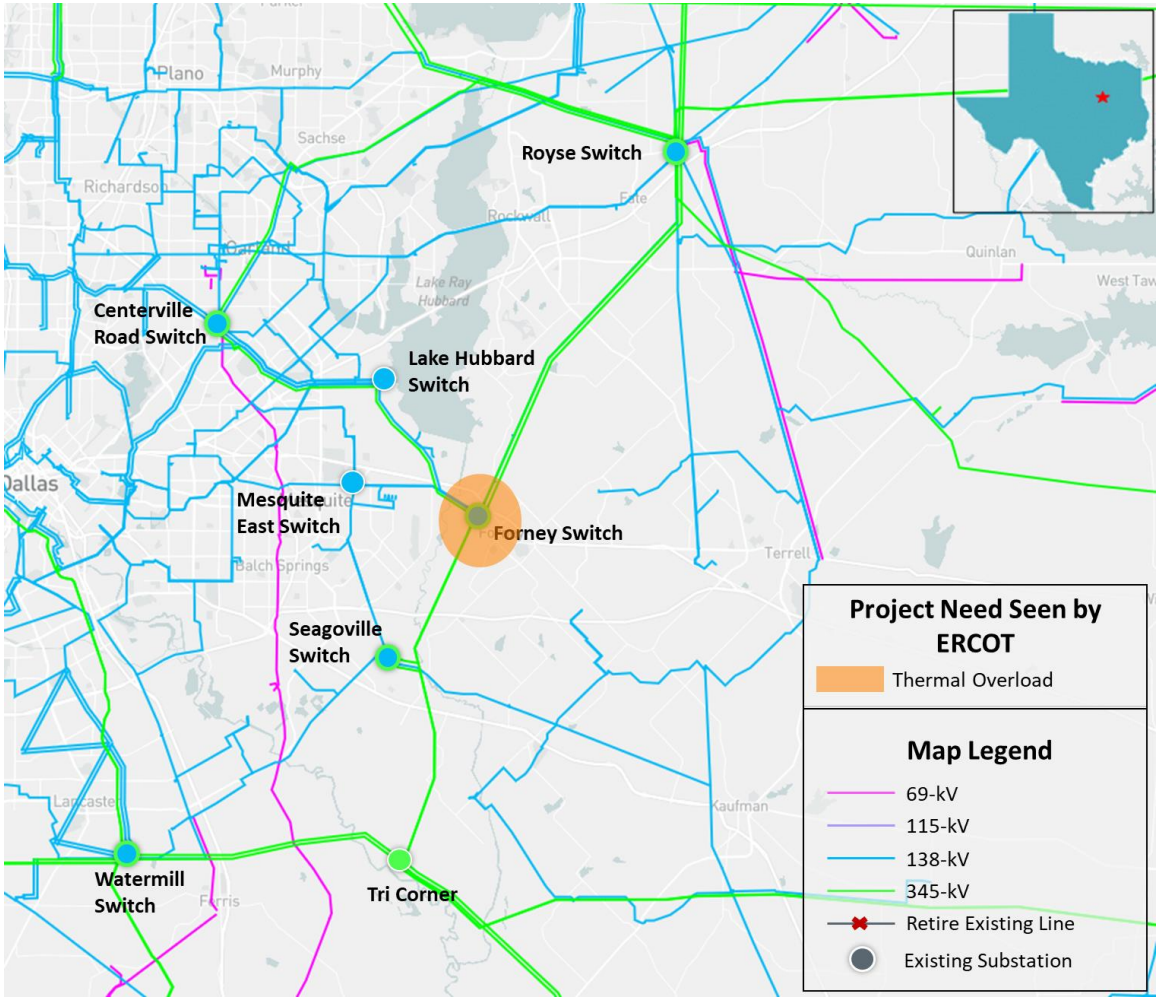
* G-1: Forney CC1
** X-1: Forney, Seagoville and Watermill 345/138-kV autotransformers

Preliminary Results of Planned Maintenance Outage Evaluation

- ERCOT conducted planned maintenance outage evaluation on the Study Basecase
  - 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

