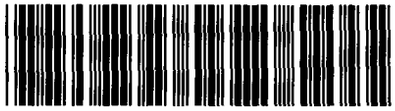


Control Number: 47342

Item Number: 33

Addendum StartPage: 0

ercot
Your Power. Our Promise.

Taylor
2705 West Lake Drive
Taylor, TX 76574
T 512.248.3000
F 512.248.3095

Austin
7620 Metro Center Drive
Austin, TX 78744
T 512.225.7000
F 512.225.7020

ercot.com

2018 MAY 18 PM 1:00

May 18, 2018

Public Utility Commission of Texas
Chairman DeAnn T. Walker
Commissioner Arthur C. D'Andrea
1701 N. Congress Ave.
Austin, Texas 78711

Re: *PUC Project No. 47342 – Project to Identify Issues Pertaining to Rayburn Country Electric Cooperative, Inc.'s Proposal to Transfer Existing Facilities and Load into the Electric Reliability Council of Texas*

Dear Commissioners:

On May 1, 2018, the Electric Reliability Council of Texas, Inc. ("ERCOT") filed with the Public Utility Commission of Texas ("Commission") the *ERCOT-SPP Coordinated RCEC Integration Analysis-Addendum* ("Modified Alternative Option Integration Analysis"). That report detailed ERCOT's analysis of the impacts of the proposed transition of the remaining portion of the Rayburn Country Electric Cooperative, Inc. ("RCEC") load that is currently served by the Southwest Power Pool (SPP) into the ERCOT Region using a transmission option deemed the "Modified Alternative Option."

The Modified Alternative Option Integration Analysis also compared the impact of integrating RCEC's load using the Modified Alternative Option against the impact of using a different transmission option, deemed "Option 2," which had been the subject of a report filed by ERCOT in this project on March 1, 2018. After conducting this comparison, ERCOT recommended that the Modified Alternative Option be used to integrate RCEC's load because it was found to be the lowest-cost reliable option.

Subsequent to filing the Modified Alternative Option Integration Analysis, ERCOT staff discovered an inaccuracy with respect to Option 2. More specifically, the previously-filed reports did not reflect the fact that a minor component of the Option 2 transmission option proposed by Lone Star Transmission, LLC—specifically, the Elkton–Tyler Switch line upgrade—was not necessary for reliability. Accordingly, that specific component should not have been included in ERCOT's analysis of the Option 2 transmission option.

In order to correct this discrepancy, ERCOT has revised the Modified Alternative Option Integration Analysis to remove the Elkton–Tyler Switch line upgrade from Option 2 for purposes of comparing Option 2 to the Modified Alternative Option. The revised report is attached hereto as Attachment A.[1] As a result of this revision, the estimated capital cost of Option 2 has decreased by $2.1 million. The removal of the Elkton–Tyler Switch line upgrade from Option 2 had no other significant impacts on ERCOT's previously-reported results with respect to Option 2.

[1] A redline of the report showing revisions to the May 1, 2018, filing is also attached hereto as Attachment B.



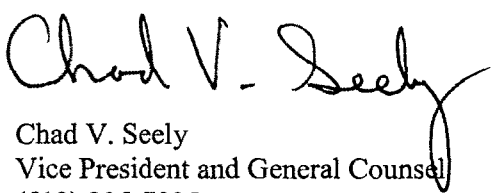
37

Despite this revision, ERCOT's prior recommendation in this matter—i.e., that the Modified Alternative Option be used for the integration—remains unchanged. As reflected in the attached revised report, the Modified Alternative Option remains the lowest-cost reliable option for integration of RCEC's load.

ERCOT is prepared to assist the Commission by providing any additional information that may be helpful to the Commission in evaluating the potential transfer of RCEC's remaining load into the ERCOT System.

Please do not hesitate to call me if you have any questions.

Regards,



Chad V. Seely
Vice President and General Counsel
(512) 225-7035
chad.seely@ercot.com

# ERCOT-SPP Coordinated RCEC Integration Analysis - Addendum

**Version 1.1**

# Document Revisions

| Date | Version | Description | Author(s) | Reviewed By |
|---|---|---|---|---|
| 04/30/2018 | 1.0 | Final | Ajay Pappu, Ying Li | Jeff Billo, Prabhu Gnanam |
| 05/18/2018 | 1.1 | Revised to reflect removal of Elkton – Tyler Switch line upgrade from Option 2 transmission configuration, including revisions to estimated capital cost for Option 2. ERCOT's recommendation to use the Modified Alternative Option to integrate RCEC's load remains unchanged. | Ajay Pappu | Jeff Billo, Prabhu Gnanam |

# Table of Contents

# 1. Background and Introduction

The ERCOT—RCEC Load Integration Study filed with the Public Utility Commission of Texas (Commission) in June 2017 (the "ERCOT Integration Study") recommended "Option 2" as the lowest cost reliable option for integrating the remaining portion of the Rayburn Country Electric Cooperative Inc. dba Rayburn Electric (RCEC) load that is currently served by the Southwest Power Pool (SPP) into the Electric Reliability Council of Texas, Inc. (ERCOT) System.[1] Accordingly, the ERCOT-SPP Coordinated Integration Analysis filed with the Commission on March 1, 2018 (the "Option 2 Integration Analysis") set forth ERCOT's study results assuming "Option 2" would be used to integrate the remaining portion of RCEC's load into the ERCOT System.[2]

When ERCOT filed the Option 2 Integration Analysis, it noted that in February 2018 Oncor Electric Delivery Company LLC (Oncor) had made ERCOT aware of an alternative proposal for integration of the RCEC load into the ERCOT System (see Figure 1). Oncor sent ERCOT its final study report for this transmission option (the "Oncor Proposed Option") on March 26, 2018.

