



TNMP – Silverleaf and Cowpen 345/138-kV Stations Project ERCOT Independent Review Status Update

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RPG Meeting
Oct 18, 2023

Recap

- TNMP submitted the Silverleaf and Cowpen 345/138-kV Stations Project for Regional Planning Group (RPG) review in May 2023
 - This Tier 1 project is estimated to cost \$299 million and will require Certificate of Convenience and Necessity (CCN) filings
 - Estimated in-service date
 - June 2027
 - Addresses both thermal overloads and voltage violations in the Reeves and Ward Counties in the Far West weather zone
 - TNMP has expressed need for “critical status designation”
- TNMP provided an overview presentation at the July RPG Meeting
 - <https://www.ercot.com/calendar/07182023-RPG-Meeting>
- ERCOT presented the study scope at the July RPG Meeting and then status update for project need and study options at the September RPG Meeting
 - <https://www.ercot.com/calendar/07182023-RPG-Meeting>
 - <https://www.ercot.com/calendar/09192023-RPG-Meeting>

Recap - Study Assumptions

- Final 2022 Regional Transmission Planning (RTP) 2027 summer peak case for West and Far West (WFW) weather zones was used as the start case
- Transmission updates
 - Newly added the Tier 4 TPIT # 76348 of upgrading the existing Pig Creek to Foxtail 138-kV line #1 and #2 with in-service date of summer 2026
 - Newly added the Tier 4 TPIT #77320 of adding capacitor banks (total 160 Mvar) at Coyanosa (38380) 138-kV substation with in-service date of summer 2026
- Generation updates
- Load updates
 - Loads in the Far West weather zone was reviewed and updated to reflect the load level in the 2023 RTP

	Load (MW)
Far West Total	14,349
Far West Large Flexible Load (LFL)	3,959

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

Contingency Category	Thermal Overloads	# of Unsolved Contingencies
N-0 (P0)	Two 345/138-kV transformers, 1.96 miles of 138-kV line	0
N-1 (P1, P2-1, P7)	2.95 miles of 138-kV line	0
G-1+N-1 (P3)	0.56 miles of 138-kV line	1
X-1+N-1 (P6-2)	Three 345/138-kV transformers, 2.60 miles of 138-kV line	0
Total	Five 345/138-kV transformers, 8.07 miles of 138-kV line	1

Recap - Upgrades Included for All Options

- Placeholder Transmission Upgrade
 - Upgrade the existing Rio Pecos to Girvin 138-kV circuit 2 (~ 0.53 miles) to 717 MVA

