LCRA Transmission Services Corporation

RPG Review: Cooks Point

SUBSTATION AND TRANSMISSION LINE ADDITION

July 8, 2016

Prepared by:

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1 EXECUTIVE SUMMARY

1.1 RECOMMENDATION

This is a proposed project plan developed by LCRA Transmission Services Corporation (LCRA TSC). Bluebonnet Electric Cooperative (BBEC) and Bryan Texas Utilities (BTU) facilities are directly impacted and have provided information associated with this proposed project.

With the objective of providing a transmission source to a new load-serving substation, Cooks Point, the project consists of constructing a new 138-kV transmission line from the existing Lyle Wolz substation to Cooks Point and a new 138-kV tranmsission line from Cooks Point to Steele Store substation.

The recommended project (Alternative 6) completion date is May 31, 2021. The total project funding requirement is estimated at $52,085,000.

This project will require a Certificate of Convenience and Necessity (CCN) amendment from the Public Utility Commission (PUC).

1.2 PROJECT SCOPE

- Construct a 138-kV transmission line (approximately 16.7 miles) using bundled 795 ACSR Drake (440 MVA) conductor with OPGW that connects the existing Lyle Wolz substation to the new Cooks Point substation.
- Construct a 138-kV transmission line (approximately 6.1 miles) using bundled 1033 ACSR Curlew (495 MVA) conductor with OPGW that connects the existing Steele Store substation to the new Cooks Point substation. One and a half miles of the line will utilize an open position on the BTU Steele Store to Snook double-circuit capable transmission line.
- Construct a new 138-kV Cooks Point substation.

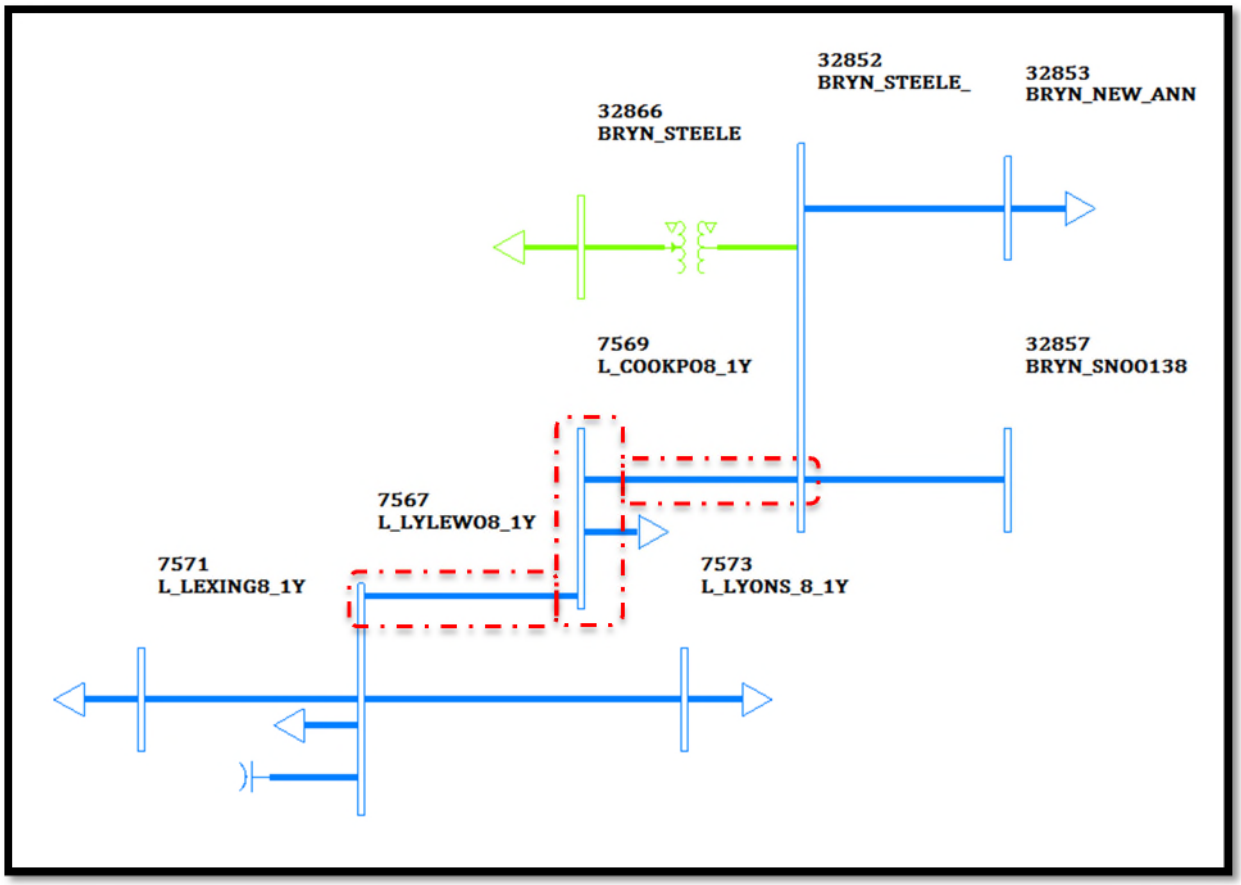

FIGURE 1: RECOMMENDED ALTERNATIVE (6) ONE-LINE DRAWING

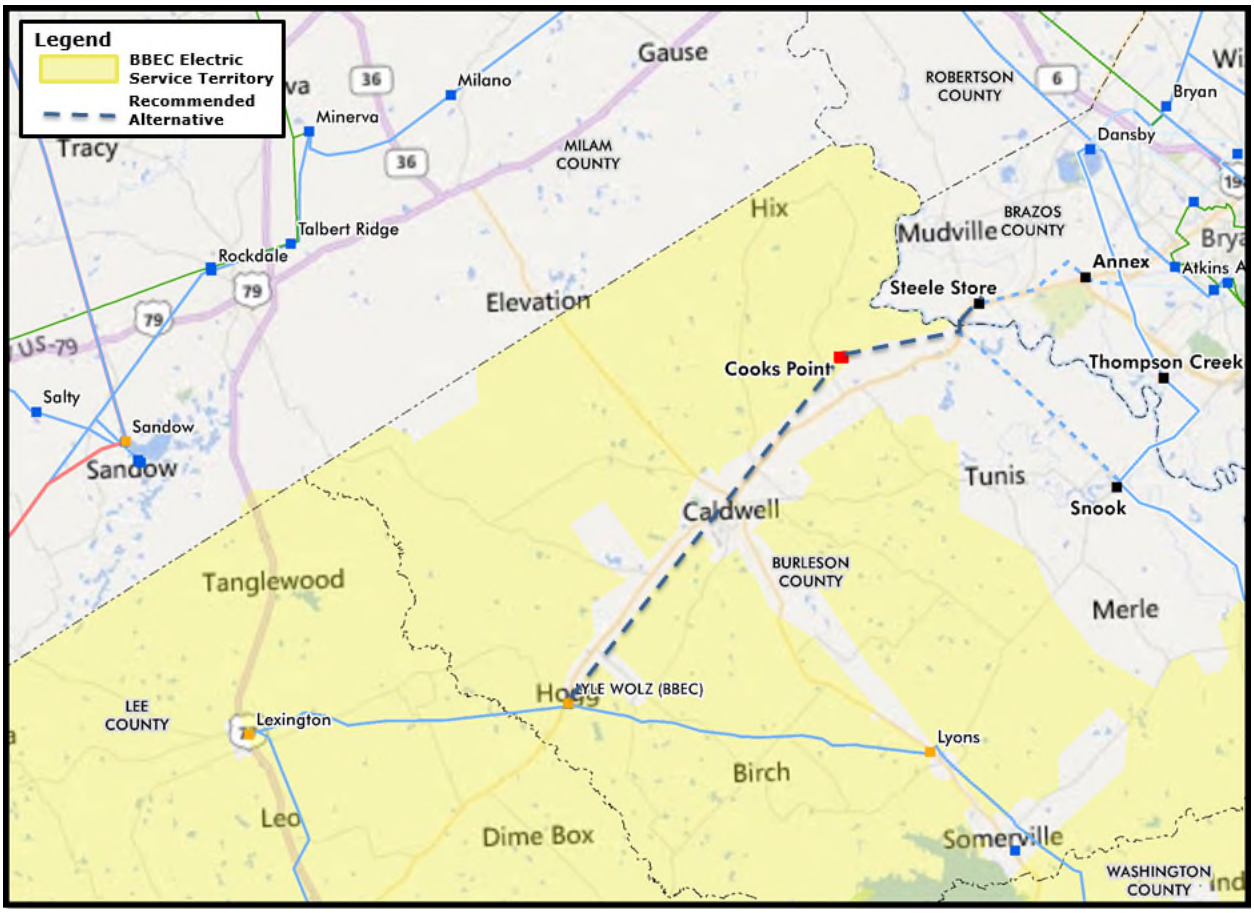

FIGURE 2: RECOMMENDED PROJECT MAP

(The dashed line representing the electrical connections of the recommended alternative is not intended to represent a physical route)

