



ERCOT Independent Review of the LCRA TSC and CPS Energy Transmission System Addition Project

March 2015

Document Revisions

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03/19/2015	1.0	Final	Sun Wook Kang, Ying Li
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03/19/2015	2.0	<u>Correction in Section 8:</u> The designated provider for the new proposed 345/138 kV transformers at Clear Springs and Marion has been changed to LCRA TSC instead of GVEC, since LCRA TSC ow ns the Clear Springs and Marion substations.	Sun Wook Kang / Prabhu Gnanam

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1. Executive Summary

The San Antonio area is one of the major load centers of the ERCOT system, located in the South Central weather zone. The load in the area is served by the generation inside the area and a 345 kV transmission loop connected to a 138 kV network. The system is connected to the rest of the ERCOT system mainly through the major 345 kV lines in the region including the key paths running between San Antonio and Austin. The power import into the region is expected to increase as the existing J.T. Deely Plant (850 MW) is scheduled to retire by December 2018, and the load in the area continues to grow.

Identifying the reliability need to improve the transmission capability in the San Antonio area, CPS Energy and LCRA TSC submitted a Regional Planning Group (RPG) project proposal in June 2014. ERCOT conducted an independent review for the proposed project and determined that several 345 kV and 138 kV lines supporting the San Antonio system and the existing 345/138 kV transformers serving the area load are vulnerable to thermal overloads under various contingency conditions by 2019.

Based on the independent review, ERCOT concludes that new transmission reinforcement is needed to meet the reliability criteria in 2019. ERCOT evaluated project alternatives to address the reliability problems and concluded that the transmission project defined as Option A is the best solution to address the reliability need in the area by 2019. The detailed description of Option A is as follows.

- Reconfigure the existing Hill Country-Elm Creek/Marion and Skyline-Marion/Elm Creek 345 kV double-circuit lines to form Hill Country-Marion double circuit and Skyline-Elm Creek double circuit. The Elm Creek-Skyline 345 kV circuits and the Hill Country-Marion 345 kV circuits are expected to have a minimum emergency rating of 1077 MVA and 1104 MVA, respectively.
- Construct a new¹ Zorn-Marion 345 kV line (approximately 21 miles) with an emergency rating of at least 1959 MVA.
- Add a second 345/138 kV transformer at Clear Springs with an emergency rating of at least 525 MVA.
- Add a second 345/138 kV transformer at Marion with an emergency rating of at least 525 MVA.
- Upgrade the existing Cibolo-Schertz 138 kV line (approximately 3.6 miles) with an emergency rating of at least 477 MVA.

The project will address the reliability need and improve the transmission system supporting San Antonio. The estimated cost of the preferred project is approximately \$86 million in 2019 dollars. The estimate may vary as the designated providers of the new transmission reinforcement (CPS Energy, Guadalupe Valley Electric Cooperative (GVEC), and LCRA TSC) perform more detailed cost analysis.

¹ Portion of the new line between Zorn and Clear Springs will utilize the open position on the existing double circuit capable Gilleland Creek-Clear Springs transmission line.

2. Introduction

The load in the San Antonio area is served by the generation inside the area and a 345 kV transmission loop connected to a 138 kV network. The system is connected to the rest of the ERCOT system mainly through the major 345 kV lines in the region including the key paths running between San Antonio and Austin. The power import into the region is expected to increase as the existing J.T. Deely Plant (850 MW) is scheduled to retire by December 2018, and the load in the area continues to grow.

Recently, CPS Energy and LCRA TSC jointly submitted an RPG project proposal for new transmission reinforcement by 2019 to address identified reliability needs. ERCOT conducted an independent review to evaluate the RPG project jointly submitted by CPS Energy and LCRA TSC. As described in this report, ERCOT performed various studies, determined the reliability need, and identified the best solution that addresses the reliability need. Figure 2.1 shows the system map of the study area.