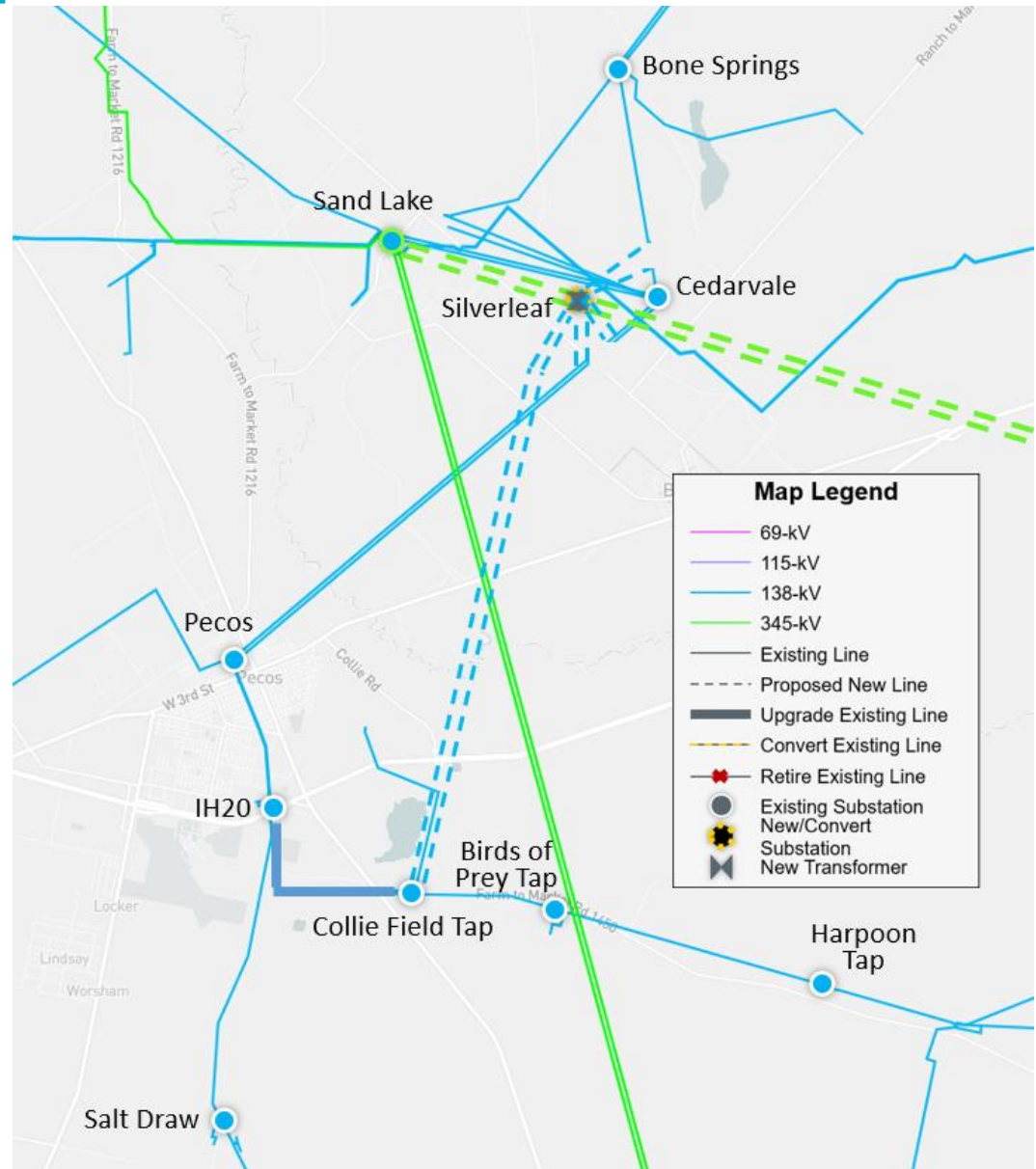
Recap - Option 1 - Proposed Project by TNMP

- Add a new 345-kV New Substation 1, nearby existing Cedarvale station, by cutting into the planned North McCamey – Sand Lake 345-kV double-circuit line
- Add a new 345/138-kV Silverleaf station, nearby New Substation 1, with three transformers, connecting to the New Substation 1 via three 345-kV tie lines
- Loop the existing Cedarvale – Pecos 138-kV line #1 and #2, and Cedarvale – Bone Springs 138-kV line into the new Silverleaf station
- Add a new 345-kV New Substation 2, ~ 13 miles away from the existing Sand Lake station, by cutting into the existing Sand Lake – Solstice 345-kV double-circuit line
- Add a new 345/138-kV Cowpen station, nearby New Substation 2, with two transformers, connecting to the nearby New Substation 2 via two 345-kV tie lines
- Loop the existing IH20 – Salt Draw 138-kV line and Birds of Prey Tap – Harpoon Tap 138-kV line into the new Cowpen station