1.3 BENEFITS OF THE PROPOSED PROJECT (ALTERNATIVE 6)

- Provides the transmission infrastructure needed to reliably serve the new Cooks Point substation identified by BBEC as necessary to maintain reliable service to the northern part of Burleson County west of Highway 21;
- Adds a 138-kV networked transmission source into an area of Burleson County with no existing ERCOT transmission service which is forecasted to experience significant load additions;
- Improves the voltage performance and increases the load serving capability of the existing transmission system in Burleson County;
- Addresses all steady state and stability criteria violations (identified for this evaluation) in 2021 and 2022 using NERC P0, P1, P2.1, P3, P6.2, P7 and ERCOT Planning Guide 1, 2, and 3 reliability performance criteria;

- Reduces the risk of 101 MW of consequential load loss in the LCRA TSC/BBEC system and the risk of 60 MW of consequential load loss in the BTU system under NERC P6 contingency conditions in 2021;
- Provides for long term load growth with improvements that support area load of 240 MW more than the planned system under P1,P2.1, P7.1 NERC, and ERCOT1 contingency conditions and 140 MW more under P3 and P6.2 NERC, ERCOT2, and ERCOT3 contingency conditions than the existing LCRA TSC/BBEC transmission systems;
- Provides the transmission system the potential to serve approximately 14 MW of load at the City of Caldwell which is currently served outside of the ERCOT Market;
- Reduces operational complexities related to maintaining service during outages;
- Meets all the project needs stated above at the lowest cost.

2 BACKGROUND AND PROJECT NEED

Bluebonnet Electric Cooperative (BBEC) completed a distribution assessment which studied the impact of growth in load served by the existing BBEC Lyle Wolz and Lyons substations. Increasing demand on the BBEC's system in Burleson County, particularly due to oil and water well load growth, in conjunction with the existing customer load growth at Lyle Wolz and Lyons substations has prompted BBEC to perform their assessment.

BBEC has seen an increase in load due to oil production resulting from well development in the Eagle Ford and Woodbine formations in Burleson County over the past year. Based on the existing oil facilities, BBEC forecasts high load growth on long distribution feeders served out of Lyle Wolz and Lyons substations. A map of the potential areas of development in relation to BBEC's existing distribution system is shown below in Figure 3.

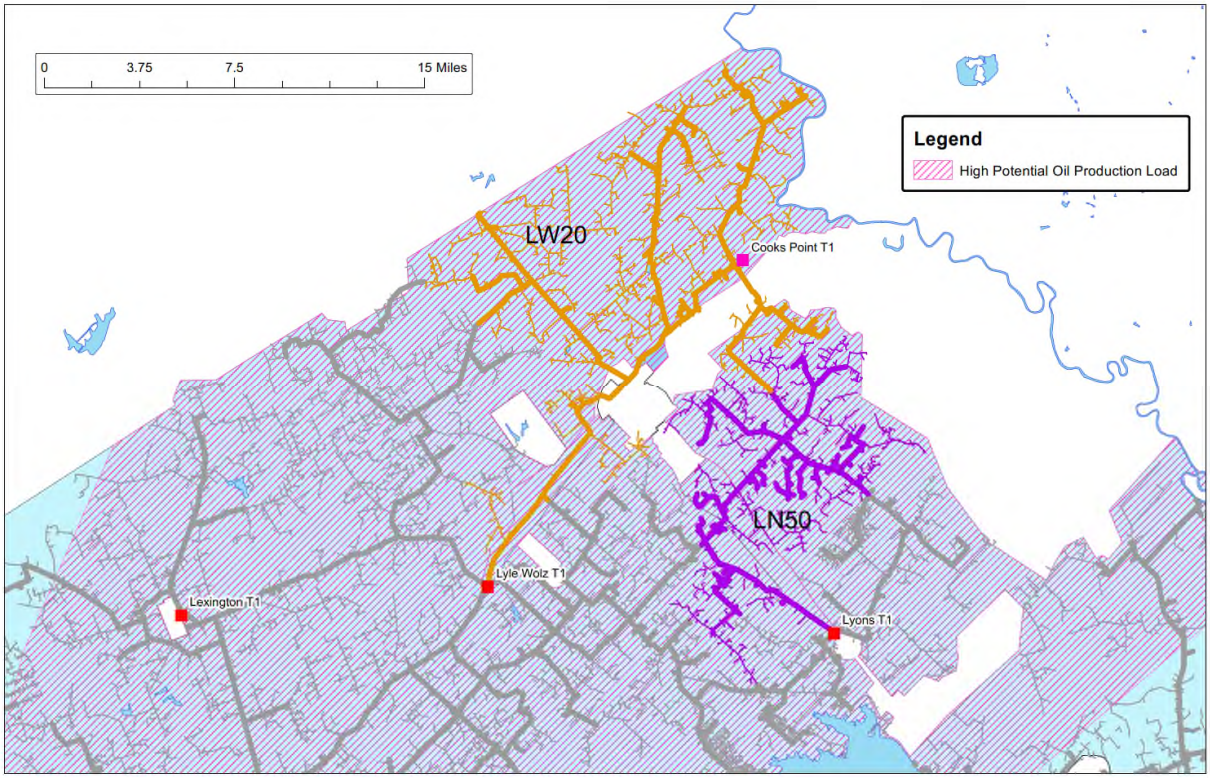

FIGURE 3: HIGH POTENTIAL OIL PRODUCTION MAP

BBEC has also indicated that this area has a high potential for ground water development and have received several requests for service to water wells to provide water from Carrizo and Simsboro Aquifers. A planned water pipeline from Burleson County to San Antonio will support delivery of water from these wells. The areas of water development in Burleson and Lee Counties is shown in Figure 4 below.

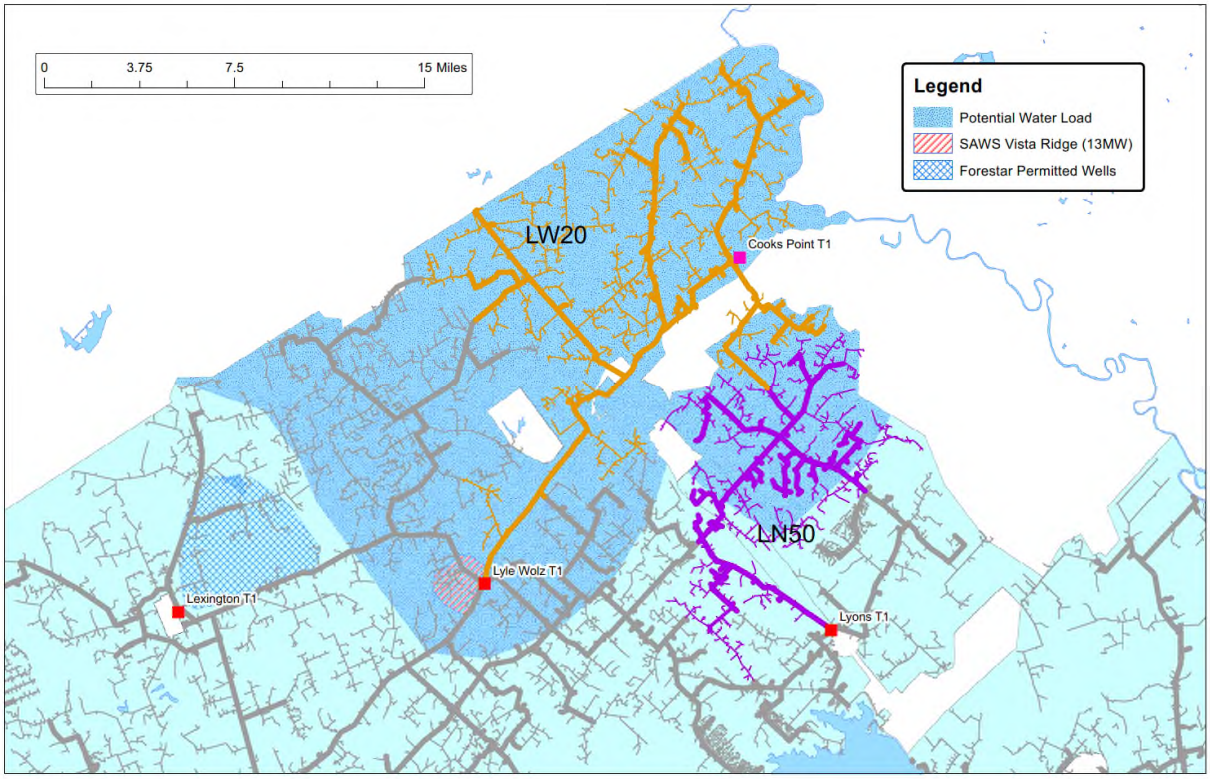

FIGURE 4: HIGH POTENTIAL GROUND WATER PRODUCTION MAP

BBEC provided the load forecast in Table 1 for the Lyle Wolz and Lyons substations based on their conservative load forecast assumptions of oil and water development.