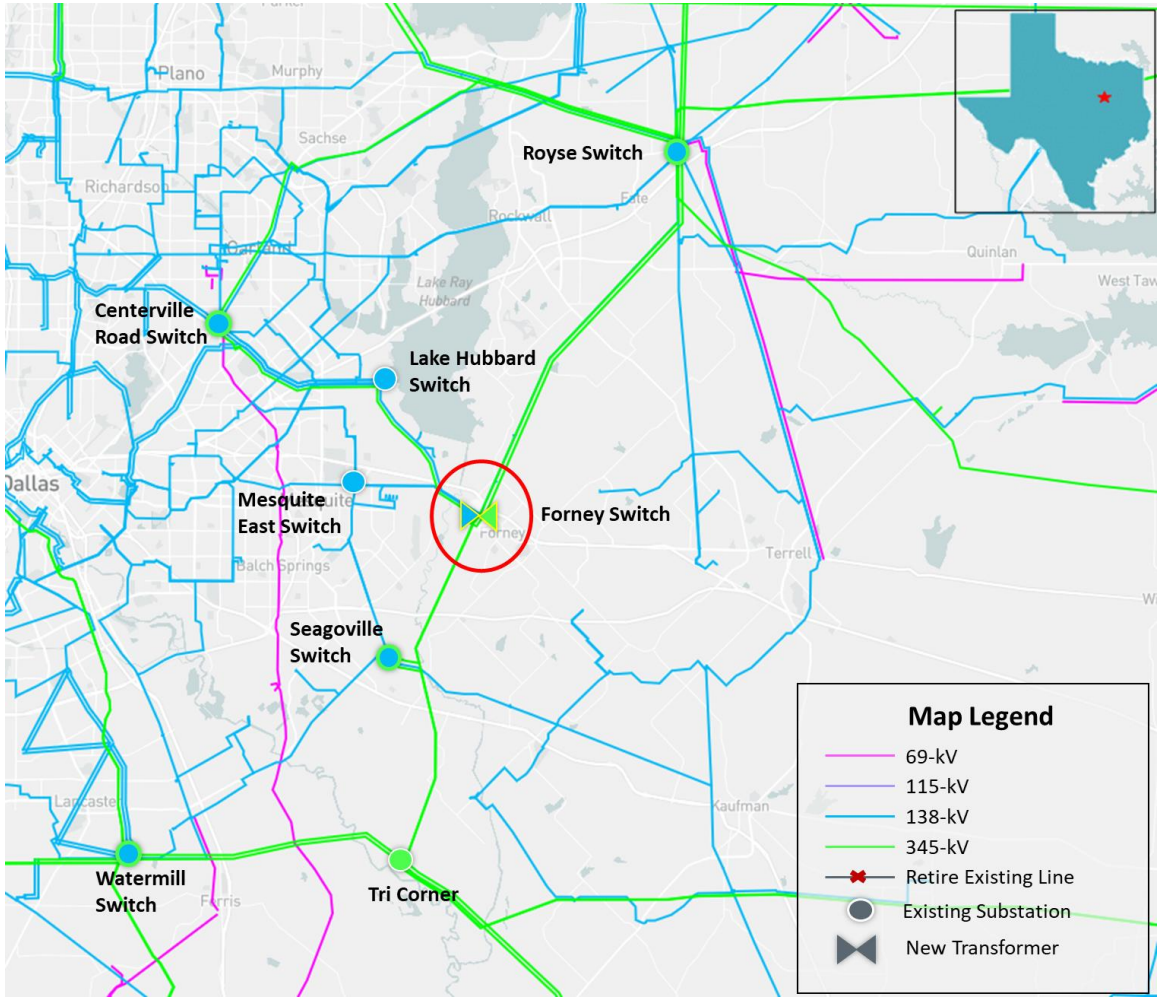
Study Area Map with Violations seen by ERCOT



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 nameplate rating of 750 MVA;
- Connect the Forney substation transformers to the Forney Switch – Mesquite East Switch 138-kV double-circuit 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.