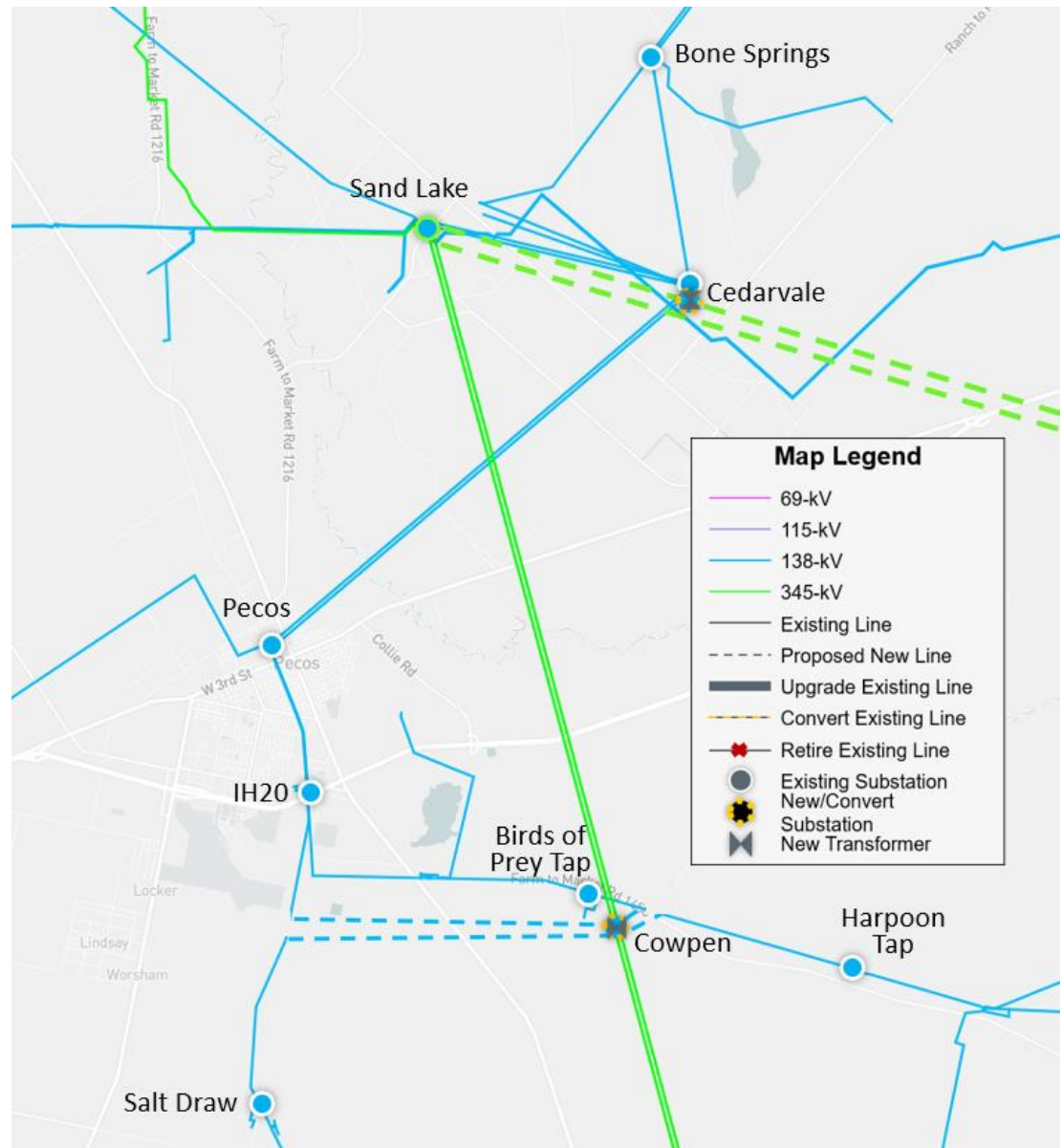
Recap - Option 2

- Add a new 345-kV New Substation 1, nearby existing Cedarvale station, by cutting into the planned North McCamey – Sand Lake 345-kV double-circuit line
- Add a new 345/138-kV Silverleaf station, nearby New Substation 1, with three transformers, connecting to the New Substation 1 via three 345-kV tie lines
- Loop the existing Cedarvale – Pecos 138-kV line #1 and #2, and Cedarvale – Bone Springs 138-kV line into the new Silverleaf station
- Add a new 138-kV double-circuit line from the new Silverleaf to Collie Field Tap
- Upgrade the existing IH20 – Collie Field Tap 138-kV line (2.95 miles)