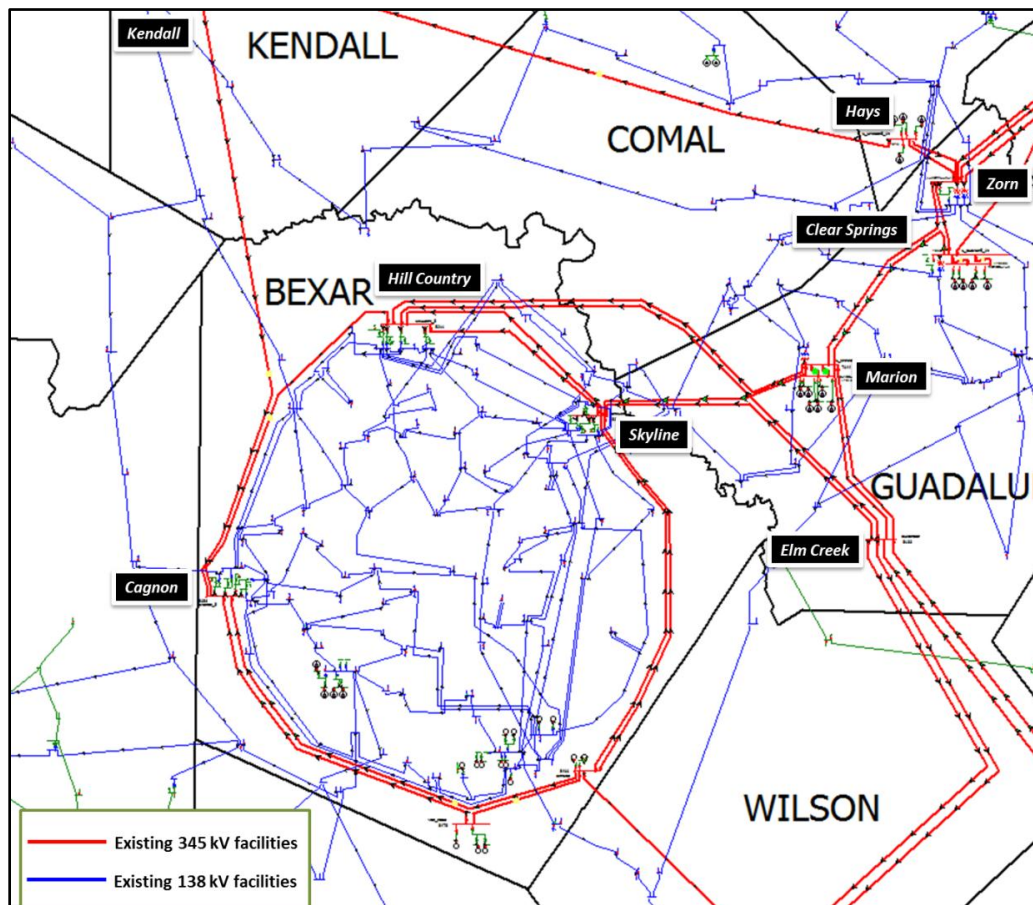


Figure 2.1: Transmission System map of study area with key substations

3. Criteria, Study Assumption, and Methodology

ERCOT studied various system conditions to determine the reliability need and to find a robust and cost-effective solution from both near-term and long-term transmission planning perspectives. The study criteria, assumption, and methodology for the ERCOT independent review are described in this section and are consistent with the NERC reliability standards, ERCOT Protocols, and the ERCOT Planning Guide.

3.1 Study Criteria and Monitored Area

The criteria applied for the AC power flow analyses are consistent with ERCOT Planning Guide 4.1.1.2 and the 2014 Regional Transmission Plan (RTP). For the reliability analysis, the following thermal and voltage limits were enforced.

- Rate A under pre-contingency conditions for 60 kV and above transmission lines and transformers with a low side voltage of 60 kV and above
- Rate B under post-contingency conditions for 60 kV and above transmission lines and transformers with a low side voltage of 60 kV and above
- 0.95 pu voltage under pre-contingency conditions for 100 kV and above transmission lines and transformers with a low side voltage of 100 kV and above
- 0.90 pu voltage under post-contingency conditions for 100 kV and above transmission lines and transformers with a low side voltage of 100 kV and above

The monitored area in the study is the South Central weather zone, particularly the transmission system in the Bexar, Comal, and Guadalupe Counties.

3.2 Study Assumption and Methodology

3.2.1 Study Base Case

The base case selected for this independent review is the 2019 South/South Central (SSC) summer peak case built for the 2014 RTP. The base case was built for the 2014 RTP for the year 2019 based on the 2014 Dataset B developed by the Steady-State Working Group (SSWG).

During the course of the independent review, CPS Energy notified ERCOT that it would be revising the load forecast for the CPS Energy area in the upcoming Annual Load Data Request (ALDR) filing (March-2015). Based on the new information, ERCOT adjusted the total load of CPS Energy in the RTP base case to 5,406 MW to create the RPG study base case. The adjustment resulted in a total load of 13,825 MW for the South Central weather zone. The reliability analysis was conducted based on this adjusted load forecast.

The RTP base case contained various transmission upgrades and projects to address the N-1 reliability issues identified during the 2014 RTP. The upgrades include a placeholder project related to this RPG proposal. ERCOT removed the placeholder project from the RTP base case to create the RPG study base case. The RTP base case also had other transmission projects modeled in and around the region as listed below. ERCOT concluded that these upgrades would

not provide significant impact on the independent review of this RPG project. These projects were kept in the RPG study base case and are listed below:

- Marion-Cibolo second circuit addition² (2017 In-service year, Tier 4 Project ID 2792);
- Zorn-York-Seguin 138 kV line upgrade² (2016 In-service year, Tier 4 Project ID 3966);
- Tapping the Shiner-Moulton 138 kV line and adding a 69/138kV transformer at the GVEC Moulton substation (2019 In-service year); and
- Lockhart auto and Lockhart-Seawillow-Luling 138kV line upgrade² (2017 In-service year, Tier 4 Project ID 3963).

In the RTP base case, all three units at Frontera, in the Lower Rio Grande Valley area, were modeled online. Based on the Notice of System Planning Data Request for Switchable Resources dated July 25, 2014 (as updated on September 25, 2014), ERCOT modeled the Frontera units offline in the RPG study base case to reflect the status of the units in the year 2019. To accommodate the change in the Frontera generation and to balance supply and demand, ERCOT reduced a total of 555 MW load in the North, North Central, West, Far West, East and Coast weather zones.

In the RPG study base case, J.T. Deely units 1 and 2 were not modeled based on the notification of Suspension of Operations of a Generator Resources submitted by CPS Energy on October 25, 2013.

In the RPG study base case, the DC ties (flows) are modeled consistent with the 2014 RTP scope assumption.