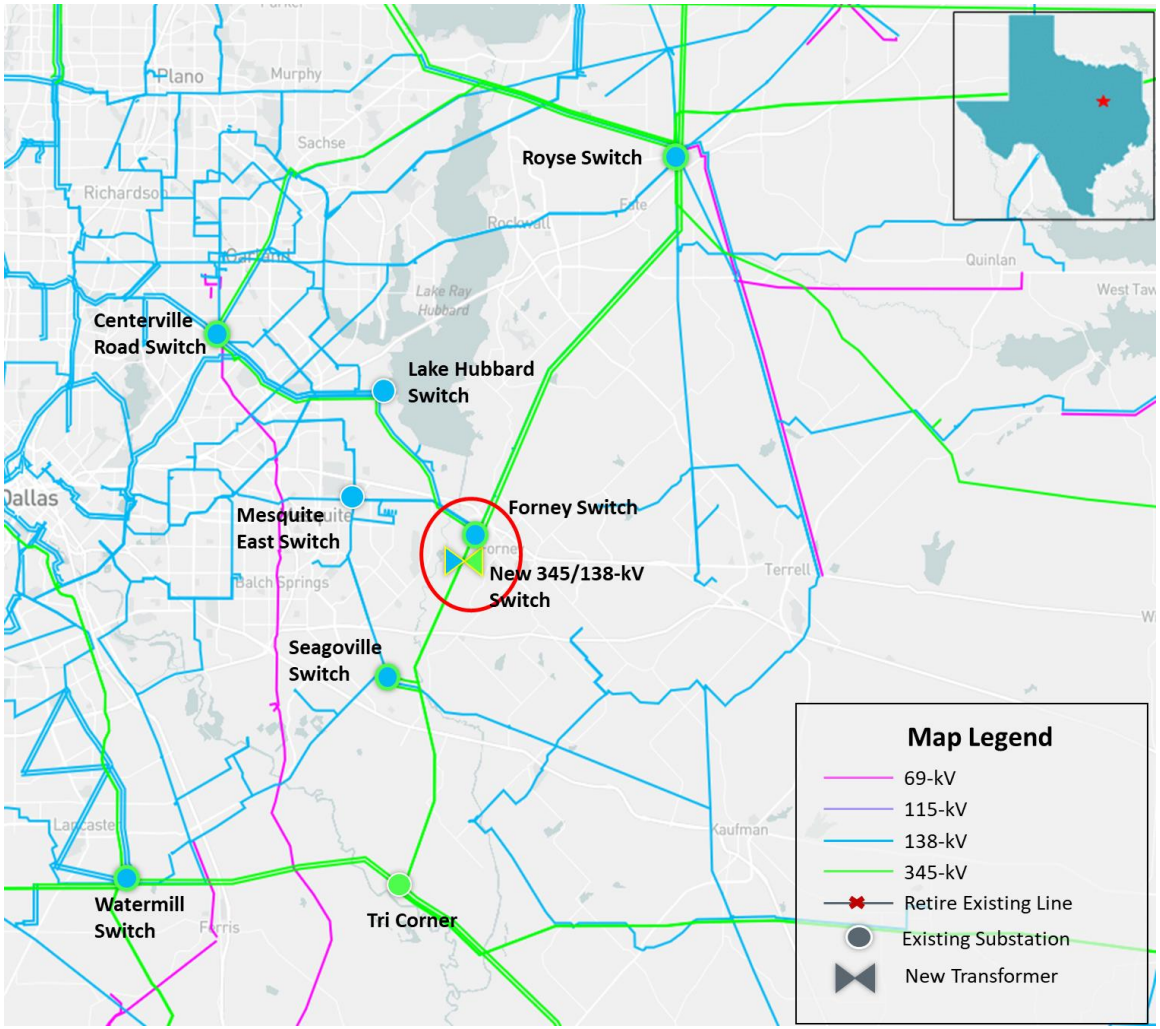
Option 1 – Oncor Preferred Option



Option 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 nameplate rating of 750 MVA;
- Connect the 138-kV terminal of the autotransformer to the 138-kV Forney Switch.