TABLE 1: BBEC PROJECTED LOAD GROWTH IN STUDY AREA

BUS NUMER	STATION	2021		2022		2023	
		MW	MVAR	MW	MVAR	MW	MVAR
7567	Lyle Wolz	37.116	8.6180	38.277	8.891	44.389	10.417
7573	Lyons	22.454	5.351	22.703	5.41	22.958	5.471

Based on this load forecast, BBEC conducted distribution system assessments and determined that distribution systems will not be able to support forecasted load growth past 2020, even with planned distribution system upgrades. BBEC's studies conclude that a new load serving 138-kV substation in the northern part of Burleson County, North East of the City of Caldwell, near Cooks Point is the best means for meeting the load serving needs of the region.

Following a review of the distribution study with BBEC, LCRA TSC examined alternatives for serving the new substation from area transmission sources. The existing transmission system in Burleson County consists of a 138-kV transmission line, with elements owned by BBEC and LCRA TSC, which is sourced from Gay Hill substation in Washington County and from Winchester substation in Fayette County. To the north, Bryan Texas Utilities is constructing a new 138-kV transmission line to connect its Steele Store and Snook substations. An Entergy 69-kV transmission line extends through Burleson county routes near the proposed substation; however, Entergy is not part of the ERCOT system and therefore, interconnections involving upgrades to the existing Entergy transmission system were not considered as an alternative for serving BBEC's system load. These transmission facilities are illustrated in Figure 5.

BBEC provided the forecast in Table 2 for substations in Burleson County with the addition of Cooks Point.

TABLE 2: BBEC PROJECTED LOAD GROWTH IN STUDY AREA

BUS NUMER	STATION	2021		2022		2023	
		MW	MVAR	MW	MVAR	MW	MVAR
7569	Cooks Point	15.34	3.845	15.363	3.85	20.387	5.109
7567	Lyle Wolz	32.455	7.438	33.549	7.706	34.644	7.975
7573	Lyons	11.825	2.818	12.068	2.876	12.316	2.935

In addition to the BBEC distribution system needs, LCRA TSC has identified high transmission loadings and voltage deviation violations related to the increased load forecast on the Burleson/Lee County 138-kV transmission loop.

2.1 RELEVANT TRANSMISSION PLANNING CRITERIA

- Section(s) III.B.2 of the LCRA TSC Transmission System Planning Criteria – "Reliability to radial-supplied station(s), exceeding 20MW of peak load, shall be addressed by the most technically and economically feasible of the alternatives described below."
- Section(s) III.A.4 of the LCRA TSC Transmission System Planning Criteria – "For NERC single element contingencies, the transient voltage at load serving buses shall recover to a minimum of 0.92 per unit voltage within 90 cycles after normal fault clearing."

- Section(s) 4 of the Electric Reliability Council of Texas (ERCOT) Planning Guide
- North American Electric Reliability Corporation (NERC) Standard(s) TPL 001-4

2.2 AREA MAP

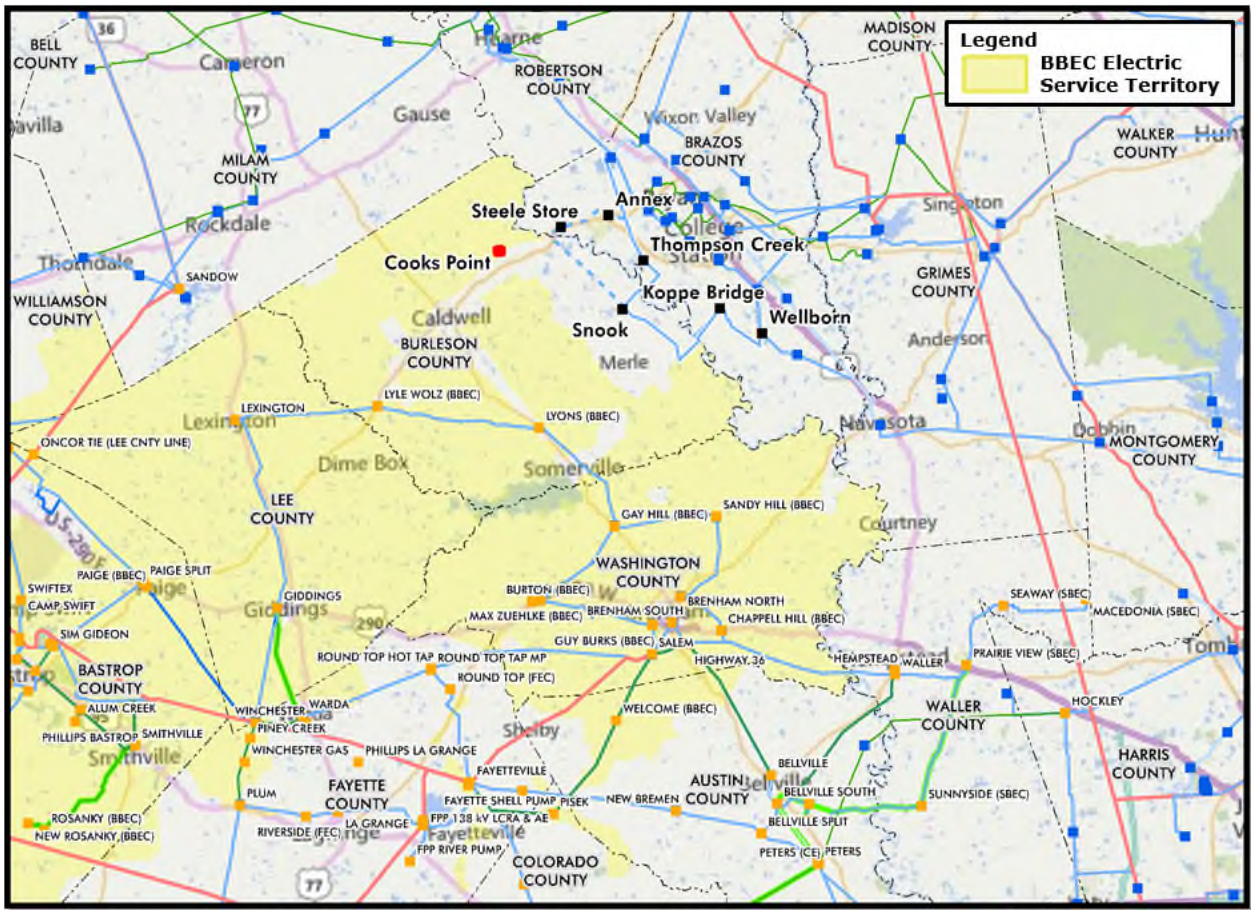

FIGURE 5: AREA MAP

2.3 ALTERNATIVES EVALUATED

Six alternatives for providing transmission service to one new substation near the forecasted load growth areas are included in this assessment. Cooks Point is forecasted to have a non-coincident peak forecast of 20.4 MW by 2023. LCRA TSC's Transmission System Planning Criteria states, "No more than twenty (20) MW of peak load shall be interrupted for an event resulting in the loss of a single element, except when the event is the failure of a single power transformer with

a peak load greater than 20 MW." Therefore, all alternatives studied in this analysis provide two transmission sources to the Cook's Point Substation.

Table 3 below summarizes the scope and cost for each alternative.

TABLE 3: ALTERNATIVE SCOPE AND COST SUMMARY

(Cost Estimates include a 15% addition to the straight-line distance presented in the table below)

Alternative	Alternative Scope	Cost in Millions ($)
1	• Construct a Substation in Northern Burleson County called Cooks Point. • Construct two 4.58-mile single circuit 138-kV transmission lines from the Steele Store to Snook 138-kV transmission line with 1033 bundled ACSR Curlew (495 MVA).	22.7
2	• Construct a Substation in Northern Burleson County called Cooks Point. • Construct a 16.7-mile single circuit 138-kV transmission line from Lyle Wolz to Cooks Point 138-kV transmission line with bundled 795 ACSR Drake (440 MVA). • Construct a 21.8-mile single circuit 138-kV transmission line from Minerva to Cooks Point with bundled 795 ACSR Drake (440 MVA).	85.7
3	• Construct a Substation in Northern Burleson County called Cooks Point. • Construct a 16.7-mile single circuit 138-kV transmission line from Lyle Wolz to Cooks Point 138-kV transmission line with bundled 795 ACSR Drake (440 MVA). • Construct a 27.2-mile single circuit 138-kV transmission line from Sandow to Cooks Point with bundled 795 ACSR Drake (440 MVA).	96.7
4	• Construct a Substation in Northern Burleson County called Cooks Point. • Construct a 5.6-mile single circuit 138-kV transmission line from Steele Store to Cooks Point 138-kV transmission line with bundled 1033 ACSR Curlew (495 MVA). • Construct a 21.8-mile single circuit 138-kV transmission line from Minerva to Cooks Point with bundled 795 ACSR Drake (440 MVA).	62.7
5	• Construct a Substation in Northern Burleson County called Cooks Point. • Construct a 5.6-mile single circuit 138-kV transmission line from Steele Store to Cooks Point 138-kV transmission line with bundled 1033 ACSR Curlew (495 MVA). • Construct a 27.2-mile single circuit 138-kV transmission line from Sandow to Cooks Point with bundled 795 ACSR Drake (440 MVA).	73.9
6	• Construct a Substation in Northern Burleson County called Cooks Point. • Construct a 6.1-mile single circuit 138-kV transmission line from Steele Store to Cooks Point 138-kV transmission line with bundled 1033 ACSR Curlew (495 MVA). 1.5 miles of the line will use an open position on the BTU Steele Store to Snook transmission line. • Construct a 16.7-mile single circuit 138-kV transmission line from Lyle Wolz to Cooks Point 138-kV transmission line with bundled 795 ACSR Drake (440 MVA).	52.1

Alternatives that connect the new transmission line at Lyons substation were considered but are not shown above because of the need to acquire new property in order to terminate a new transmission line into the substation. In addition, the ability to expand Lyons is limited by roads and structures located on properties adjacent to the substation.