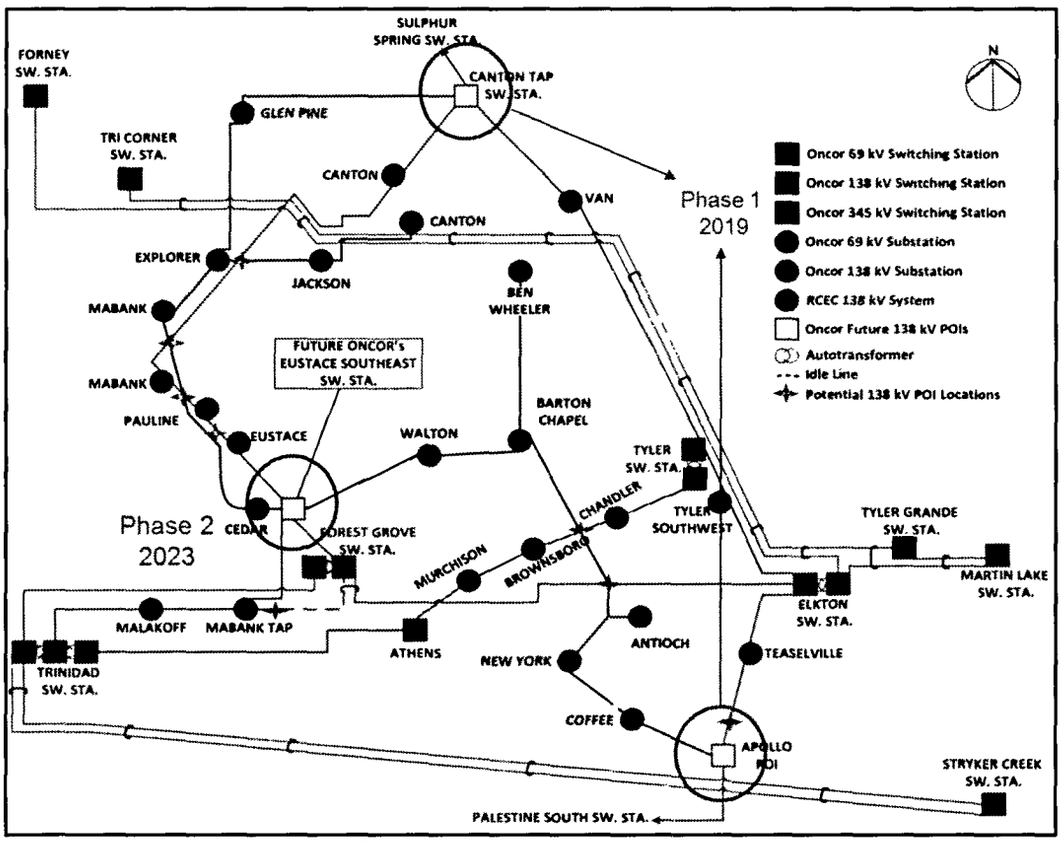



**Figure 1 RCEC Integration - Oncor Proposed Option**

[1] *Project to Identify Issues Pertaining to Rayburn Country Electric Cooperative, Inc.'s Proposal to Transfer Existing Facilities and Load into the Electric Reliability Council of Texas*, Project No. 47342, ERCOT - RCEC Load Integration Study (June 27, 2017) ("ERCOT Integration Study").

[2] *Project to Identify Issues Pertaining to Rayburn Country Electric Cooperative, Inc.'s Proposal to Transfer Existing Facilities and Load into the Electric Reliability Council of Texas*, Project No 47342, ERCOT-SPP Coordinated RCEC Integration Analysis (March 1, 2018) ("Option 2 Integration Analysis").

Oncor recommended the Oncor Proposed Option be constructed in two phases as follows:

Phase 1 (proposed completion in 2019)
- Apollo 138kV Sw. Station\POI
- Apollo Sw. Station – RCEC Coffee 138kV Line
- Canton Tap 138kV Sw. Station\POI

Phase 2 (proposed completion in 2023)
- Mabank Tap – Eustace Southeast Sw. Station 138kV Line
- Eustace Southeast 138kV Sw. Station

ERCOT's analysis of the Oncor Proposed Option revealed reliability criteria violations. Accordingly, modifications to the Oncor Proposed Option are necessary in order to reliably integrate RCEC's load. The Oncor Proposed Option, combined with ERCOT's recommended modifications, is referred to herein as the "Modified Alternative Option."

The Modified Alternative Option was the study case used to complete the analysis herein. More specifically, ERCOT studied the Modified Alternative Option to determine if it would meet ERCOT and North American Electric Reliability Corporation (NERC) planning criteria, and to compare the Modified Alternative Option to Option 2.

# 2. Assumptions, Criteria and Methodology

Unless specifically noted herein, ERCOT's study of the Modified Alternative Option was performed using the same assumptions, criteria and methodology as ERCOT's earlier study of Option 2. Those assumptions, criteria and methodology are set forth in detail in Section 2 of the Option 2 Integration Analysis, as filed with the Commission on March 1, 2018.

## 2.1. Assumptions

### 2.1.1. Steady State

To complete the steady state analysis of the Modified Alternative Option, ERCOT used the same assumptions as those detailed in Section 2.1.1. of the Option 2 Integration Analysis,[3] except that for purposes of this study the RCEC winter peak load was assumed to be 190 MW, based on the latest information provided by RCEC.

To be consistent, ERCOT also performed an analysis of Option 2 assuming a 190 MW winter peak load. This change in winter peak load did not materially impact the conclusions set forth in the Option 2 Integration Analysis.

### 2.1.2. Economic

To perform the economic assessment, ERCOT used the same 2020 and 2025 models used to perform the Option 2 Integration Analysis, except for the topology changes necessary to model the Modified Alternative Option.

[3] To complete the previously filed Option 2 Integration Analysis, ERCOT used a summer peak load of 122 8 MW and a winter peak load of 156 MW because that was the most updated information available at the time

### 2.2. Study Criteria

For the reliability analysis of the Modified Alternative Option, ERCOT used the same criteria used to perform the reliability analysis of Option 2. Those criteria are set forth in detail in Section 2.2. of the Option 2 Integration Analysis.