3.2.2 Study Methodology

To evaluate the reliability need, ERCOT studied the 2019 RPG study base case by applying the planning criteria in Section 3.1. Then, ERCOT studied two options to address the reliability issues identified in the 2019 RPG study base case. The two options were created based on analyzing the identified reliability issues and reviewing the RPG project submittal which was conducted using a higher load initially forecasted for the study area compared to the most recent load forecast used in this analysis. More details of the two options can be found in Section 5.

For need analysis and project option evaluation, ERCOT performed N-1, G-1+N-1 (generator outage), and X-1+N-1 (transformer outage) contingency analyses. ERCOT also tested severe events (i.e., NERC Category C and D conditions) with and without each project option to check the robustness of each transmission option.

In addition to comparing the system performance of each option, ERCOT also compared the cost estimates of the two options.

² Source: <http://www.ercot.com/gridinfo/planning/index.html>, Transmission Project and Information Tracking, ERCOT October TPIT No Cost 100114

3.2.3 Tools

ERCOT utilized PowerWorld version 18 with SCOPF for AC power flow analysis as the software tool for the independent review of the CPS Energy/LCRA TSC Transmission Addition project.

3.2.4 Contingencies

All ERCOT Category B contingencies were evaluated for the AC power flow analyses. For G-1+N-1 analysis, the following generator outages were considered as the worst G-1 condition for the study area

- JK Spruce 2 (JKS2, 775 MW)
- OW Sommers 1 (OWS1, 420 MW)
- VH Braunig 3 (VHB3, 412 MW)

For the X-1+N-1 analysis³, ERCOT considered the following 345/138 kV transformers (as the prior outage condition) in the study area.

- Hill Country 345/138 kV transformer #1 or #3
- Cagnon 345/138 kV transformer #1 or #3
- Skyline 345/138 kV transformer #3
- Marion 345/138 kV transformer #1
- Zorn 345/138 kV transformer #2
- Clear Springs 345/138 kV transformer #1

In addition, ERCOT also tested approximately 193 multi-element contingencies representing the NERC C and D events, based on the knowledge of the system in the study area and the combinations of the major transmission lines in the area of interest.

4. Project Need

Driven by the continued load growth in the area and the announced⁴ generation retirement in San Antonio, several reliability issues (thermal post-contingency overloads) were identified on the 345 and 138 kV transmission facilities coming from the north/east into San Antonio area by 2019.

ERCOT conducted an AC power flow analysis using the RPG study base case. The study result indicated overloads of approximately 16 miles of 345 kV line and 14 miles of 138 kV lines in the area under N-1 contingency conditions. The N-1 issues were aggravated further under the G-1+N-1 contingency conditions resulting in overloads of approximately 69 miles of 345 kV lines, 26 miles of 138 kV lines, and one 345/138 kV transformer in the area. The result of the G-1+N-1 analysis indicated that the outage of JK Spruce 2 would cause the most severe impact on the 345 kV facilities in the area compared to other G-1 conditions (OW Sommers 2 or VH Braunig 3). The results of the N-1 and G-1+N-1 contingency analyses are summarized below.

³ N-1 contingency analysis under the prior outage of a 345/138 kV transformer

⁴ See ERCOT Market Notice W-A102513-01 Notification of Suspension of Operations for CPS Energy (RE), CALAVERS_JTD1 and CALAVERS_JTD2

- N-1 Result
 - Overload of Skyline-Marion 345 kV line (~16 miles, 105%)
 - Overload of McCarty Ln-Henne-Comal 138 kV line (~14.2 miles, 106~109%)
 - Heavy flow on Comal-Loop 337 138 kV line (98%)
 - Heavy flow on Zorn 345/138 kV transformer T1 (99%)
 - Heavy flow on Clear Springs 345/138 kV transformer T1 (99.5%)
- G-1+N-1 Result
 - Worst G-1: JK Spruce 2 G-1 causes the most severe impact on the system
 - Overload of Skyline-Marion 345 kV line (~16 miles, 118~131%)
 - Overload of Marion-Clear Springs 345 kV line (~8.5 miles, 111~123%)
 - Overload of Hill Country-Marion 345 kV line (~26.7 miles, 99~108%)
 - Overload of Zorn-Marion 345 kV line (~18 miles, 99~110%)
 - Overload of Clear Springs 345/138 kV transformer (107~111%)
 - Overload of McCarty Lane-Henne-Comal-Loop 337-Gpi Switch 138 kV lines (~19.8 miles, 118~132%)
 - Overload of Henne-Zorn 138 kV line (~6.5 miles, 101~106%)
 - Heavy flow on Zorn 345/138 kV T1 transformer (98~99%)

ERCOT also performed the X-1+N-1 contingency analysis for the outage of each 345/138 kV transformer defined in Section 3.2.4. The X-1+N-1 analysis identified additional overloads of 345/138 kV transformers in the area in addition to the 345 and 138 kV line overloads. However, most of the overloads found under the X-1+N-1 conditions are generally less severe than those identified in the G-1+N-1 contingency analysis. The results of the X-1+N-1 contingency analysis are summarized below.