The construction of a new line from Lyle Wolz to Cooks Point to Snook was also studied but is not presented as an alternative because it is electrically similar to the recommended alternative, provides no additional performance benefits, and would require approximately 7 more transmission line miles on new right of way than the recommended alternative.

3 ASSESSMENT FINDINGS

3.1 CONTINGENCY ANALYSIS

The evaluation of the transmission alternatives consisted of evaluating the impact to area transmission facilities in 2021 and 2022 resulting from the addition of each alternative. LCRA TSC Transmission System Planning Criteria applicable to the evaluation are shown in the table below.

TABLE 4: PERFORMANCE CRITERIA

Type	Condition	Criteria
Thermal Loading	Pre-contingency	Not exceed 100% of Rate A
Thermal Loading	Post contingency	Not exceed 100% of Rate B
Steady State Voltage	Pre-contingency	Not below 0.95 V(PU) Not exceed 1.05 V(PU)
Steady State Voltage	Post contingency	Not below 0.92 V(PU) Not exceed 1.05 V(PU)
Steady State Voltage Deviation	Post contingency at 3 or more buses	Not exceed 7% change

STEADY STATE THERMAL RESULTS

The following, Table 5, summarizes the reliability performance results of the NERC P0, P1, P2.1, P3, P6.2 (345/138-kV Autos only), P7, ERCOT1, ERCOT2, and ERCOT3 contingencies for each evaluated alternative.

Alternatives 1, 4, 5 and 6 provide load relief for the Lyle Wolz to Gay Hill 138-kV transmission line (T349).

Alternative 3 causes a thermal violation on T346 between Lyle Wolz and Lyons under P3 (G-1 + N-1) contingencies.

Alternatives 2 and 3 increase line flows through the Sandy Hill to Gay Hill 138-kV transmission line (T350) from 79% to over 90% of the line's emergency rating. No thermal violations were found on the Bryan Texas Utility system for any of the alternatives studied.

TABLE 5: 2021/2022 SUMMARY NERC P0, P1, P2.1, P3, P6.2, P7

(See Appendix A for contingency categories associated with these loading percentages)

MONITORED ELEMENT	RATEA	RATEB	% Loading of Rate B						
			BASE CASE	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6
7567 L_LYLEWO8_1Y138.00 7573 L_LYONS_8_1Y138.00 1	128	128	79.9	74.9	86.2	104.1	74.9	74.9	74.9
7572 L_GAYHIL8_1Y138.00 7573 L_LYONS_8_1Y138.00 1	128	128	98.4	84.4	76.9	94.7	84.4	84.4	65.5
7570 L_SANDHI8_1Y138.00 7572 L_GAYHIL8_1Y138.00 1	128	128	79.0	81.4	91.8	96.6	81.4	81.4	86.2
7565 L_MAXZUE8_1Y138.00 7572 L_GAYHIL8_1Y138.00 1	128	128	94.1	89.1	69.3	61.8	89.1	89.1	84.5
7306 L_WINCHE8_1Y138.00 7310 L_SIMGID8_1Y138.00 1	193	193	90.4	89.0	74.0	69.3	89.0	89.0	77.5

STEADY STATE VOLTAGE RESULTS

Analysis of the base case shows that under a P1 (N-1) contingency, voltage deviations occur at three buses on the Burleson/Lee County 138-kV loop. All the tested alternatives resolve the deviation issue; however, alternatives 2, 3, and 6 provide long-term relief. Voltage violations seen in the Base Case will re-emerge in alternatives 1, 4 and 5 when loads at the existing stations on the Burleson/Lee County 138-kV loop reach 2021 levels. Note that alternatives 4 and 5 add new overlapping single contingencies that add significant load to the existing BTU and BBEC transmission systems and results in poor voltage performance under peak load conditions.

TABLE 6: 2021/2022 VOLTAGE DEVIATION GREATER THAN 7% (FOR 3 BUSES OR GREATER)

MONITORED BUS	NERC CATEGORY	ERCOT PLANNING GUIDE	CONTINGENCY DESCRIPTION	BASE CASE	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6
7302 L_GIDDIN8_1Y138.00	P1.2	N/A	(B2B) - T222 GIDDINGS - WINCHESTER	-0.082	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved
7568 L_LINCOL8_1Y138.00	P1.2	N/A	(B2B) - T222 GIDDINGS - WINCHESTER	-0.080	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved
7571 L_LEXING8_1Y138.00	P1.2	N/A	(B2B) - T222 GIDDINGS - WINCHESTER	-0.077	Resolved	Resolved	Resolved	Resolved	Resolved	Resolved

Under NERC P6 (Overlapping Single) N-1-1 contingency analysis, voltage violations were identified in the Base Case and Alternatives 1, 4, and 5.

TABLE 7: 2021/2022 SUMMARY NERC P6 OVERLAPPING SINGLE VOLTAGE VIOLATION SUMMARY

MONITORED BUS	WORST VOLTAGE (PU)							NUMBER OF VIOLATIONS						
	BASE CASE	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6	BASE CASE	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6
7302 L_GIDDIN8_1Y138.00	0.812	0.858	> 0.92	> 0.92	0.858	0.858	> 0.92	24	13	0	0	13	13	0
7565 L_MAXZUE8_1Y138.00	0.878	0.910	> 0.92	> 0.92	0.911	0.911	> 0.92	6	4	0	0	4	4	0
7567 L_LYLEWO8_1Y138.00	0.824	0.875	> 0.92	> 0.92	0.875	0.876	> 0.92	33	14	0	0	14	14	0
7568 L_LINCOL8_1Y138.00	0.812	0.864	> 0.92	> 0.92	0.864	0.864	> 0.92	38	17	0	0	17	17	0
7570 L_SANDHI8_1Y138.00	0.918	> 0.92	> 0.92	> 0.92	> 0.92	> 0.92	> 0.92	2	0	0	0	0	0	0
7571 L_LEXING8_1Y138.00	0.813	0.867	> 0.92	> 0.92	0.867	0.867	> 0.92	40	17	0	0	17	17	0
7572 L_GAYHIL8_1Y138.00	0.882	0.914	> 0.92	> 0.92	0.914	0.915	> 0.92	8	2	0	0	2	2	0
7573 L_LYONS_8_1Y138.00	0.849	0.893	> 0.92	> 0.92	0.893	0.893	> 0.92	22	8	0	0	8	8	0

CONSEQUENTIAL LOAD LOSS CONSIDERATIONS

Under the 2021 base case system configuration, there are two worst case conditions where the LCRA TSC and Bryan Texas Utilities system can expect to see consequential load loss between 23 MW and 113 MW during peak load periods. These conditions are anticipated for an outage on any of the lines in the contingency combination listed in Tables 8 and 9 below.

TABLE 8: 2021 LCRA TSC/BBEC P6 CONTINGENCY LOAD LOSS CONDITIONS

FIRST CONTINGENCY DESCRIPTION	SECOND CONTINGENCY DESCRIPTION	BASE CASE		ALT1,4,5		ALT2,3,6	
		Total Load Loss (MW)	Stations Lost	Total Load Loss (MW)	Stations Lost	Total Load Loss (MW)	Stations Lost
(B2B) - T222 GIDDINGS – WINCHESTER	(B2B) - T349 LYLE WOLZ – GAY HILL	113	5	98	5	12	1
(B2B) - T638 GIDDINGS – LINCOLN	(B2B) - T349 LYLE WOLZ – GAY HILL	79	4	64	4	12	1

TABLE 9: 2021 BTU P6 CONTINGENCY LOAD LOSS CONDITIONS

FIRST CONTINGENCY DESCRIPTION	SECOND CONTINGENCY DESCRIPTION	BASE CASE		ALT1,2,3		ALT4,5,6	
		Total Load Loss (MW)	Stations Lost	Total Load Loss (MW)	Stations Lost	Total Load Loss (MW)	Stations Lost
ANNEX 138 TO DANSBY	GP TO WBRN	60	8	75	9	0	0
ANNEX 138 TO DANSBY	KOPPE BRIDGE TO WELLBORN	39	5	54	6	0	0
ANNEX 138 TO DANSBY	KB TO SNOOK	23	4	39	5	0	0

Alternative 6 reduces the maximum amount of consequential load loss under these contingency combinations to 12 MW as it provides a third 138-kV source into both the LCRA TSC/BBEC and BTU transmission systems. While the other alternatives may provide benefits to one of these conditions, they do not resolve the possibility of significant load loss for both systems. The loads subject to load loss resulting from P6

contingencies in Table 8 and 9 are served at the remote edges of the area transmission systems and the recommended alternative provides ability to resolve these conditions.