## 3. Study Results

### 3.1. Steady-State Results

ERCOT's reliability analysis of the Oncor Proposed Option revealed reliability criteria violations. In order to resolve those violations, ERCOT recommends the following modifications to the Oncor Proposed Option:

- All three ERCOT-RCEC connections should be in service at the time RCEC's load is transferred to the ERCOT System;
- Upgrade the Forest Grove (#3131)–Eustace (#3178) 4.3 mile 138 kV line to approximately 495 MVA; and
- Upgrade the Palestine (#3271) – Palestine South (#3272) 1.3 mile 138 kV line to approximately 249 MVA.[4]

The results presented in this report use study cases that assume that the above ERCOT-recommended modifications will be implemented. As noted above, this transmission option is referred to herein as the Modified Alternative Option.

The Modified Alternative Option was tested for compliance with ERCOT and NERC steady-state reliability planning criteria. Table 3.1 summarizes the results of the steady-state reliability analysis.

**Table 3.1: Steady State Results**

| | Contingency (NERC/ERCOT) reliability requirements | | |
|---|---|---|---|
| | P0/P1 | P7 | P6 (X-1+N-1) |
| Modified Alternative Option | Met | Met | Met |

### 3.2. Economic Assessment

Production cost simulations were completed to compare total ERCOT production cost with and without the integration of RCEC's remaining load into the ERCOT System using the Modified Alternative Option. This was then compared to the production cost impact of Option 2.

Table 3.2 shows the production cost impact of integrating RCEC's remaining load into the ERCOT System for both the Modified Alternative Option and Option 2. No measurable congestion impact on the ERCOT System was found with the integration of RCEC's load using either the Modified Alternative Option or Option 2.

[4] In order to meet ERCOT reliability criteria based on the most updated study case assumptions, ERCOT also recommends that the Palestine–Palestine South 1 3 mile 138 kV line upgrade be added to Option 2 This recommended modification was not part of the transmission configuration studied in the Option 2 Integration Analysis; however, for purposes of the total capital cost comparison set forth in this report. this modification to Option 2 is included Further. in conducting the comparison between Option 2 and the Modified Alternative Option, ERCOT became aware that one component of the Option 2 transmission configuration that was part of the transmission configuration previously studied in the Option 2 Integration Analysis—specifically the Elkton–Tyler Switch line upgrade —was not necessary for reliability Accordingly, this component of Option 2 has been removed from that transmission configuration for purposes of the analysis and results set forth herein.

**Table 3.2: Production Cost Impact**

| Study Year | Annual Production Cost Increase ($M) – Option 2 | Annual Production Cost Increase ($M) – Modified Alternative Option |
|---|---|---|
| 2020 | 15 | 14 |
| 2025 | 16 | 17 |

### 3.3. Customer Impact

ERCOT is not able to allocate system reliability impacts by customer class nor provide a complete evaluation of the cost impacts on all customer classes in ERCOT. Nevertheless, in an effort to provide some insight into potential customer impacts, production cost analyses were performed to compare Locational Marginal Price (LMP) values with and without the remaining RCEC load integrated into the ERCOT System. ERCOT did not observe a material difference in impact on LMPs if RCEC is integrated using Option 2 versus the Modified Alternative Option. Table 3.3 summarizes the estimated annual load-weighted average LMPs in 2020 and 2025, with and without the RCEC integration, for both transmission options.

**Table 3.3: Annual Load Weighted Average LMP – System Wide**

| | Option 2 ($/MWh) | Modified Alternative Option ($/MWh) |
|---|---|---|
| 2020 Base | 30 05 | 30.05 |
| 2020 with RCEC Integration | 30 05 | 30.04 |
| 2025 Base | 31 55 | 31.55 |
| 2025 with RCEC Integration | 31.55 | 31.56 |

## 4. Transfer Capability Comparison

ERCOT performed a transfer analysis for both Option 2 and the Modified Alternative Option to compare the long-term load serving capability. In this analysis, ERCOT determined the load level at which an overload would be expected to occur for both transmission options. As shown in Table 4.1, the transmission options have the same maximum transfer capability, 390 MW, which is more than double the forecasted winter peak load. Therefore, the long-term load serving capability of each of the options is considered adequate and comparable for both options.

**Table 4.1: VSAT Transfer Analysis**

| Options Description | Base Load Level (MW) | Next Maximum Transfer (MW) | Thermal Overload Location |
|---|---|---|---|
| Modified Alternative Option | 190 | 390 | Eustace (#3178) – Mabank Tap (#29266) |
| Option 2 | | 390 | Forest Grove (#3131) – Eustace (#3178) |

## 5. Avoided or New Project Analysis

ERCOT did not identify any projects from the 2017 Regional Transmission Plan (RTP) or 2016 Long-Term System Assessment (LTSA) that could be deferred or eliminated as a result of the integration of RCEC's remaining load into the ERCOT System using the Modified Alternative Option. ERCOT reached this same conclusion with respect to Option 2.

# 6. ERCOT Estimated Generic Cost Comparison

ERCOT reported in the Option 2 Integration Analysis that the estimated total capital cost for Option 2 was $38 million. This estimate was calculated using estimated equipment costs provided by Lone Star Transmission LLC (Lone Star).[5] Similarly, Oncor estimated that the total capital cost for the Oncor Proposed Option (i.e., without ERCOT's recommended modifications in the Modified Alternative Option) was $12.2 million.

Although both Option 2 and the Oncor Proposed Option shared some similar components (e.g., a new Apollo switch station), Lone Star and Oncor provided ERCOT with significantly different cost estimates for these same components. Given these varying cost estimates from the Transmission Service Providers (TSPs), ERCOT has chosen for purposes of this study to assign generic costs to each component of Option 2 and the Modified Alternative Option in order to more equitably compare the total capital cost of both options.

In determining the generic equipment costs used in this study, ERCOT utilized the February 2018 Transmission Project Information Tracking (TPIT), which is updated by all ERCOT TSPs, to estimate the generic per unit cost of equipment similar to the components of Option 2 and the Modified Alternative Option. ERCOT then used these generic costs to develop an estimated total capital cost for each transmission option.

Table 6.1 details the components of both transmission options and the generic cost estimate for each. Using generic costs, the total estimated capital cost for Option 2 is $41.7 million and for the Modified Alternative Option is $31.7 million.