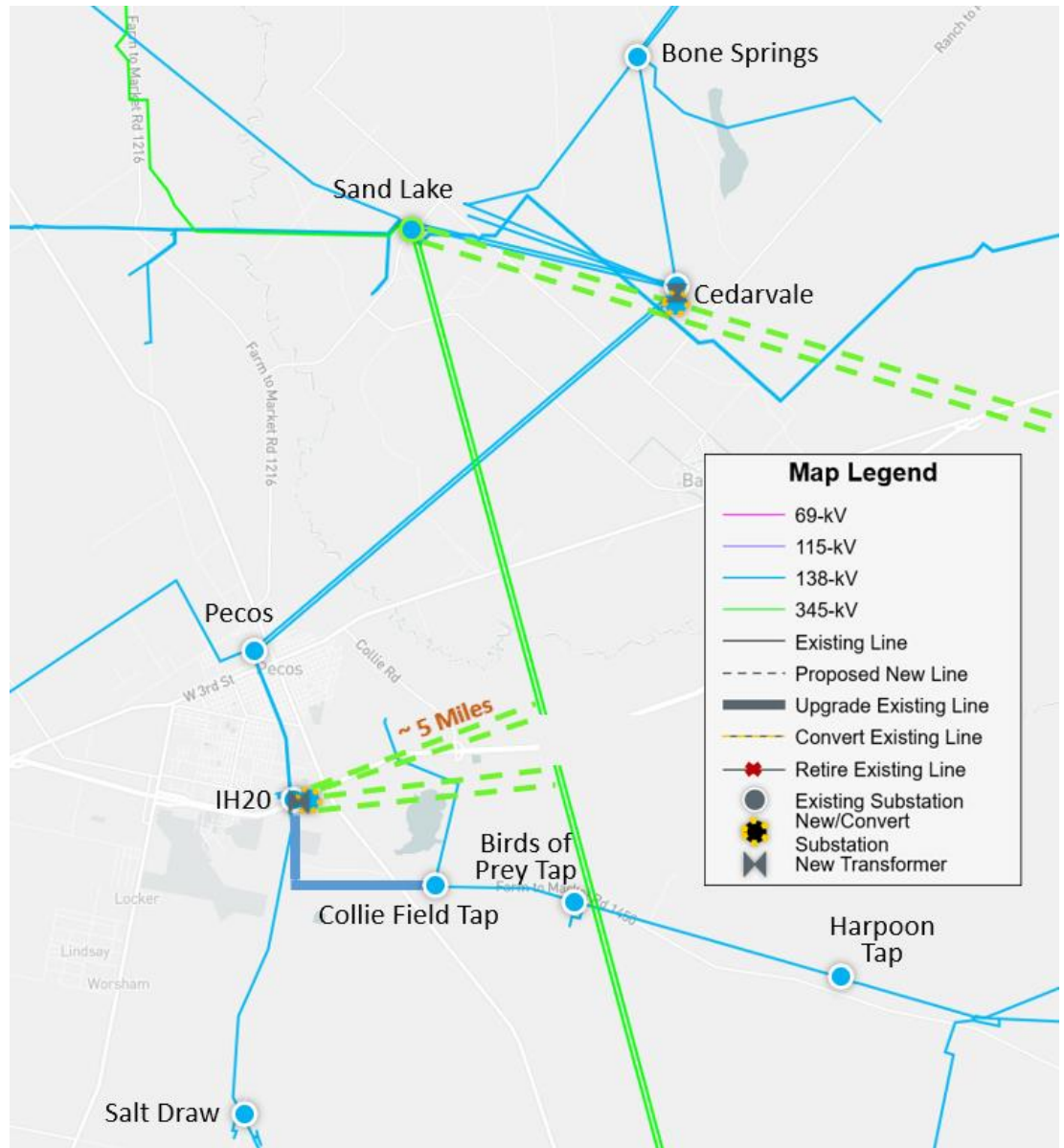
Recap - Option 3

- Expand the existing Cedarvale 138-kV station to 345/138-kV with three transformers
- Loop the planned North McCamey – Sand Lake 345-kV double-circuit line into the Cedarvale 345/138-kV station
- Add a new 345-kV New Substation 2, ~ 13 miles away from the existing Sand Lake station, by cutting into the existing Sand Lake – Solstice 345-kV double-circuit line
- Add a new 345/138-kV Cowpen station, nearby New Substation 2, with two transformers, connecting to the nearby New Substation 2 via two 345-kV tie lines
- Loop the existing IH20 – Salt Draw 138-kV line and Birds of Prey Tap – Harpoon Tap 138-kV line into the new Cowpen station



Recap - Option 4

- Expand the existing Cedarvale 138-kV station to 345/138-kV with three transformers
- Loop the planned North McCamey – Sand Lake 345-kV double-circuit line into the Cedarvale 345/138-kV station
- Expand the existing IH20 138-kV station to 345/138-kV with two transformers
- Loop the existing Sand Lake – Solstice 345-kV double-circuit line into the IH20 345/138-kV station
- Upgrade the existing IH20 – Collie Field Tap 138-kV line (2.95 miles)



Recap - Preliminary Results of Reliability Assessment – Options

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

Analysis Performed

- Long-Term Load Serving Capability Assessment
- Planned Maintenance Outage Analysis
- Cost Estimate and Feasibility Assessment

Long-Term Load Serving Capability Assessment

- The need drivers of this RPG project