Alternatives for connecting Cooks Point to the Oncor system at Minerva or Sandow were considered for providing consequential load loss benefits to Oncor's system. However, options for connecting Cooks Point to the BBEC Lyle Wolz substation provided greater benefits to reducing consequential load loss associated with P6 contingencies (101 MW reduction for Lyle Wolz connections versus 24 MW reduction for connections to Minerva and no reduction for connections to Sandow), therefore alternative 6 provides the largest benefit for reducing consequential load loss over all the alternatives studied.

CITY OF CALDWELL SENSITIVITY

A sensitivity case with 14 MW[1] of load added to the steady state study between Lyle Wolz and Cooks Point was tested. This sensitivity only applies to alternatives 2, 3, and 6 since they contain transmission additions with the potential to pass near the City of Caldwell. No additional thermal or voltage violations were identified.

3.2 SENSITIVITY ANALYSIS

The following results under NERC P0, P1, P2.1 and P7.1 category contingencies illustrate each alternative's ability to support long-term load growth in Brazos, Burleson, Lee and Washington Counties. This analysis was completed using the last year in study (2022) with total Brazos County load levels at 646 MW and Burleson/Lee/Washington county load levels at 266 MW. The analysis revealed that thermal violations on existing transmission facilities would occur before wide-spread voltage violations or voltage collapse. Table 10 below shows alternatives 1, 4, and 5 have the capability to serve up to 50 MW of load growth and alternatives 2 and 6 have the capability to serve from 240 to 270 MW of load growth above the 2022 load projections in Burleson, Lee and Washington Counties under these N-1 conditions. The thermal violations on

[1] The present non-coincident peak load provided by the City of Caldwell.

Lyle Wolz to Lyons, found in Table 5, rule out alternative 3 as a viable solution and was therefore excluded from the sensitivity analysis

TABLE 10: 2022 LCRA TSC/BBEC SYSTEM NERC P1 AND P7 MW INCREASE LIMIT RESULTS

ALTERNATIVE	CONTINGENCY DESCRIPTION	NERC CATEGORY	MW INCREASE LIMIT[2]	LIMIT TYPE
BASECASE	(B2B) - T222 GIDDINGS - WINCHESTER	P1	10	THERMAL
ALT1	(B2B) - T222 GIDDINGS - WINCHESTER	P1	50	THERMAL
ALT2	(B2B) - T211 FAYETTE POWER PLANT YARD #1 - SALEM	P1	270	THERMAL
ALT4	(B2B) - T222 GIDDINGS - WINCHESTER	P1	50	THERMAL
ALT5	(B2B) - T222 GIDDINGS - WINCHESTER	P1	50	THERMAL
ALT6	(B2B) - T211 FAYETTE POWER PLANT YARD #1 - SALEM	P1	240	THERMAL

In addition, A-1 and G-1 initial conditions were evaluated followed by the N-1 contingency set (NERC P0, P1, P2.1 and P7.1). Alternatives 2 and 6 provide the longest term thermal loading benefits to the LCRA TSC and BBEC transmission system. The limiting contingency and initial condition are shown in Table 11 below.

TABLE 11: 2022 LCRA TSC/BBEC SYSTEM NERC P3 AND P6.2 MW INCREASE LIMIT RESULTS

ALTERNATIVE	CONTINGENCY DESCRIPTION	NERC CONTINGENCY	LIMITING INITIAL CONDITION	MW INCREASE LIMIT[3]	LIMIT TYPE
BASECASE	(B2B) - T222 GIDDINGS - WINCHESTER	P1	N/A	10	THERMAL
ALT1	(B2B) - T211 FAYETTE POWER PLANT YARD #1 - SALEM	P1	GIDEON-N3	50	THERMAL
	(B2B) - T222 GIDDINGS - WINCHESTER	P1	N/A	50	THERMAL
ALT2	(B2B) - T211 FAYETTE POWER PLANT YARD #1 - SALEM	P1	GIDEON-N3	170	THERMAL

[2] MW increases in the study area load assumed a 0.97 lagging power factor

ALTERNATIVE	CONTINGENCY DESCRIPTION	NERC CONTINGENCY	LIMITING INITIAL CONDITION	MW INCREASE LIMIT[3]	LIMIT TYPE
ALT4	(B2B) - T211 FAYETTE POWER PLANT YARD #1 - SALEM	P1	GIDEON-N3	50	THERMAL
	(B2B) - T222 GIDDINGS - WINCHESTER	P1	N/A	50	THERMAL
ALT5	(B2B) - T222 GIDDINGS - WINCHESTER	P1	N/A	50	THERMAL
ALT6	(B2B) - T211 FAYETTE POWER PLANT YARD #1 - SALEM	P1	GIDEON-N3	140	THERMAL

3.3 TRANSIENT VOLTAGE RECOVERY

The ability of the area transmission system to meet LCRA TSC's transient voltage recovery criteria was also analyzed. The analysis shows that voltage at Giddings, Lexington, Lincoln, Lyle Wolz and Lyons Substations will not meet the LCRA TSC and ERCOT voltage recovery criteria following a three phase fault event on the Giddings to Winchester line (NERC P1) in the base case, see Chart 1 below. Alternatives 2, 3 and 6 provide a third source into Lyle Wolz substation which improves the transient voltage recovery of the 138-kV stations in Burleson and Lee Counties (shown in Chart 3). Alternatives 1, 4, and 5 improve the voltage response by reducing the total load on the Burleson/Lee county loop; however, these alternatives do not resolve the voltage recovery issue to a level within the voltage recovery criteria (shown in Chart 2).

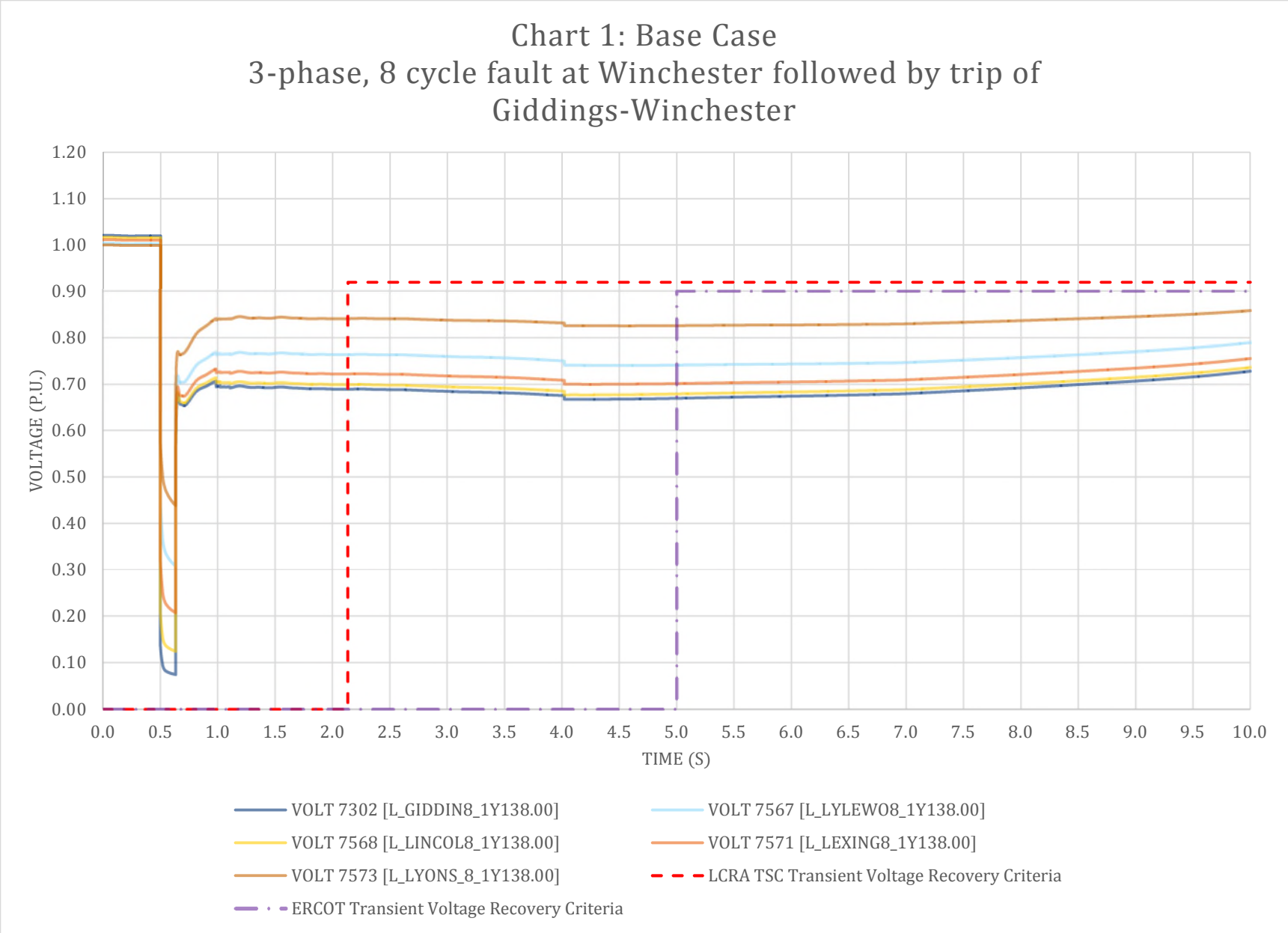
Chart 1: Base Case
3-phase, 8 cycle fault at Winchester followed by trip of Giddings-Winchester
VOLTAGE (P.U.)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
TIME (S)
VOLT 7302 [L_GIDDIN8_1Y138.00]
VOLT 7567 [L_LYLEWO8_1Y138.00]
VOLT 7568 [L_LINCOL8_1Y138.00]
VOLT 7571 [L_LEXING8_1Y138.00]
VOLT 7573 [L_LYONS_8_1Y138.00]
LCRA TSC Transient Voltage Recovery Criteria
ERCOT Transient Voltage Recovery Criteria