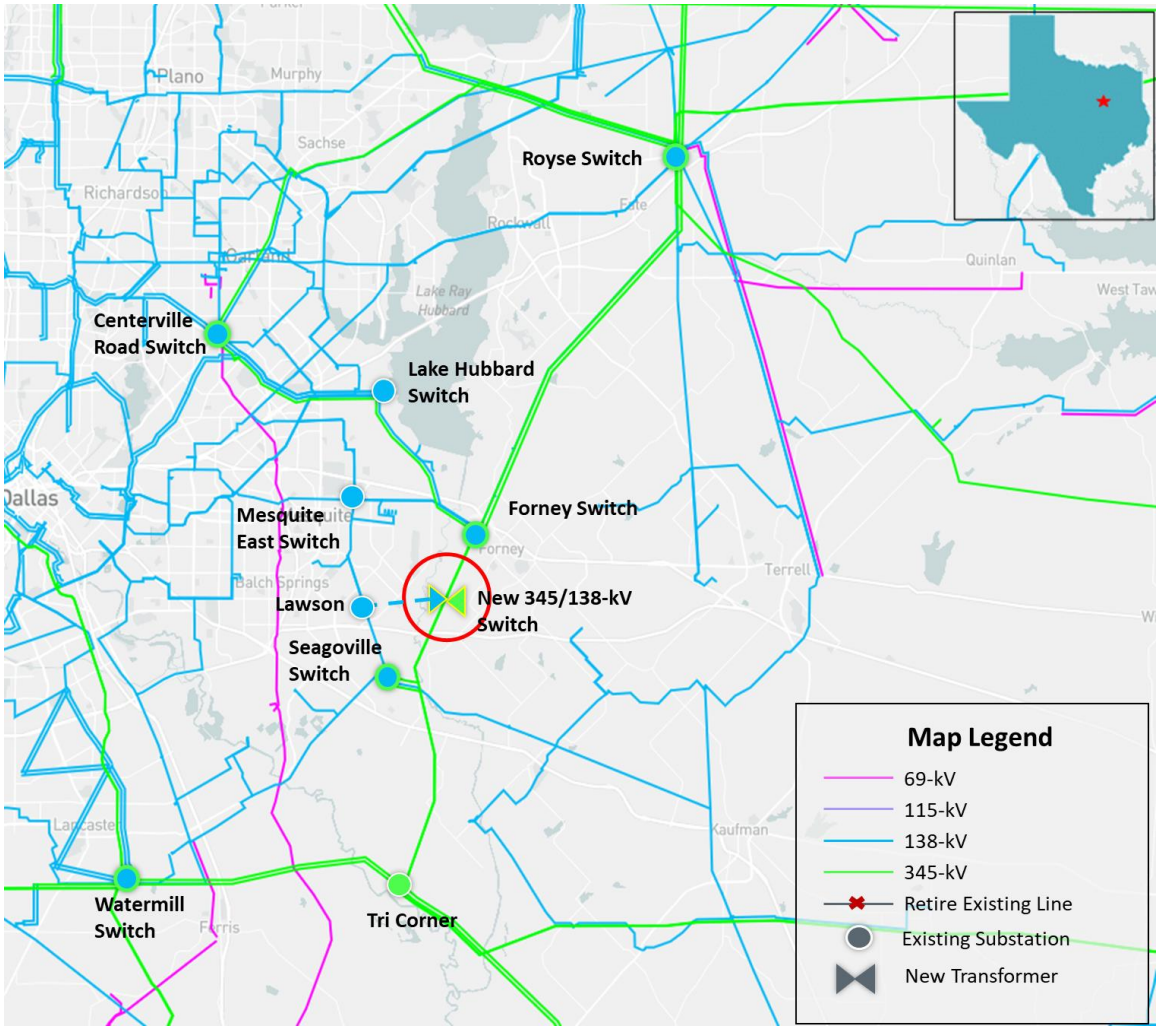
Option 2 – New 345/138-kV Switch



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 nameplate rating of 750 MVA;
- 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.