- X-1+N-1 Result
 - Skyline-Marion and Marion-Clear Springs 345 kV lines were overloaded up to 113.6% and 104.7% respectively.
 - Overloads of Henne-Comal 138 kV line (up to 130.3%), Henne-McCarty Lane 138 kV line (up to 121.6%), Coma-Loop 337-Gpi Switch 138 kV line (up to 104.3%, 101.6%), and Henne-Zorn 138 kV line (up to 130.7%)
 - Clear Springs or Zorn transformer outage condition appears to provide the most severe impact
 - Overloads of Clear Springs 345/138 kV transformer (101~109%) under various X-1+N-1 conditions
 - Overloads of Zorn 345/138 kV transformers (100~112%) under Clear Springs, Zorn, Marion or Skyline X-1+N-1 condition
 - Overload of Marion 345/138 kV transformer (104%) under Clear Springs X-1+N-1 condition

The overall study results (overloaded and experiencing heavy flows) are summarized in Table 4.1.

No voltage violation was found in the study area under the N-1, G-1+N-1 and X-1+N-1 contingency conditions.

Figure 4.1 shows the map of all the system problems identified under the N-1, G-1+N-1 and X-1+N-1 analyses. The detailed results of the reliability analyses can be found in Appendix A.

Table 4.1: Thermal overload or heavy flow issues identified in the area

345 and 138 kV Facilities with Overload or Heavy Flow					Worst Percent (%) Loading under N-1, G-1+N-1 and X-1+N-1 Conditions											
From Bus	To Bus	Ckt ID	KV (From)	KV (To)	N-1	G-1 (JKS2)+N-1	G-1 (OWS1)+N-1	G-1 (VHB3)+N-1	Hill Country T1 X-1+N-1	Hill Country T3 X-1+N-1	Cagnon T1 X-1+N-1	Cagnon T3 X-1+N-1	Skyline T3 X-1+N-1	Clear Springs T1 X-1+N-1	Zorn T2 X-1+N-1	Marion T1 X-1+N-1
Skyline	Marion	1	345	345	104.9	130.6	117.7	118.6	105.9	105.4	104.9	105.5	102.7	108.8	106.3	113.6
Marion	Clear Springs	1	345	345	93.1	122.5	110.7	111.3	96.4	95.2	93.1	94.8	91.7	104.7	100.5	< 90
Hill Country	Marion	1	345	345	< 90	108.4	98.6	99.4	< 90	< 90	< 90	< 90	< 90	91.4	< 90	95.7
Zorn	Marion	1	345	345	< 90	109.8	98.9	99.4	< 90	< 90	< 90	< 90	< 90	90.8	< 90	< 90
Clear Springs	Clear Springs	1	345	138	99.5	111.3	108.2	107.2	101.3	100.8	99.7	100.6	100.1	< 90	109.5	101.5
Zorn	Zorn	1	345	138	99.4	99.4	98.8	98.2	99.7	99.6	99.5	99.6	100.2	112.3	< 90	106.8
Zorn	Zorn	2	345	138	< 90	< 90	< 90	< 90	< 90	< 90	< 90	< 90	< 90	91.2	107.9	< 90
Zorn	Zorn	2	345	138	91.9	91.9	91.3	90.8	92.2	92.1	92.0	92.1	92.6	103.8	< 90	98.7
Marion	Marion	1	345	138	< 90	91.1	92.6	90.9	< 90	< 90	< 90	< 90	< 90	104.1	91.1	< 90
Hill Country	Hill Country	2	345	138	< 90	< 90	91.2	91.1	96.0 *	94.1	< 90	< 90	94.5	< 90	< 90	< 90
Hill Country	Hill Country	4	345	138	< 90	< 90	< 90	< 90	< 90	91.5	< 90	< 90	< 90	< 90	< 90	< 90
Henne	Comal	1	138	138	109.4	132.3	126.7	125.1	112.8	111.8	109.7	111.4	110.7	< 90	94.3	130.3
Henne	McCarty Lane	1	138	138	106.3	129.2	124.1	122.4	109.8	108.7	106.6	108.1	107.4	< 90	96.2	121.6
Loop 337	Gpi Switch	1	138	138	94.7	129.3	120.8	118.3	99.8	98.2	95.1	97.6	96.5	< 90	92.0	101.6
Comal	Loop 337	1	138	138	97.6	129.1	121.3	119.1	102.3	100.9	98.0	100.3	99.4	< 90	94.7	104.3
Henne	Zorn	1	138	138	< 90	105.8	101.7	100.6	91.8	91.0	< 90	90.7	90.3	130.7	< 90	104.4
Merida	Westside	1	138	138	< 90	< 90	< 90	93.9	< 90	< 90	< 90	< 90	< 90	< 90	< 90	< 90

* Adjusting the tap setting would reduce the percent loading on the Hill Country T2 to below 95% under the worst contingency condition.