[5] The $38 million total capital cost estimate previously reported in the Option 2 Integration Analysis did not include the cost of the Palestine–Palestine South 1.3 mile 138 kV line upgrade, which ERCOT now recommends be included as a part of Option 2 based on updated data, but did include the cost of upgrading the Elkton-Tyler Switch 138 kV line The generic cost estimates calculated in this study are with the Palestine–Palestine South 1.3 mile 138 kV line upgrade added to Option 2 and the with the upgrade to the Elkton-Tyler Switch 138 kV line removed from Option 2

**Table 6.1: ERCOT Generic Cost Estimates**

| **Option 2**[6] | | | |
|---|---|---|---|
| **Description**[7] | **ERCOT Generic Cost ($M or $M/mile)** | **Distance/Quantity** | **Total Cost ($ million)** |
| Extend bus work & add 138 kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap* | 1.0 | 1 | 1 0 |
| Construct new Apollo 138 kV switch station in Teaselville - Palestine line* | 9.6 | 1 | 9.6 |
| Extend the Coffee - Jacksonville 138 kV line into new 138 kV Apollo switching station* | 1.0 | 0.5 | 0.5 |
| Upgrade Palestine - Palestine South switch station 138 kV line* | 1.0 | 1.3 | 1.3 |
| Construct new 345 kV 6 breaker ring bus on Tyler Grande - Tricorner line (Aristotle) | 17.2 | 1 | 17 2 |
| Install new 345/138 kV 650 MVA transformer at Aristotle | 9.2 | 1 | 9.2 |
| Construct new Aristotle – Benwheeler 138 kV line, ~0.9 mile | 1.0 | 0.9 | 0.9 |
| Expand Benwheeler substation to accommodate Aristotle 345 substation and Canton substation connection[8] | 2 | 1 | 2.0 |
| | | | |
| | | **Total** | **41.7** |

| **Modified Alternative Option** | | | |
|---|---|---|---|
| **Description**[7] | | | |
| Extend bus work & add 138 kV jumper (<0 1 mile) to connect Canton Switch Station to Canton Tap* | 1.0 | 1 | 1.0 |
| Construct new Apollo 138 kV switch station in Teaselville - Palestine line* | 9.6 | 1 | 9.6 |
| Extend the Coffee - Jacksonville 138 kV line into new 138 kV Apollo switching station* | 1.0 | 0.5 | 0.5 |
| Upgrade Palestine - Palestine South switch station 138 kV line* | 1.0 | 1.3 | 1.3 |
| Construct Mabank Tap – Eustace Southeast Sw. Station 138 kV Line | 0.9 | 6 | 5.4 |
| Construct new Eustace Southeast 138 kV switch station | 9.6 | 1 | 9.6 |
| Upgrade Forest Grove switch station - Eustace Southeast switch station 138 kV line | 1.0 | 4.3 | 4 3 |
| | | **Total** | **31.7** |

[6] Although the Elkton – Tyler Switch line was proposed by Lone Star Transmission, LLC as an incremental upgrade as part of Option 2, ERCOT has determined that the upgrade is not necessary for reliability and accordingly, it has been removed from Option 2 for purposes of this study, including the calculation of estimated capital costs

[7] Components that are common to both Option 2 and the Modified Alternative Option are marked with an asterisk (*)

[8] Because there was no similar project available in TPIT to estimate a generic cost for this component, the estimated cost, for this component only, is the cost provided by the relevant TSP (Lone Star Transmission)

# 7. Facility End Points

Table 7.1 shows the new facilities required to integrate RCEC's load into the ERCOT System for both Option 2 and the Modified Alternative Option, along with the owner(s) of the end point(s) of those facilities.

**Table 7.1: End Point Owners**

| Option 2 | | |
|---|---|---|
| **Description** | **Owner End Point 1** | **Owner End Point 2** |
| Extend bus work & add 138 kV jumper (<0 1 mile) to connect Canton Switch Station to Canton Tap | Oncor | RCEC |
| Construct new Apollo 138 kV switch station in Teaselville - Palestine line | New Substation | Oncor |
| Extend the Coffee - Jacksonville 138 kV line into new 138 kV Apollo switching station | RCEC | New Substation |
| Upgrade Palestine - Palestine South switch station 138 kV line | Oncor | Oncor |
| Construct new 345 kV 6 breaker ring bus on Tyler Grande - Tricorner line (Aristotle) | New Substation | Oncor |
| Install new 345/138 kV 650 MVA transformer at Aristotle | New Substation | New Substation |
| Construct new Aristotle – Benwheeler 138 kV line, ~0.9 mile | New Substation | RCEC |
| Expand Benwheeler substation to accommodate Aristotle 345 substation and Canton substation connection | RCEC | RCEC |
| | | |

| Modified Alternative Option | | |
|---|---|---|
| **Description** | Owner End Point 1 | Owner End Point 2 |
| Extend bus work & add 138 kV jumper (<0 1 mile) to connect Canton Switch Station to Canton Tap | Oncor | RCEC |
| Construct new Apollo 138 kV switch station in Teaselville - Palestine line | New Substation | Oncor |
| Extend the Coffee - Jacksonville 138 kV line into new 138 kV Apollo switching station | RCEC | New Substation |
| Upgrade Palestine - Palestine South switch station 138 kV line | Oncor | Oncor |
| Construct Mabank Tap – Eustace Southeast Sw. Station 138 kV Line | Oncor | Oncor |
| Construct new Eustace Southeast 138 kV switch station | New Substation | Oncor |
| Upgrade Forest Grove switch station - Eustace Southeast switch station 138 kV line | Oncor | Oncor |

# 8. Conclusion

ERCOT has made the following findings, which compare the results of ERCOT's analysis assuming integration of RCEC's load using Option 2 against the results for the Modified Alternative Option:

1. **Production cost analysis for ERCOT.**

   The annual ERCOT production cost is expected to increase by approximately $15 million in 2020, and by approximately $16 million in 2025, if RCEC's load is integrated using Option 2. The annual ERCOT production cost is expected to increase by approximately $14 million in 2020, and by approximately $17 million in 2025, if RCEC's load is integrated using the Modified Alternative Option.

2. **Analysis of the impacts on the transmission system that includes an evaluation of the estimated economic impacts of the proposed integration.**

   The estimated ERCOT generic capital cost for the Option 2 transmission facilities is $41.7 million. The estimated ERCOT generic capital cost for the Modified Alternative Option transmission facilities is $31.7 million.