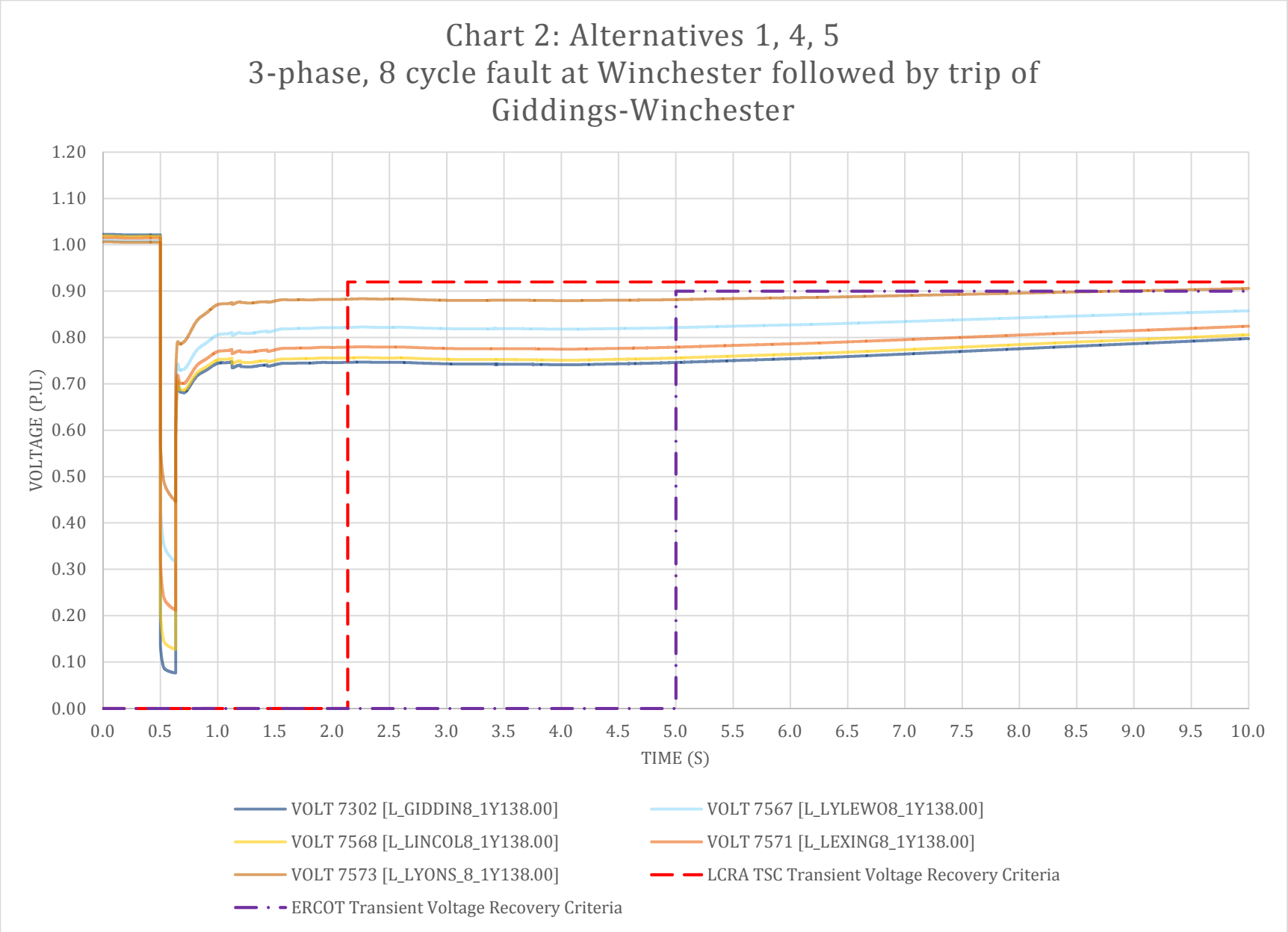
Chart 2: Alternatives 1, 4, 5
3-phase, 8 cycle fault at Winchester followed by trip of Giddings-Winchester
VOLTAGE (P.U.)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
TIME (S)
VOLT 7302 [L_GIDDIN8_1Y138.00]
VOLT 7567 [L_LYLEWO8_1Y138.00]
VOLT 7568 [L_LINCOL8_1Y138.00]
VOLT 7571 [L_LEXING8_1Y138.00]
VOLT 7573 [L_LYONS_8_1Y138.00]
LCRA TSC Transient Voltage Recovery Criteria
ERCOT Transient Voltage Recovery Criteria

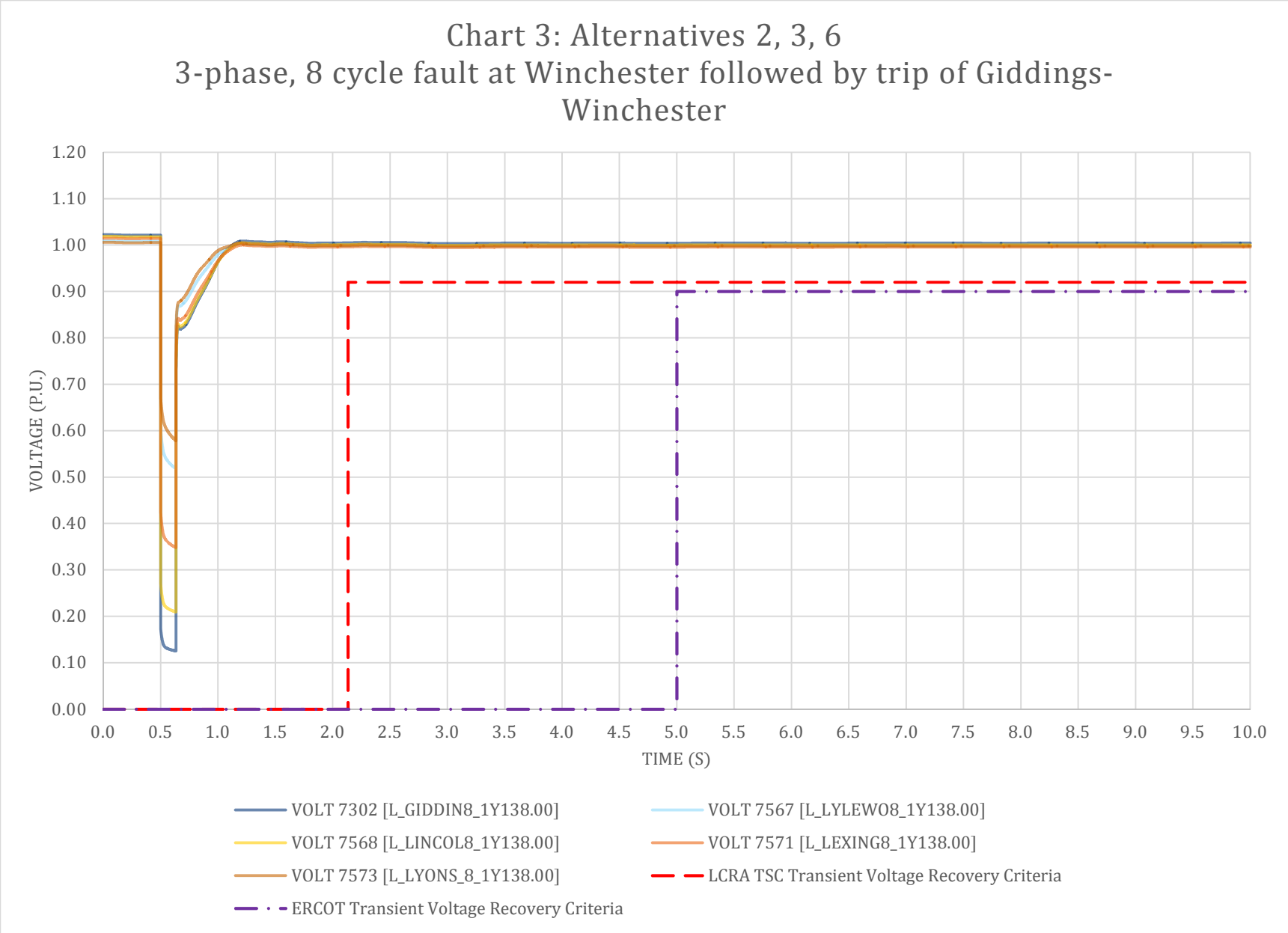
Chart 3: Alternatives 2, 3, 6
3-phase, 8 cycle fault at Winchester followed by trip of Giddings-Winchester
VOLTAGE (P.U.)
1.20
1.10
1.00
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
5.0
5.5
6.0
6.5
7.0
7.5
8.0
8.5
9.0
9.5
10.0
TIME (S)
VOLT 7302 [L_GIDDIN8_1Y138.00]
VOLT 7567 [L_LYLEWO8_1Y138.00]
VOLT 7568 [L_LINCOL8_1Y138.00]
VOLT 7571 [L_LEXING8_1Y138.00]
VOLT 7573 [L_LYONS_8_1Y138.00]
LCRA TSC Transient Voltage Recovery Criteria
ERCOT Transient Voltage Recovery Criteria