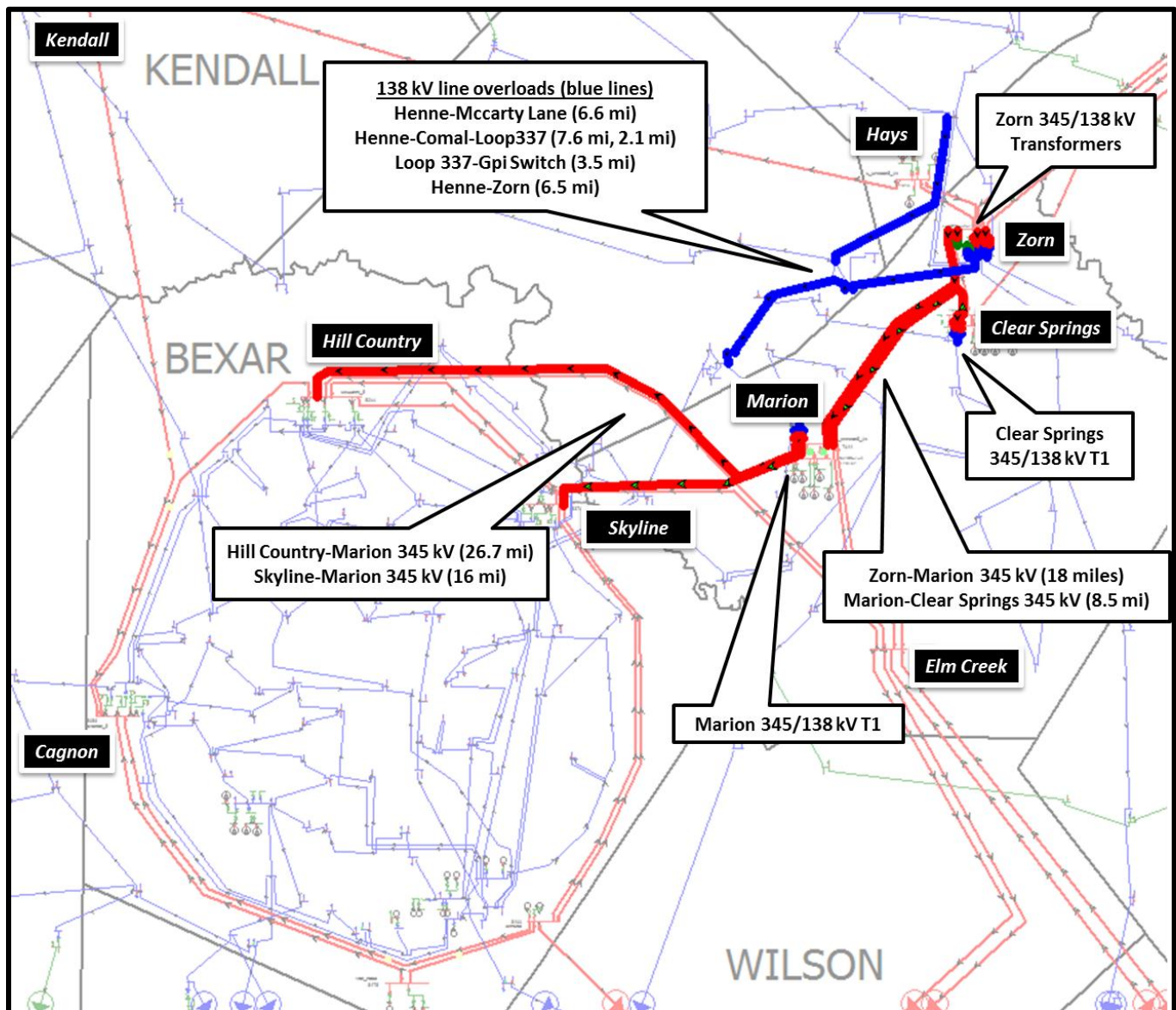


Figure 4.1: Map of system problems in the study area

5. Project Options

ERCOT considered two options: Option A involving the construction of a new 345 kV line and Option B involving the upgrades of the existing lines identified as overloaded. These two options are described as follows.

- Option A
 - Reconfigure the existing Hill Country-Elm Creek/Marion and Skyline-Marion/Elm Creek 345 kV double-circuit lines to form Hill Country-Marion double circuit and Skyline-Elm Creek double circuit. The Elm Creek-Skyline 345

kV double circuit and the Hill Country-Marion 345 kV double circuit are expected to have a minimum emergency rating of 1077 MVA and 1104 MVA, respectively.

- Construct a new Zorn-Marion 345 kV line⁵ (approximately 21 miles) with an emergency rating of at least 1959 MVA.
- Add a second 345/138 kV transformer at Clear Springs with an emergency rating of at least 525 MVA.
- Add a second 345/138 kV transformer at Marion with an emergency rating of at least 525 MVA.
- Upgrade the existing Cibolo-Schertz 138 kV line⁶ (approximately 3.6 miles) with an emergency rating of at least 477 MVA.
- The construction cost estimated for Option A is approximately \$ 86 million in 2019 dollars.

▪ Option B

- Reconfigure the existing Hill Country-Elm Creek/Marion and Skyline-Marion/Elm Creek 345 kV double-circuit lines to form Hill Country-Marion double circuit and Skyline-Elm Creek double circuit. The Elm Creek-Skyline 345 kV double circuit and the Hill Country-Marion 345 kV double circuit are expected to have a minimum emergency rating of 1077 MVA and 1104 MVA, respectively.
- Loop the existing Marion-Zorn 345 kV line into Clear Springs and upgrade the Marion-Clear Springs double circuit 345 kV (8.5 miles) with an emergency rating of at least 1959 MVA.
- Upgrade several existing 138 kV lines; McCarty Ln-Henne (6.6 miles) with an emergency rating of at least 477 MVA, Henne-Comal double circuit (7.6 miles) with an emergency rating of at least 477 MVA, Comal-Loop337-GPI Switch (5.6 miles) with an emergency rating of at least 789 MVA, GPI Switch-EC Mornhinweg-Parkway⁷ (10.6 miles) with an emergency rating of at least 435 MVA, and Henne-Zorn 138 kV line (6.5 miles) with an emergency rating of at least 435 MVA.⁸
- Add a fourth 345/138 kV transformer at Zorn with an emergency rating of at least 525 MVA.
- Add a second 345/138 kV transformer at Clear Springs with an emergency rating of at least 525 MVA.
- The construction cost estimated for Option B is approximately \$ 130 million in 2019 dollars.