 - Add additional 345/138-kV transformer capacity to meet the forecasted loads in the area
 - Both Sand Lake 345/138-kV transformers are overloaded under N-0 (P0) in the study base case
 - Riverton and Solstice 345/138-kV transformers are overloaded under X-1 + N-1 (P6-2) in the study base case
 - Provide another source to the IH20 area to address the maintenance outage issues
- The long-term load serving capability assessment is to evaluate the loadings on the 345/138-kV transformers under base case and higher load conditions to compare the performance of the four study options
 - Study base case load level
 - Higher load level which increases the loads at all 138-kV paths connecting to Sand Lake, Silverleaf/Cedarvale, and Cowpen/IH20 stations

Preliminary Results of Long-Term Load Serving Capability Assessment – Study Case Load Level

- Loadings on the 345/138-kV transformers for all four options at the study base case load level

Transformer	N-1				X-1 + N-1			
	O1	O2	O3	O4	O1	O2	O3	O4
Sand Lake	56.3	68.7	50.7	< 50	66.3	83.5	62.1	57.5
Silverleaf	< 50	65.1	N/A	N/A	65.7	86.7	N/A	N/A
Cedarvale	N/A	N/A	52.1	< 50	N/A	N/A	67.3	66.4
Cowpen	57.9	N/A	58.3	N/A	72.4	N/A	72.8	N/A
IH20	N/A	N/A	N/A	64.5	N/A	N/A	N/A	77.2
Solstice	54.3	60.3	54.0	54.1	85.6	88.0	85.6	85.7

- Overall, the loadings on the 345/138-kV transformers for Option 2 are higher than Options 1, 3, and 4 under both N-1 and X-1 + N-1 conditions

Preliminary Results of Long-Term Load Serving Capability Assessment – Higher Load Level

- Loadings on the 345/138-kV transformers with additional 700 MW of load in the area