3.4 SUMMARY OF ALTERNATIVE BENEFITS

The following Table 12 is a summary of the overall system benefits for each alternative evaluated. Alternative 6 is the recommended solution because it provides the best long-term effectiveness / system benefit to meet the stated need.

TABLE 12: SUMMARY OF ALTERNATIVE BENEFITS

ALT	Alternative Name	Looped Transmission Service	Potential Infrastructure to serve City of Caldwell	Addresses Load Loss Concerns (Table 8 and 9)	Meets Voltage Recovery Criteria	Long Term Growth Benefits	Cost in Millions($)
1	Steele Store to Cooks Point; Cooks Point to Snook	YES	NO	NO	NO	NO	22.7
2	Lyle Wolz to Cooks Point; Cooks Point to Minerva	YES	YES	NO	YES	YES	85.7
3	Lyle Wolz to Cooks Point; Cooks Point to Sandow	YES	YES	NO	YES	NO	96.7
4	Steele Store to Cooks Point; Cooks Point to Minerva	YES	NO	NO	NO	NO	62.7
5	Steele Store to Cooks Point; Cooks Point to Sandow	YES	NO	NO	NO	NO	73.9
6	Lyle Wolz to Cooks Point; Cooks Point to Steele Store	YES	YES	YES	YES	YES	52.1

4 CONCLUSION

Construction of a new 138-kV transmission line from Lyle Wolz to a new Cooks Point Substation and continuing to the Steele Store Substation (Alternative 6) is the recommended alternative.

Alternative 1, while the lowest cost option, does not provide many benefits for system performance in the transmission system. It does not resolve transient voltage recovery issues which have been identified on the LCRA TSC/BBEC system and provides no support for long-term load growth in Burleson and Lee Counties. This alternative does not resolve the concern for consequential load loss under N-1-1 contingency conditions for 101 MW of load in the LCRA TSC/BBEC system and 75 MW of load on the BTU system. This alternative also does not address N-1-1 steady state low voltage concerns in the LCRA TSC/BBEC system. In addition, alternative 1 does not provide the infrastructure to support the 14 MW of load at the City of Caldwell. This alternative does not allow BTU to operate all substations looped by its transmission system (BTU's preference), which is a disadvantage in comparison to the recommended alternative.

Alternative 2 and 3, are two of the highest cost options and do not provide system performance benefits to the transmission system comparable to the recommended alternative 6. Alternatives 2 and 3 meet the transient voltage recovery criteria. These alternatives leave high loadings (alternative 2) or overloads (alternative 3) on the Lyle Wolz to Lyons to Gay Hill transmission line. This will drive the need for additional 138-kV upgrades of approximately 25.5 miles of transmission sooner than the recommended alternative 6. Although these options reduce consequential load loss concerns (24 MW) on Oncor's system the recommended alternative provides greater reduction in load loss (60 MW) on BTU's system.

Alternative 4 and 5, are higher cost options and do not provide system performance benefits to the transmission system comparable to the recommended alternative 6. Alternative 4 and 5 do not meet the transient voltage recovery criteria. These alternatives do not provide support for long-term load growth on the Burleson/ Lee 138-kV loop. Although these options reduce consequential load loss concerns (24 MW) on Oncor's system the recommended alternative provides greater reduction in load loss (101 MW) on the LCRA TSC/BBEC system. These alternatives also do not address N-1-1 steady state low voltage concerns in the area transmission system.

The recommended alternative (Alternative 6) provides the greatest system benefits for serving the new load at the proposed Cooks Point substation. Alternative 6 meets the LCRA TSC transient voltage recovery criteria. The proposed project will improve steady state N-1-1 voltage performance and increase the load serving capability of the existing transmission system. This recommended project reduces the risk of consequential load loss under N-1-1 contingencies for 161 MW of load in Burleson, Brazos and Lee Counties. This recommended project is the lowest cost option which can provide two geographically diverse transmission sources into Cooks Point and provide the potential to serve approximately 14 MW of load at the City of Caldwell which is currently served outside of the ERCOT Market.

5 SUPPORTING INFORMATION

1. 15SSWG_2021_SUM1_U2_Final_02232016.raw
2. 15SSWG_2022_SUM1_U2_Final_02232016.raw
3. TPITWithCost020116_022316 – Project Updates All Cases
    a. LCRA TSC Planned Projects (LCRA TSC_FY17Approved.idv)
    b. Back out of Non RPG Approved Projects (NonRPG.idv)
4. Case Changes
    a. 2021 Base Case Updates (2021_BaseCase.idv)
    b. 2022 Base Case Updates (2022_BaseCase.idv)
5. Alternatives Evaluated
    a. ALT1.idv
    b. ALT2.idv
    c. ALT3.idv
    d. ALT4.idv
    e. ALT5.idv
    f. ALT6.idv