The two options are illustrated in Figures 5.1 and 5.2.

⁵ Portion of the new line between Zorn and Clear Springs will utilize the open position on the existing double circuit capable Gilleland Creek-Clear Springs transmission line, and the remaining portion of the new line will be built on the new double circuit capable structure.

⁶ Upgrading the Cibolo-Schertz 138 kV line is included in Option A since the 138 kV line is found overload due to other upgrades in Option A

⁷ Upgrading the Gpi Switch-EC Mornhinweg-Parkway 138 kV lines is included in Option B since the 138 kV lines are found overload due to other upgrades in Option B

⁸ LCRA has indicated that a new parallel 138 kV path could be an alternative for these 138 kV line upgrades.

With respect to Option B, upgrades to the existing Comal-Loop 337-GPI Switch 138 kV path would leave these lines loaded in excess of 95% leaving little capacity available to serve future load growth, therefore, the more substantial upgrades to this path presented in Option B are appropriate for the evaluation of these two alternatives.

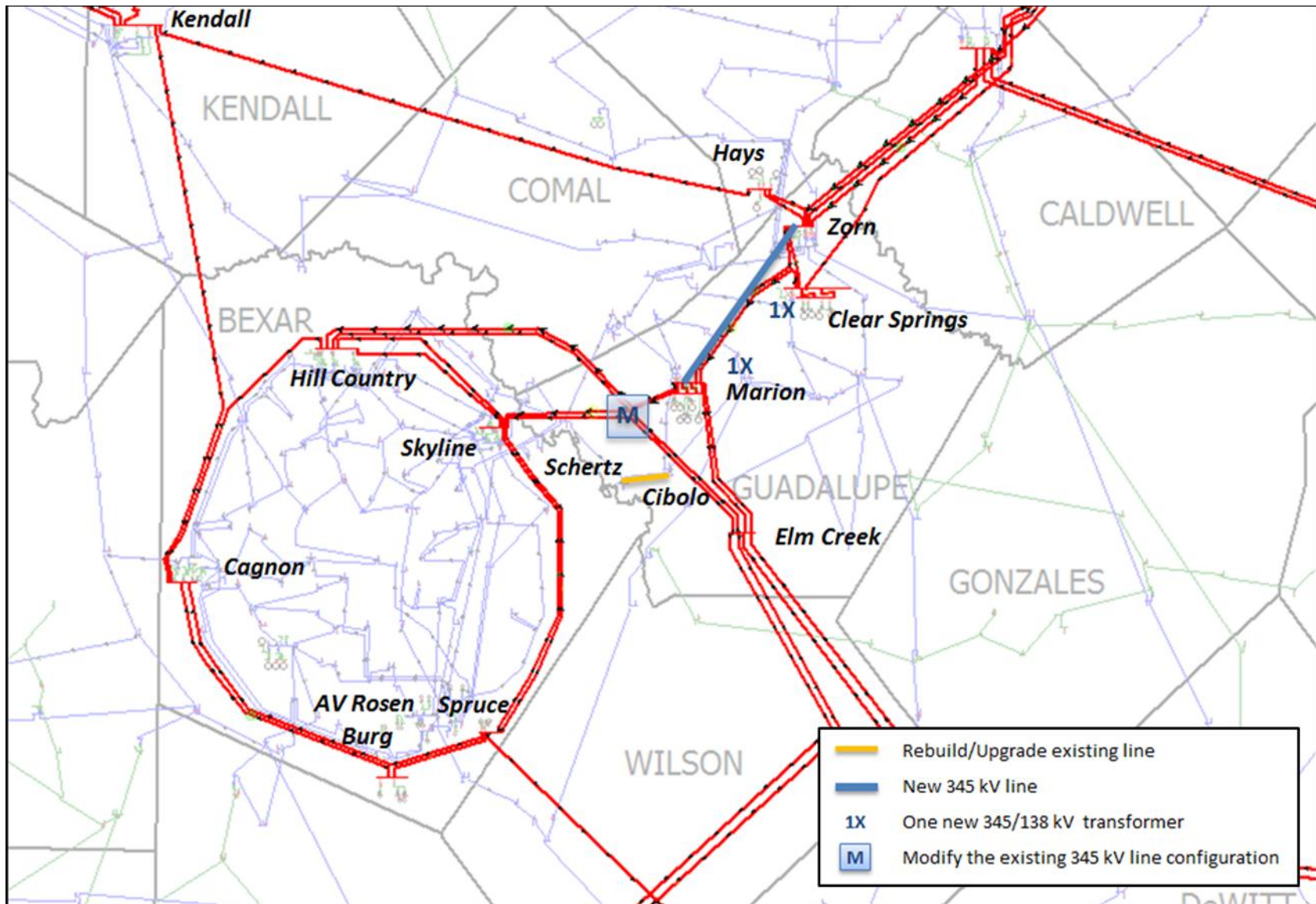


Figure 5.1: System map of Option A

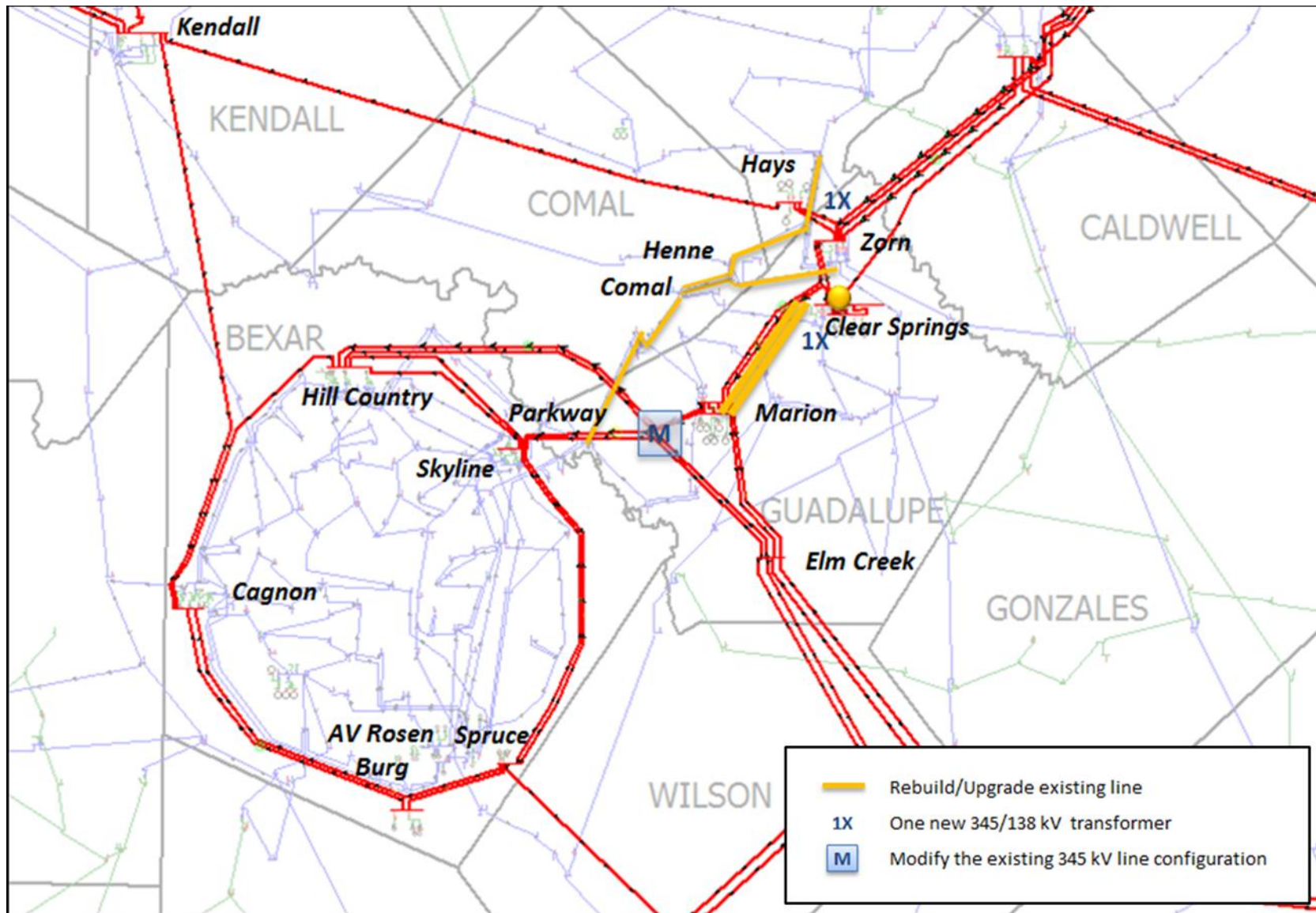


Figure 5.2: System map of Option B

6. Evaluation of the Options

ERCOT performed contingency analyses to ensure that the two options address the identified reliability issues. ERCOT also tested approximately 193 NERC Category C and D events (e.g., multi-element outages) to understand the robustness of the two options while also comparing the planning-level cost estimates. ERCOT also compared the transmission efficiency improved by each option from a system loss perspective and considered the long-term benefit of each option.

6.1 Results of Contingency Analyses of the Options

The N-1, G-1+N-1, and X-1+N-1 contingency analyses were performed for the two selected options, and both options addressed the reliability need identified in Section 4.

6.2 Cost Comparison

As noted in Section 5, it is estimated that the cost of Option A is approximately \$86 million in 2019 dollars, while the cost of Option B is approximately \$130 million in 2019 dollars. The costs are based on the estimates provided by CPS Energy and LCRA TSC.

Based on these cost estimates, it is concluded that Option B is more expensive compared to Option A. In addition, Option B would also likely result in higher real-time congestion cost or other construction challenges due to outages/clearances required for the existing line upgrades.

6.3 Impact of NERC Category C and D Contingencies

NERC Category C and D contingency conditions were studied to check if each option would introduce any additional reliability issues to the system under these severe events. ERCOT tested approximately 193 NERC Category C and D events in the study area.

The results indicate that both options would improve the system reliability under the severe events compared to the base case (with no upgrade). Table 6.1 summarizes the result of the analysis.