3. **Analysis of avoided projects or new projects as a result of moving the RCEC load to the ERCOT System.**

   ERCOT's results were the same for both Option 2 and the Modified Alternative Option. ERCOT's analysis indicated that, regardless of whether Option 2 or the Modified Alternative Option is used to integrate RCEC's load, no planned system improvement projects in the 2017 RTP or 2016 LTSA (Current Trends scenario) could be avoided or deferred by integrating RCEC's load into ERCOT. No additional ERCOT System improvement projects will be needed to integrate RCEC's load into the ERCOT System, other than either Option 2 or the Modified Alternative Option.

4. **Other potential reliability impacts on the ERCOT System.**

   ERCOT's results were the same for both Option 2 and the Modified Alternative Option. ERCOT performed steady-state reliability studies to determine potential reliability impacts on the ERCOT System in the event of RCEC's integration. The studies did not reveal a need for additional transmission improvement project recommendations other than either Option 2 or the Modified Alternative Option.

5. **An evaluation of power flow and system contingencies for the ERCOT System.**

   ERCOT's results were the same for both Option 2 and the Modified Alternative Option. ERCOT performed steady-state power flow studies and evaluated system contingencies. None of these studies revealed any ERCOT System reliability performance impacts or transmission improvement project recommendations were needed beyond either Option 2 or the Modified Alternative Option.

In summary, the Modified Alternative Option was found to have similar reliability and long-term load-serving capability as Option 2. However, because the Modified Alternative Option has a lower total estimated capital cost, ERCOT recommends that it be used for integrating RCEC's remaining load into the ERCOT System.

ercot

# ERCOT-SPP Coordinated RCEC Integration Analysis - Addendum

**Version 1.~~0~~1**

# Document Revisions

| Date | Version | Description | Author(s) | Reviewed By |
|---|---|---|---|---|
| 04/30/2018 | 1.0 | Final | Ajay Pappu, Ying Li | Jeff Billo, Prabhu Gnanam |
| 05/18/2018 | 1.1 | Revised to reflect removal of Elkton – Tyler Switch line upgrade from Option 2 transmission configuration, including revisions to estimated capital cost for Option 2. ERCOT's recommendation to use the Modified Alternative Option to integrate RCEC's load remains unchanged | Ajay Pappu | Jeff Billo, Prabhu Gnanam |

# Table of Contents

# 1. Background and Introduction

The ERCOT—RCEC Load Integration Study filed with the Public Utility Commission of Texas (Commission) in June 2017 (the "ERCOT Integration Study") recommended "Option 2" as the lowest cost reliable option for integrating the remaining portion of the Rayburn Country Electric Cooperative Inc. dba Rayburn Electric (RCEC) load that is currently served by the Southwest Power Pool (SPP) into the Electric Reliability Council of Texas, Inc. (ERCOT) System.[1] Accordingly, the ERCOT-SPP Coordinated Integration Analysis filed with the Commission on March 1, 2018 (the "Option 2 Integration Analysis") set forth ERCOT's study results assuming "Option 2" would be used to integrate the remaining portion of RCEC's load into the ERCOT System.[2]

When ERCOT filed the Option 2 Integration Analysis, it noted that in February 2018 Oncor Electric Delivery Company LLC (Oncor) had made ERCOT aware of an alternative proposal for integration of the RCEC load into the ERCOT System (see Figure 1). Oncor sent ERCOT its final study report for this transmission option (the "Oncor Proposed Option") on March 26, 2018.

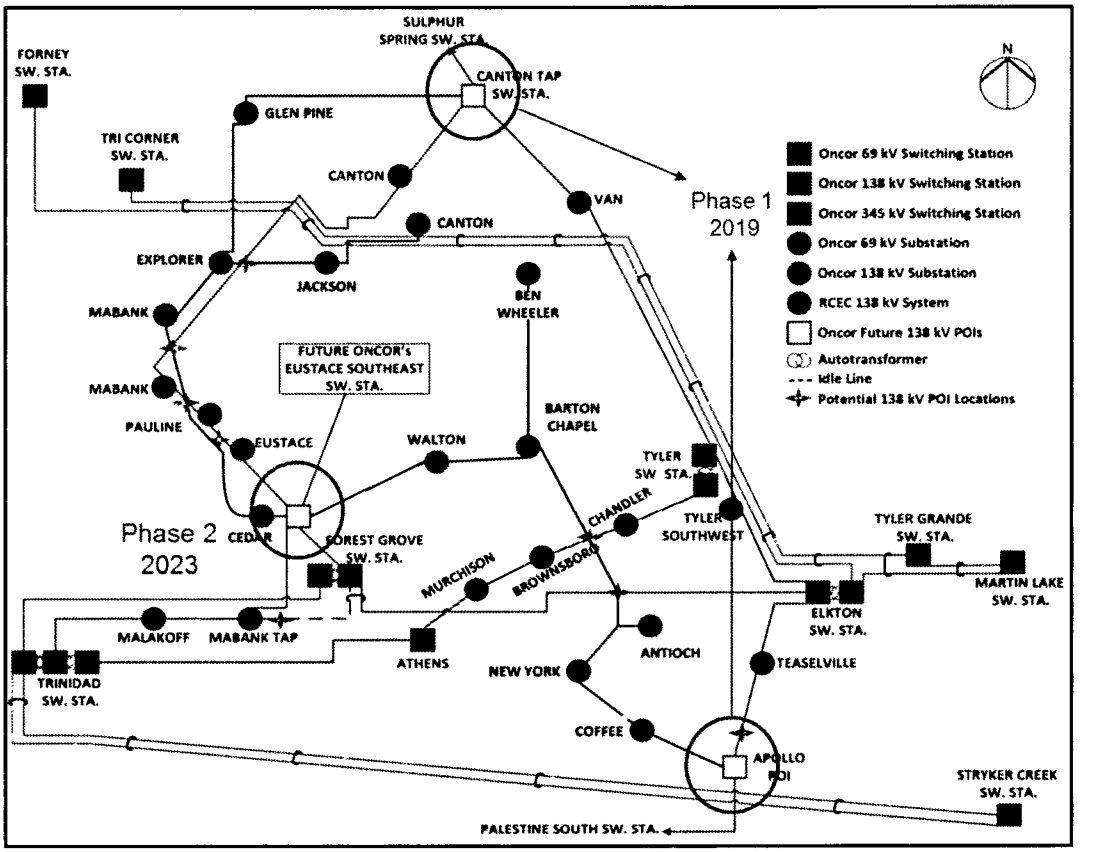



**Figure 1 RCEC Integration - Oncor Proposed Option**

[1] *Project to Identify Issues Pertaining to Rayburn Country Electric Cooperative, Inc. s Proposal to Transfer Existing Facilities and Load into the Electric Reliability Council of Texas*, Project No 47342, ERCOT - RCEC Load Integration Study (June 27, 2017) ("ERCOT Integration Study").