6 APPENDIX A

TABLE 13: 2021/2022 SUMMARY NERC P0, P1, P2.1, P3, P6.2, P7

					Loading as a % of Rate B						
MONITORED ELEMENT	RATEA	RATEB	NERC CATEGORY	ERCOT PLANNING GUIDE	BASE CASE	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6
7567 L_LYLEWO8_1Y138.00 7573 L_LYONS_8_1Y138.00 1	128	128	NA	ERCOT2	26.8	26.0	86.2	104.1	26.0	26.0	74.9
			NA	ERCOT3	27.1	26.1	80.8	99.5	26.1	26.1	69.2
			P0	NA	9.2	9.2	22.1	37.3	9.2	9.2	9.8
			P1.1	NA	9.7	9.7	28.5	44.5	9.7	9.7	12.5
			P1.2	NA	79.3	74.4	36.0	51.0	74.4	74.4	31.8
			P1.3	NA	12.0	12.2	26.2	42.6	12.2	12.2	11.8
			P1.4	NA	10.6	10.6	22.6	37.4	10.6	10.6	12.3
			P2.1	NA	79.3	74.4	41.9	54.4	74.4	74.4	31.8
			P3	NA	79.5	74.6	56.6	72.4	74.6	74.6	42.1
			P6	ERCOT3	79.9	74.9	78.0	95.8	74.9	74.9	66.4
			P7.1	ERCOT1	23.8	22.9	74.5	92.4	22.9	22.9	66.7
			MAX VALUE		79.9	74.9	86.2	104.1	74.9	74.9	74.9
7572 L_GAYHIL8_1Y138.00 7573 L_LYONS_8_1Y138.00 1	128	128	NA	ERCOT2	32.6	25.8	76.9	94.7	25.8	25.8	65.5
			NA	ERCOT3	34.0	27.3	71.5	90.3	27.3	27.3	59.7
			P0	NA	21.5	14.8	12.8	28.1	14.8	14.8	12.3
			P1.1	NA	22.5	15.7	19.3	35.4	15.7	15.7	13.6
			P1.2	NA	97.6	83.8	26.6	41.7	83.8	83.8	39.1
			P1.3	NA	25.9	19.0	16.9	33.6	19.0	19.0	16.4
			P1.4	NA	21.8	15.5	13.3	28.5	15.5	15.5	13.9
			P2.1	NA	97.6	83.8	32.2	44.9	83.8	83.8	39.1
			P3	NA	97.9	84.0	47.3	63.2	84.0	84.0	45.7
			P6	ERCOT3	98.4	84.4	68.8	86.5	84.4	84.4	57.0
			P7.1	ERCOT1	27.1	20.5	65.3	83.2	20.5	20.5	57.1
			MAX VALUE		98.4	84.4	76.9	94.7	84.4	84.4	65.5
7570 L_SANDHI8_1Y138.00 7572 L_GAYHIL8_1Y138.00 1	128	128	NA	ERCOT2	46.8	46.6	52.8	59.5	46.6	46.6	47.8
			NA	ERCOT3	47.0	46.8	47.4	56.0	46.8	46.8	46.7
			P0	NA	19.9	23.4	35.2	42.3	23.4	23.4	27.0
			P1.1	NA	23.7	27.3	41.3	48.6	27.3	27.3	31.9
			P1.2	NA	74.2	76.6	86.1	90.9	76.6	76.6	80.7
			P1.3	NA	20.5	24.0	37.0	44.7	24.0	24.0	28.6
			P1.4	NA	20.3	24.1	35.4	42.3	24.1	24.1	27.7
			P2.1	NA	74.2	76.6	86.1	90.9	76.6	76.6	80.7
			P3	NA	79.0	81.4	91.8	96.6	81.4	81.4	86.2
			P6	ERCOT3	75.5	77.9	87.5	92.4	77.9	77.9	82.2
			P7.1	ERCOT1	46.8	46.6	46.6	52.5	46.6	46.6	46.5
			MAX VALUE		79.0	81.4	91.8	96.6	81.4	81.4	86.2
7565 L_MAXZUE8_1Y138.00 7572 L_GAYHIL8_1Y138.00 1	128	128	NA	ERCOT2	74.4	67.9	45.9	38.1	67.9	67.9	62.8
			NA	ERCOT3	73.9	67.3	43.8	35.2	67.3	67.3	64.8
			P0	NA	47.1	43.2	30.1	21.6	43.2	43.2	41.1
			P1.1	NA	48.8	44.9	30.4	21.9	44.9	44.9	43.1
			P1.2	NA	90.4	85.5	67.2	56.7	85.5	85.5	79.8
			P1.3	NA	50.1	46.2	30.6	21.9	46.2	46.2	43.8
			P1.4	NA	47.2	43.2	30.2	21.7	43.2	43.2	41.1
			P2.1	NA	90.4	85.5	67.2	56.7	85.5	85.5	79.8
			P3	NA	93.2	88.2	69.3	61.8	88.2	88.2	83.1
			P6	ERCOT3	94.1	89.1	68.0	57.4	89.1	89.1	84.5
			P7.1	ERCOT1	69.6	63.0	41.7	33.6	63.0	63.0	58.7

					Loading as a % of Rate B						
MONITORED ELEMENT	RATEA	RATEB	NERC CATEGORY	ERCOT PLANNING GUIDE	BASE CASE	ALT1	ALT2	ALT3	ALT4	ALT5	ALT6
			MAX VALUE		94.1	89.1	69.3	61.8	89.1	89.1	84.5
7306 L_WINCHE8_1Y138.00 7310 L_SIMGID8_1Y138.00 1	193	193	NA	ERCOT2	90.4	89.0	74.0	69.3	89.0	89.0	77.5
			NA	ERCOT3	86.3	84.9	71.2	66.5	84.9	84.9	74.4
			P0	NA	16.8	16.1	12.5	10.4	16.1	16.1	15.0
			P1.1	NA	21.1	20.5	16.4	14.1	20.5	20.5	19.2
			P1.2	NA	34.8	34.0	29.1	26.5	34.0	34.0	31.8
			P1.3	NA	34.8	34.0	29.1	26.5	34.0	34.0	31.8
			P1.4	NA	16.9	16.2	12.8	10.9	16.2	16.2	15.1
			P2.1	NA	34.8	34.0	29.1	26.5	34.0	34.0	31.8
			P3	NA	39.9	39.1	33.2	30.6	39.1	39.1	36.0
			P6	ERCOT3	84.0	82.6	69.0	64.4	82.6	82.6	72.4
			P7.1	ERCOT1	32.2	31.3	67.6	62.9	31.3	31.3	72.4
			MAX VALUE		90.4	89.0	74.0	69.3	89.0	89.0	77.5

LCRA TSC Cooks Point Project –Consolidated Comments

Date	07/22/16

From:	
Name	Shawndra Curry
E-mail Address	Sgreen-cury@btutilities.com
Company	Bryan Texas Utilities (BTU)

Bryan Texas Utilities supports the proposed new Cooks Point Substation and Transmission Line Addition project being developed by LCRA TSC, and we agree that the recommended alternative (alternative 6) will provide the best overall system benefit. We believe this project will improve system reliability and operational flexibility in the region through such means as additional voltage support, increased transmission capacity, and remediation of consequential load loss in the BTU system under NERC P6 contingencies. Additionally, this project will create a new 138kV East/West tie that could prove to be beneficial as load continues to increase in the region.

LCRA TSC Cooks Point Project –Consolidated Comments

Date	August 2, 2016

From:	
Name	Maurice Walker
E-mail Address	Maurice.walker@oncor.com
Company	Oncor Electric Delivery

Oncor appreciates the opportunity to provide comments on LCRA TSC's Cooks Point Substation and Transmission Line Addition to maintain reliability under various normal and contingency conditions. Our overall goal is to provide the best solution to support planning standard requirements.

After examining the proposal, Oncor agrees with and supports LCRA TSC's recommendation to build the new Cooks Point facility along with the associated Cooks Point – Lyle Wolz and Cooks Point – Steele Store 138 kV transmission lines (Option 6), as this would provide a robust technical solution at a reasonable cost. Oncor also appreciates the breadth and depth of the analysis performed in the justification of this solution.

LCRA TSC Cooks Point Project - Comment Form

Date	July 12, 2016

From:	
Name	Johnny L. Price, City Administrator
E-mail Address	JPRICE@CALDWELLTX.GOV
Company	City of Caldwell

The City of Caldwell respectfully submits the following comments:

The City of Caldwell has reviewed information regarding the above-referenced project and appreciates the opportunity to provide you with our comments. The proposed 138-kV line will provide service to a planned Cooks Point substation (owned by LCRA TSC/BBEC) located in Burleson County and, although routing has not yet been determined, will ideally traverse in close vicinity to the City of Caldwell which is presently served by Entergy at the western edge of the MISO system.

Based upon our review of this project, it provides an opportunity to support the possible future integration of the City of Caldwell and its 14 MW peak electric system load into ERCOT. An integration into ERCOT will improve the City of Caldwell's electric system reliability by replacing aged substation and transmission infrastructure owned by Entergy, will potentially reduce wholesale cost of power by moving the City of Caldwell electric load from MISO to ERCOT, and be beneficial in supporting the anticipated future load in the area served by the City of Caldwell.

The City of Caldwell advocates for the submission and approval of the Cooks Point transmission line project and is supportive of a route that is in close vicinity to the City of Caldwell to allow for future integration with, and transmission service for, the City of Caldwell's municipal load-serving facilities.

LCRA TSC Cooks Point Project –Comment Form

Date	07/26/16

From:	
Name	Eric Kocian
E-mail Address	Eric.Kocian@bluebonnet.coop
Company	Bluebonnet Electric Cooperative (BBEC)

Bluebonnet Electric Cooperative supports the proposed new Cooks Point Substation and Transmission Line Addition project being developed by LCRA TSC, and we agree that the recommended alternative (alternative 6) will provide the best overall system benefit.

We believe this project will improve system reliability and operational flexibility in the region through such means as additional voltage support, increased transmission capacity, additional distribution delivery point/s, reducing miles of line per feeder to serve the existing and future load growth and providing increased distribution system protection and restoration possibilities.

LCRA TSC Cooks Point Project –Comment Form

Kristian Koellner

From: Regional Planning Group <REGPLANGROUP@LISTS.ERCOT.COM> on behalf of Gnanam, Gnanaprabhu <Gnanaprabhu.Gnanam@ERCOT.COM>
Sent: Friday, July 07, 2017 12:04 PM
To: REGPLANGROUP@LISTS.ERCOT.COM
Subject: LCRA TSC Cooks Point project - End of RPG review

Message received from an external source

******* EXTERNAL email. Please be cautious and evaluate before you click on links, open attachments, or provide credentials. *******

RPG,

The LCRA TSC Cooks Point project was originally submitted to the RPG with the objective of providing a transmission source to a new load-serving transmission substation. The project went through RPG review and received only comments in support of the project.

LCRA TSC's submission states that the proposed project is required to meet the reliability needs of the Bluebonnet Electric Cooperative and LCRA TSC planning criteria for load-serving substation reliability. ERCOT has therefore determined that the project should be reclassified as a "Tier 4 Neutral project." ERCOT has determined that the project as proposed will not result in any violations of NERC or ERCOT performance requirements. This concludes the RPG review.

Thanks,

Prabhu Gnanam
Manager, Transmission and Interconnection Studies
Electric Reliability Council of Texas
2705 West Lake Drive | Taylor, TX 76574
Ph: 512-248-3146| gnanaprabhu.gnanam@ercot.com

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