Table 6.1: Impact of NERC Category C and D condition with and without option

Options	Number of Unsolved Contingencies	Number of Thermal Loading Above 115% On 345 kV	Number of Low Voltage at 345 kV Buses (Below 0.9 pu)
w/o Option	0	2	0
Option A	0	0	0
Option B	0	0	0

6.4. System Loss Reduction

As improvements are added to a system, transmission efficiency will be improved due to decrease in the system impedance and increase in the system voltage. The transmission efficiency improved by a new line can be measured by system loss reduction.

ERCOT performed the system loss analysis for each option, using the RPG study base case (2019 summer peak condition), in order to capture the benefit of transmission efficiency improved by the two options. The amount of loss reduction is shown in Table 6.4 indicating significant loss reduction realized by each option during the peak hour.

Table 6.2: System loss reduction under 2019 summer peak condition

Option	Option A	Option B
System Loss Reduction (MW)	11.2	12.4

6.5. Overall Comparison

The comparison of the study results of Option A and Option B are summarized below.

- Both Option A and Option B address the reliability need in the study area, as identified in the 2019 RPG study base case, and meet the reliability criteria.
- Both Option A and Option B provide system loss reduction and improve system reliability under severe system conditions (NERC Category C and D contingencies) tested for the study area.
- Both options remove the 345 kV line crossing that exists on the Skyline-Marion and Hill Country-Elm Creek lines.
- Option A (~\$86 million) is the least cost option compared to Option B (~\$130 million). It is also expected that Option B would likely result in higher real-time congestion cost or other construction challenges due to outages/clearances required for the existing line upgrades.

7. Conclusion and Recommendation

ERCOT identified reliability criteria violations in the San Antonio area in 2019. The reliability need is primarily driven by continued load growth in the area and retirement of J.T. Deely units 1 and 2 generation inside San Antonio.

Based on the independent review, ERCOT recommends the following facilities as the preferred option.

- Reconfigure the existing Hill Country-Elm Creek/Marion and Skyline- Marion/Elm Creek 345 kV double-circuit lines to form Hill Country-Marion double circuit and Skyline-Elm Creek double circuit. The Elm Creek-Skyline 345 kV double circuit and the Hill Country-Marion 345 kV double circuit are expected to have a minimum emergency rating of 1077 MVA and 1104 MVA, respectively.
- Construct a new Zorn-Marion 345 kV line (approximately 21 miles) with an emergency rating of at least 1959 MVA.
- Add a second 345/138 kV transformer at Clear Springs with an emergency rating of at least 525 MVA.
- Add a second 345/138 kV transformer at Marion with an emergency rating of at least 525 MVA.
- Upgrade the existing Cibolo-Schertz 138 kV line (approximately 3.6 miles) with an emergency rating of at least 477 MVA.
- The estimated cost for Option A is approximately \$86 million in 2019 dollars.

8. Designated Provider of Transmission Facilities






In accordance with ERCOT Nodal Protocols Section 3.11.4.8, ERCOT staff is to designate transmission providers for projects reviewed in the RPG. The default providers will be those that own the end points of the new projects. These providers can agree to provide or delegate the new facilities or inform ERCOT if they do not elect to provide them. If different providers own the two ends of the recommended projects, ERCOT will designate them as co-providers and they can decide between themselves what parts of the recommended projects they will each provide.

The preferred solution involves constructing a new line between Zorn and Marion and installing new 345/138 kV transformers at Clear Springs and Marion substations. Since LCRA TSC owns the substations, LCRA TSC is designated as the provider of the new 345 kV line from Zorn to Marion and the new 345/138 kV transformers at Clear Springs and Marion substations. LCRA TSC has indicated that it is unlikely for the new 345 kV line to be in-service before summer peak of 2019 unless ERCOT designates the new 345 kV line critical to reliability per PUCT Substantive Rule 25.101(b)(3)(D). Since there is a reliability need to have the project in place before summer 2019, ERCOT deems this portion of the project critical to reliability.

The preferred solution also involves reconfiguration of the existing Hill Country-Elm Creek-Marion and Skyline- Marion/Elm Creek 345 kV double-circuit lines. As a result of the reconfiguration, there will be a double circuit between Hill Country and Marion and another double circuit between Skyline and Elm Creek. Therefore, based on the ownership of the substations, ERCOT designates CPS Energy and LCRA TSC as the co-providers of the Hill Country-Marion double-circuit 345 kV line, and CPS Energy as the provider of the Skyline-Elm Creek double-circuit 345 kV line.

ERCOT designates GVEC as the provider for the upgrade of the existing Cibolo-Schertz 138 kV line since GVEC owns the substations associated with the upgrades.

Appendix A: Results of Contingency Analyses of the RPG Study Base Case and Option A

AC Contingency Result of 2019 RPG Study Base Case (N-1 Analysis)	 Appendix A1 - AC Contingency Result o
AC Contingency Result of 2019 RPG Study Base Case (G-1+N-1 Analysis)	 Appendix A2 - AC Contingency Result o
AC Contingency Result of 2019 RPG Study Base Case (X-1+N-1 Analysis)	 Appendix A3 - AC Contingency Result o
AC Contingency Result of 2019 RPG Study Base Case with Option A (N-1 analysis)	 Appendix A4 - AC Contingency Result o
AC Contingency Result of 2019 RPG Study Base Case with Option A (G-1+N-1 and X-1+N-1 analysis)	 Appendix A5 - AC Contingency Result o