[2] *Project to Identify Issues Pertaining to Rayburn Country Electric Cooperative, Inc.'s Proposal to Transfer Existing Facilities and Load into the Electric Reliability Council of Texas*, Project No 47342. ERCOT-SPP Coordinated RCEC Integration Analysis (March 1, 2018) ("Option 2 Integration Analysis").

Oncor recommended the Oncor Proposed Option be constructed in two phases as follows:

Phase 1 (proposed completion in 2019)
- Apollo 138kV Sw. Station\POI
- Apollo Sw. Station – RCEC Coffee 138kV Line
- Canton Tap 138kV Sw. Station\POI

Phase 2 (proposed completion in 2023)
- Mabank Tap – Eustace Southeast Sw. Station 138kV Line
- Eustace Southeast 138kV Sw. Station

ERCOT's analysis of the Oncor Proposed Option revealed reliability criteria violations. Accordingly, modifications to the Oncor Proposed Option are necessary in order to reliably integrate RCEC's load. The Oncor Proposed Option, combined with ERCOT's recommended modifications, is referred to herein as the "Modified Alternative Option."

The Modified Alternative Option was the study case used to complete the analysis herein. More specifically, ERCOT studied the Modified Alternative Option to determine if it would meet ERCOT and North American Electric Reliability Corporation (NERC) planning criteria, and to compare the Modified Alternative Option to Option 2.

# 2. Assumptions, Criteria and Methodology

Unless specifically noted herein, ERCOT's study of the Modified Alternative Option was performed using the same assumptions, criteria and methodology as ERCOT's earlier study of Option 2. Those assumptions, criteria and methodology are set forth in detail in Section 2 of the Option 2 Integration Analysis, as filed with the Commission on March 1, 2018.

## 2.1. Assumptions

### 2.1.1. Steady State

To complete the steady state analysis of the Modified Alternative Option, ERCOT used the same assumptions as those detailed in Section 2.1.1. of the Option 2 Integration Analysis,[3] except that for purposes of this study the RCEC winter peak load was assumed to be 190 MW, based on the latest information provided by RCEC.

To be consistent, ERCOT also performed an analysis of Option 2 assuming a 190 MW winter peak load. This change in winter peak load did not materially impact the conclusions set forth in the Option 2 Integration Analysis.

### 2.1.2. Economic

To perform the economic assessment, ERCOT used the same 2020 and 2025 models used to perform the Option 2 Integration Analysis, except for the topology changes necessary to model the Modified Alternative Option.

[3] To complete the previously filed Option 2 Integration Analysis, ERCOT used a summer peak load of 122.8 MW and a winter peak load of 156 MW because that was the most updated information available at the time

### 2.2. Study Criteria

For the reliability analysis of the Modified Alternative Option, ERCOT used the same criteria used to perform the reliability analysis of Option 2. Those criteria are set forth in detail in Section 2.2. of the Option 2 Integration Analysis.

## 3. Study Results

### 3.1. Steady-State Results

ERCOT's reliability analysis of the Oncor Proposed Option revealed reliability criteria violations. In order to resolve those violations, ERCOT recommends the following modifications to the Oncor Proposed Option:

- All three ERCOT-RCEC connections should be in service at the time RCEC's load is transferred to the ERCOT System;
- Upgrade the Forest Grove (#3131)–Eustace (#3178) 4.3 mile 138 kV line to approximately 495 MVA; and
- Upgrade the Palestine (#3271) – Palestine South (#3272) 1.3 mile 138 kV line to approximately 249 MVA.[4]

The results presented in this report use study cases that assume that the above ERCOT-recommended modifications will be implemented. As noted above, this transmission option is referred to herein as the Modified Alternative Option.

The Modified Alternative Option was tested for compliance with ERCOT and NERC steady-state reliability planning criteria. Table 3.1 summarizes the results of the steady-state reliability analysis.

**Table 3.1: Steady State Results**

| | Contingency (NERC/ERCOT) reliability requirements | | |
|---|---|---|---|
| | P0/P1 | P7 | P6 (X-1+N-1) |
| Modified Alternative Option | Met | Met | Met |

### 3.2. Economic Assessment

Production cost simulations were completed to compare total ERCOT production cost with and without the integration of RCEC's remaining load into the ERCOT System using the Modified Alternative Option. This was then compared to the production cost impact of Option 2.

Table 3.2 shows the production cost impact of integrating RCEC's remaining load into the ERCOT System for both the Modified Alternative Option and Option 2. No measurable congestion impact on the ERCOT System was found with the integration of RCEC's load using either the Modified Alternative Option or Option 2.

[4] In order to meet ERCOT reliability criteria based on the most updated study case assumptions, ERCOT also recommends that the Palestine–Palestine South 1 3 mile 138 kV line upgrade be added to Option 2. This recommended modification was not part of the transmission configuration studied in the Option 2 Integration Analysis. however, for purposes of the total capital cost comparison set forth in this report. this modification to Option 2 is included. Further, in conducting the comparison between Option 2 and the Modified Alternative Option, ERCOT became aware that one component of the Option 2 transmission configuration that was part of the transmission configuration previously studied in the Option 2 Integration Analysis—specifically the Elkton–Tyler Switch line upgrade —was not necessary for reliability. Accordingly, this component of Option 2 has been removed from that transmission configuration for purposes of the analysis and results set forth herein.