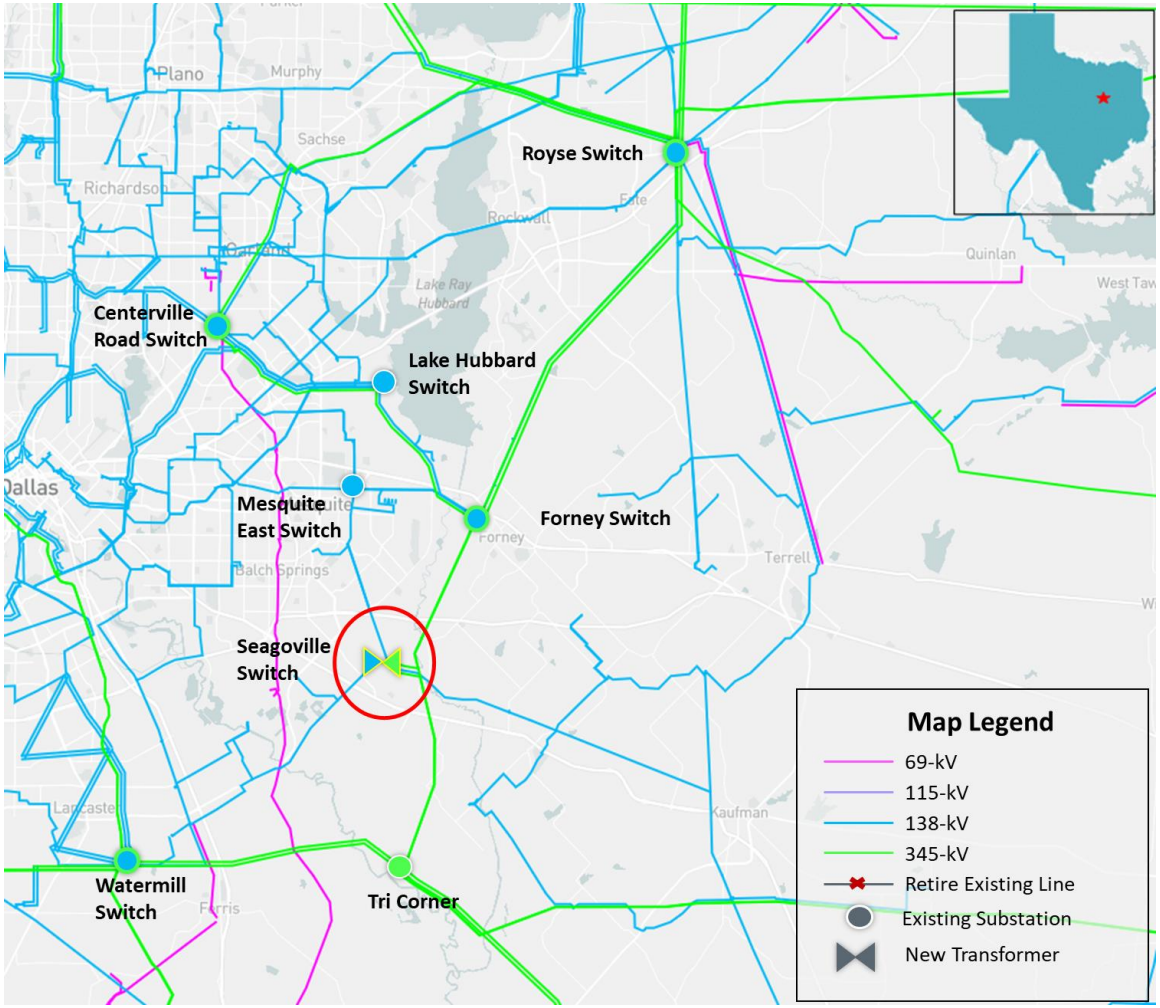
Option 3 – New 345/138-kV Switch



Option 4 – Additional Transformer at Seagoville

- Rebuild Seagoville 345/138-kV Switch;
- Install a second 345/138-kV autotransformer at Seagoville Switch with nameplate rating of 750 MVA.

Option 4 - Additional Transformer at Seagoville



Preliminary 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
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

Preliminary Results of Planned Maintenance Outage Evaluation

- ERCOT conducted planned maintenance outage evaluation on the shortlisted 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
2	None	None	None
3	None	None	None
4	None	None	None

Next Steps and Tentative Timeline

- ERCOT will continue to evaluate options and provide status updates at future RPG meetings
  - ERCOT may perform the following studies
    - Long-term load-serving capability assessment
    - Congestion analysis may be performed based on the recommended transmission upgrades to ensure that the identified transmission upgrades do not result in new congestion within the study area
  - Generation and Load Scaling Sensitivity Analyses
    - Planning Guide Section 3.1.3(4)
  - Subsynchronous Resonance (SSR) Assessment
    - Nodal Protocol Section 3.22.1.3(2)
  - Cost estimates and feasibility assessments will be requested from Oncor

Deliverables

- Tentative Timelines
  - Status updates at future RPG meetings
  - Final recommendation – End of Q4 2024

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