Transformer	N-1				X-1 + N-1			
	O1	O2	O3	O4	O1	O2	O3	O4
Sand Lake	65.0	80.2	58.8	54.9	76.6	99.2	71.8	66.5
Silverleaf	56.9	75.9	N/A	N/A	75.2	100.9	N/A	N/A
Cedarvale	N/A	N/A	59.6	55.3	N/A	N/A	76.9	75.8
Cowpen	71.6	N/A	71.8	N/A	88.5	N/A	88.9	N/A
IH20	N/A	N/A	N/A	78.1	N/A	N/A	N/A	93.9
Solstice	55.7	63.3	55.5	55.7	92.3	95.7	92.7	92.7

- The loadings on Sand Lake and Silverleaf/Cedarvale 345/138-kV transformers are significantly higher for Option 2 when compared to Options 1, 3, and 4 under both N-1 and X-1 + N-1 conditions
- For Option 2, the loadings on Sand Lake 345/138-kV transformers are close to the emergency ratings, and Silverleaf 345/138-kV transformers are overloaded under X-1 + N-1 contingency conditions with additional 700 MW of load in the area

Preliminary Results of Planned Maintenance Outage Analysis

- ERCOT conducted planned maintenance outage analysis on all four options to compare relative performance of the options
 - Load level in the Far West weather zone was scaled down to 96% of the summer peak load in the study base case based on ERCOT load forecast, historical load, and ratio of residential/commercial load from TSP, in order to mimic the non-summer peak load condition
 - N-2 contingencies were tested as a proxy for N-1-1
 - Pecos County Transmission Improvement Project recently submitted by TNMP was modelled as a placeholder project in the maintenance outage evaluation
 - The transmission elements in the area of Silverleaf and Cowpen 345/138-kV Stations Project were monitored in the maintenance outage evaluation
- Planned maintenance outage analysis results for all four options

Option	Unsolved Power Flow	Thermal Overloads	Voltage Violations
1	None	0	None
2	None	0	None
3	None	0	None
4	None	2	None

Cost Estimate and Feasibility Assessment

- TSP(s) performed feasibility assessments and provided cost estimates for the study options
 - Based on input from TNMP, Options 3 and 4 are deemed infeasible due to the land use reasons

Option	Cost Estimates (\$M)	CCN Required (Miles)	Feasibility
Option 1	~ 273.3	~ 21.6	Feasible
Option 2	~ 182.8	~ 21.2	Feasible
Option 3	N/A	N/A	Not Feasible
Option 4	N/A	N/A	Not Feasible

Comparison of Study Options

	Option 1	Option 2
Meets ERCOT and NERC Reliability Criteria	Yes	Yes
Improves Long-Term Load Serving Capability	Yes (Better)	Yes
Improves Operational Flexibility	Yes	Yes
Requires CCN (miles)	~ 21.6	~ 21.2
Cost Estimate* (\$M)	~ 273.3	~ 182.8

* Cost estimates were provided by Transmission Service Providers (TSPs)

- Although Option 2 is less expensive, Option 1 provides better long-term load serving capability

Preferred Option

- Option 1 is selected as the preferred option because it
 - Addresses reliability violation
 - Improves long-term load serving capability for future load growth in the area
 - Improves operational flexibility

Next Steps and Tentative Timeline

- Additional Analyses for the Preferred Option 1
 - Congestion analysis
 - Congestion analysis is being performed using the 2022 RTP 2027 final economic case
 - Generation addition sensitivity analysis (Planning Guide (PG) Section 3.1.3 (4) (a))
 - Load scaling sensitivity analysis (PG Section 3.1.3 (4) (b))
 - Sub-Synchronous Resonance (SSR) assessment (Nodal Protocol Section 3.22.1.3)
- Tentative timeline
 - Final status update at November RPG meeting
 - EIR report to be posted in the MIS in November 2023
 - EIR recommendation to TAC in December 2023
 - Seek ERCOT Board of Directors endorsement in December 2023

Thank you!