**Table 3.2: Production Cost Impact**

| Study Year | Annual Production Cost Increase ($M) – Option 2 | Annual Production Cost Increase ($M) – Modified Alternative Option |
|---|---|---|
| 2020 | 15 | 14 |
| 2025 | 16 | 17 |

### 3.3. Customer Impact

ERCOT is not able to allocate system reliability impacts by customer class nor provide a complete evaluation of the cost impacts on all customer classes in ERCOT. Nevertheless, in an effort to provide some insight into potential customer impacts, production cost analyses were performed to compare Locational Marginal Price (LMP) values with and without the remaining RCEC load integrated into the ERCOT System. ERCOT did not observe a material difference in impact on LMPs if RCEC is integrated using Option 2 versus the Modified Alternative Option. Table 3.3 summarizes the estimated annual load-weighted average LMPs in 2020 and 2025, with and without the RCEC integration, for both transmission options.

**Table 3.3: Annual Load Weighted Average LMP – System Wide**

| | Option 2 ($/MWh) | Modified Alternative Option ($/MWh) |
|---|---|---|
| 2020 Base | 30.05 | 30.05 |
| 2020 with RCEC Integration | 30.05 | 30.04 |
| 2025 Base | 31 55 | 31.55 |
| 2025 with RCEC Integration | 31.55 | 31 56 |

## 4. Transfer Capability Comparison

ERCOT performed a transfer analysis for both Option 2 and the Modified Alternative Option to compare the long-term load serving capability. In this analysis, ERCOT determined the load level at which an overload would be expected to occur for both transmission options. As shown in Table 4.1, the transmission options have the same maximum transfer capability, 390 MW, which is more than double the forecasted winter peak load. Therefore, the long-term load serving capability of each of the options is considered adequate and comparable for both options.

**Table 4.1: VSAT Transfer Analysis**

| Options Description | Base Load Level (MW) | Next Maximum Transfer (MW) | Thermal Overload Location |
|---|---|---|---|
| Modified Alternative Option | 190 | 390 | Eustace (#3178) – Mabank Tap (#29266) |
| Option 2 | | 390 | Forest Grove (#3131) – Eustace (#3178) |

## 5. Avoided or New Project Analysis

ERCOT did not identify any projects from the 2017 Regional Transmission Plan (RTP) or 2016 Long-Term System Assessment (LTSA) that could be deferred or eliminated as a result of the integration of RCEC's remaining load into the ERCOT System using the Modified Alternative Option. ERCOT reached this same conclusion with respect to Option 2.

# 6. ERCOT Estimated Generic Cost Comparison

ERCOT reported in the Option 2 Integration Analysis that the estimated total capital cost for Option 2 was $38 million. This estimate was calculated using estimated equipment costs provided by Lone Star Transmission LLC (Lone Star).[5] Similarly, Oncor estimated that the total capital cost for the Oncor Proposed Option (i.e., without ERCOT's recommended modifications in the Modified Alternative Option) was $12.2 million.

Although both Option 2 and the Oncor Proposed Option shared some similar components (e.g., a new Apollo switch station), Lone Star and Oncor provided ERCOT with significantly different cost estimates for these same components. Given these varying cost estimates from the Transmission Service Providers (TSPs), ERCOT has chosen for purposes of this study to assign generic costs to each component of Option 2 and the Modified Alternative Option in order to more equitably compare the total capital cost of both options.

In determining the generic equipment costs used in this study, ERCOT utilized the February 2018 Transmission Project Information Tracking (TPIT), which is updated by all ERCOT TSPs, to estimate the generic per unit cost of equipment similar to the components of Option 2 and the Modified Alternative Option. ERCOT then used these generic costs to develop an estimated total capital cost for each transmission option.

Table 6.1 details the components of both transmission options and the generic cost estimate for each. Using generic costs, the total estimated capital cost for Option 2 is ~~$43.8~~41.7 million and for the Modified Alternative Option is $31.7 million.

[5] The $38 million total capital cost estimate previously reported in the Option 2 Integration Analysis did not include the cost of the Palestine–Palestine South 1 3 mile 138 kV line upgrade, which ERCOT now recommends be included as a part of Option 2 based on updated data, but did include the cost of upgrading the Elkton-Tyler Switch 138 kV line The generic cost estimates calculated in this study are with the Palestine–Palestine South 1 3 mile 138 kV line upgrade added to Option 2 and the with the upgrade to the Elkton-Tyler Switch 138 kV line removed from Option 2

**Table 6.1: ERCOT Generic Cost Estimates**

| **Option 2**[6] | | | |
|---|---|---|---|
| **Description**[7] | **ERCOT Generic Cost ($M or $M/mile)** | **Distance/Quantity** | **Total Cost ($ million)** |
| Extend bus work & add 138 kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap* | 1.0 | 1 | 1.0 |
| Construct new Apollo 138 kV switch station in Teaselville - Palestine line* | 9.6 | 1 | 9.6 |
| Extend the Coffee - Jacksonville 138 kV line into new 138 kV Apollo switching station* | 1.0 | 0 5 | 0.5 |
| Upgrade Palestine - Palestine South switch station 138 kV line* | 1.0 | 1.3 | 1.3 |
| Construct new 345 kV 6 breaker ring bus on Tyler Grande - Tricorner line (Aristotle) | 17 2 | 1 | 17.2 |
| Install new 345/138 kV 650 MVA transformer at Aristotle | 9.2 | 1 | 9.2 |
| Construct new Aristotle – Benwheeler 138 kV line, ~0.9 mile | 1.0 | 0 9 | 0.9 |
| Expand Benwheeler substation to accommodate Aristotle 345 substation and Canton substation connection[8] | 2 | 1 | 2 0 |
| ~~Upgrade Elkton - Tyler Switch 138 kV line~~ | ~~1.0~~ | ~~2.1~~ | ~~2.1~~ |
| | | | |
| | | **Total** | ~~43.8~~41.7 |

| **Modified Alternative Option** | | | |
|---|---|---|---|
| ~~Description~~Description | | | |
| Extend bus work & add 138 kV jumper (<0 1 mile) to connect Canton Switch Station to Canton Tap* | 1.0 | 1 | 1.0 |
| Construct new Apollo 138 kV switch station in Teaselville - Palestine line* | 9 6 | 1 | 9.6 |
| Extend the Coffee - Jacksonville 138 kV line into new 138 kV Apollo switching station* | 1.0 | 0.5 | 0.5 |
| Upgrade Palestine - Palestine South switch station 138 kV line* | 1.0 | 1.3 | 1.3 |
| Construct Mabank Tap – Eustace Southeast Sw. Station 138 kV Line | 0.9 | 6 | 5.4 |
| Construct new Eustace Southeast 138 kV switch station | 9 6 | 1 | 9.6 |
| Upgrade Forest Grove switch station - Eustace Southeast switch station 138 kV line | 1.0 | 4.3 | 4.3 |
| | | **Total** | **31.7** |

[6] Although the Elkton – Tyler Switch line was proposed by Lone Star Transmission, LLC as an incremental upgrade as part of Option 2, ERCOT has determined that the upgrade is not necessary for reliability and, accordingly, it has been removed from Option 2 for purposes of this study, including the calculation of estimated capital costs.

[7] Components that are common to both Option 2 and the Modified Alternative Option are marked with an asterisk (*).

[8] Because there was no similar project available in TPIT to estimate a generic cost for this component, the estimated cost, for this component only, is the cost provided by the relevant TSP (Lone Star Transmission)

# 7. Facility End Points

Table 7.1 shows the new facilities required to integrate RCEC's load into the ERCOT System for both Option 2 and the Modified Alternative Option, along with the owner(s) of the end point(s) of those facilities.

**Table 7.1: End Point Owners**

| Option 2 | | |
|---|---|---|
| **Description** | **Owner End Point 1** | **Owner End Point 2** |
| Extend bus work & add 138 kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap | Oncor | RCEC |
| Construct new Apollo 138 kV switch station in Teaselville - Palestine line | New Substation | Oncor |
| Extend the Coffee - Jacksonville 138 kV line into new 138 kV Apollo switching station | RCEC | New Substation |
| Upgrade Palestine - Palestine South switch station 138 kV line | Oncor | Oncor |
| Construct new 345 kV 6 breaker ring bus on Tyler Grande - Tricorner line (Aristotle) | New Substation | Oncor |
| Install new 345/138 kV 650 MVA transformer at Aristotle | New Substation | New Substation |
| Construct new Aristotle – Benwheeler 138 kV line, ~0.9 mile | New Substation | RCEC |
| Expand Benwheeler substation to accommodate Aristotle 345 substation and Canton substation connection | RCEC | RCEC |
| ~~Upgrade Elkton - Tyler Switch 138 kV line~~ | ~~Oncor~~ | ~~Oncor~~ |
| | | |

| Modified Alternative Option | | |
|---|---|---|
| **Description** | Owner End Point 1 | Owner End Point 2 |
| Extend bus work & add 138 kV jumper (<0.1 mile) to connect Canton Switch Station to Canton Tap | Oncor | RCEC |
| Construct new Apollo 138 kV switch station in Teaselville - Palestine line | New Substation | Oncor |
| Extend the Coffee - Jacksonville 138 kV line into new 138 kV Apollo switching station | RCEC | New Substation |
| Upgrade Palestine - Palestine South switch station 138 kV line | Oncor | Oncor |
| Construct Mabank Tap – Eustace Southeast Sw. Station 138 kV Line | Oncor | Oncor |
| Construct new Eustace Southeast 138 kV switch station | New Substation | Oncor |
| Upgrade Forest Grove switch station - Eustace Southeast switch station 138 kV line | Oncor | Oncor |

# 8. Conclusion

ERCOT has made the following findings, which compare the results of ERCOT's analysis assuming integration of RCEC's load using Option 2 against the results for the Modified Alternative Option:

1. **Production cost analysis for ERCOT.**

   The annual ERCOT production cost is expected to increase by approximately $15 million in 2020, and by approximately $16 million in 2025, if RCEC's load is integrated using Option 2. The annual ERCOT production cost is expected to increase by approximately $14 million in 2020, and by approximately $17 million in 2025, if RCEC's load is integrated using the Modified Alternative Option.

2. **Analysis of the impacts on the transmission system that includes an evaluation of the estimated economic impacts of the proposed integration.**

   The estimated ERCOT generic capital cost for the Option 2 transmission facilities is ~~$43.8~~$41.7 million. The estimated ERCOT generic capital cost for the Modified Alternative Option transmission facilities is $31.7 million.

3. **Analysis of avoided projects or new projects as a result of moving the RCEC load to the ERCOT System.**

   ERCOT's results were the same for both Option 2 and the Modified Alternative Option. ERCOT's analysis indicated that, regardless of whether Option 2 or the Modified Alternative Option is used to integrate RCEC's load, no planned system improvement projects in the 2017 RTP or 2016 LTSA (Current Trends scenario) could be avoided or deferred by integrating RCEC's load into ERCOT. No additional ERCOT System improvement projects will be needed to integrate RCEC's load into the ERCOT System, other than either Option 2 or the Modified Alternative Option.

4. **Other potential reliability impacts on the ERCOT System.**

   ERCOT's results were the same for both Option 2 and the Modified Alternative Option. ERCOT performed steady-state reliability studies to determine potential reliability impacts on the ERCOT System in the event of RCEC's integration. The studies did not reveal a need for additional transmission improvement project recommendations other than either Option 2 or the Modified Alternative Option.

5. **An evaluation of power flow and system contingencies for the ERCOT System.**

   ERCOT's results were the same for both Option 2 and the Modified Alternative Option. ERCOT performed steady-state power flow studies and evaluated system contingencies. None of these studies revealed any ERCOT System reliability performance impacts or transmission improvement project recommendations were needed beyond either Option 2 or the Modified Alternative Option.

In summary, the Modified Alternative Option was found to have similar reliability and long-term load-serving capability as Option 2. However, because the Modified Alternative Option has a lower total estimated capital cost, ERCOT recommends that it be used for integrating RCEC's remaining load into the ERCOT System.