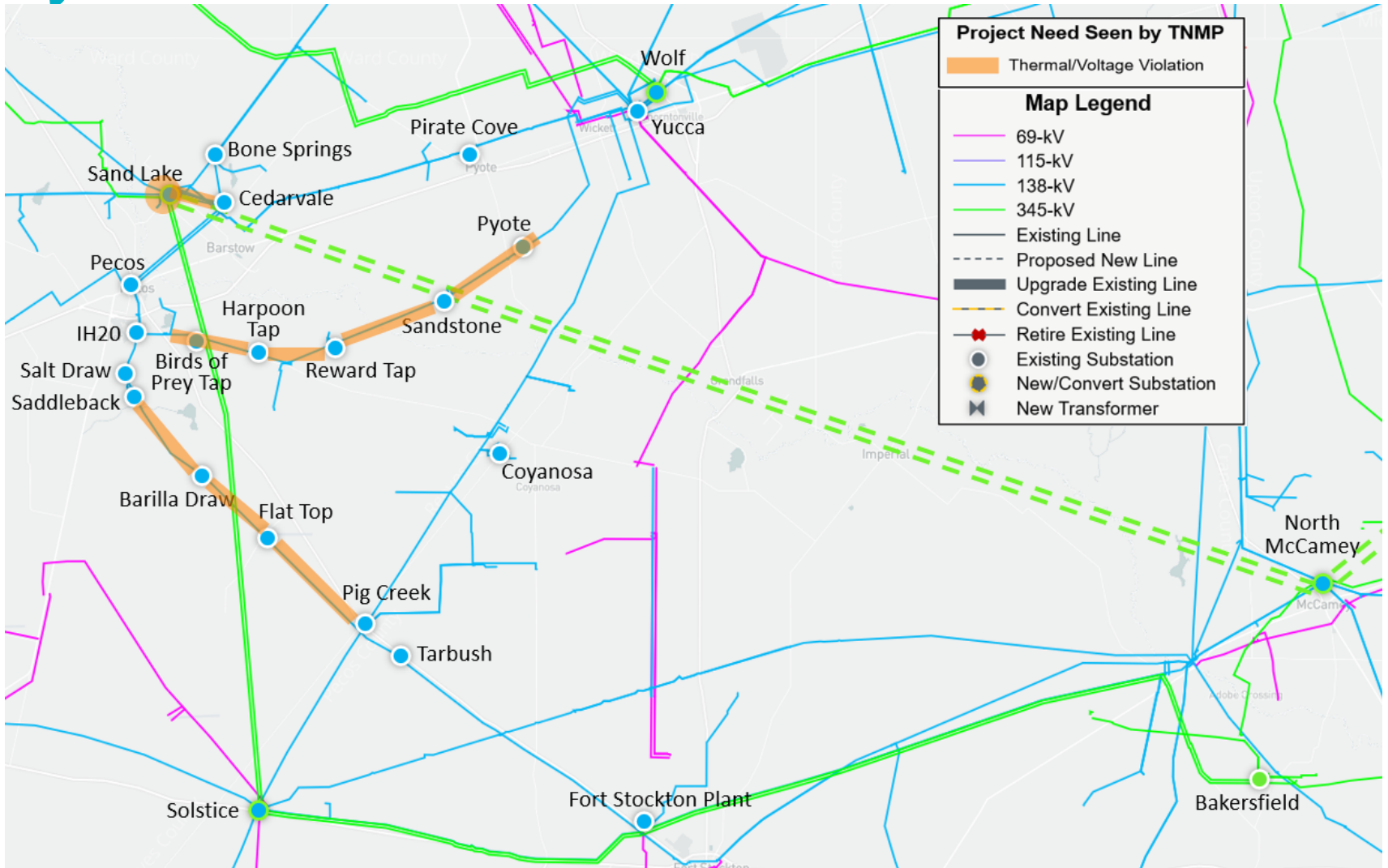


Stakeholder comments also welcomed through:

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Recap: Study Area Map with Project Need Seen by TNMP



The reliability need includes the planned maintenance outage condition

Project Need (P0, P1, P2-1, P3, P6-2, and P7) as Seen by ERCOT

