



Item 13: Jones Creek Regional Planning Group Project Independent Review

Jeff Billo

Manager, Transmission Planning

Board of Directors Meeting

ERCOT Public

February 9-10, 2015

Project Background

Freeport LNG

- Announced natural gas liquefaction and export project on Quintana Island
 - 690 MW total load (no self-serve generation)
 - Additional 146 MW load with 82 MW self-serve generation at pretreatment plant (not on Quintana Island)
 - Load will come on between Q3 2017 and Q3 2018

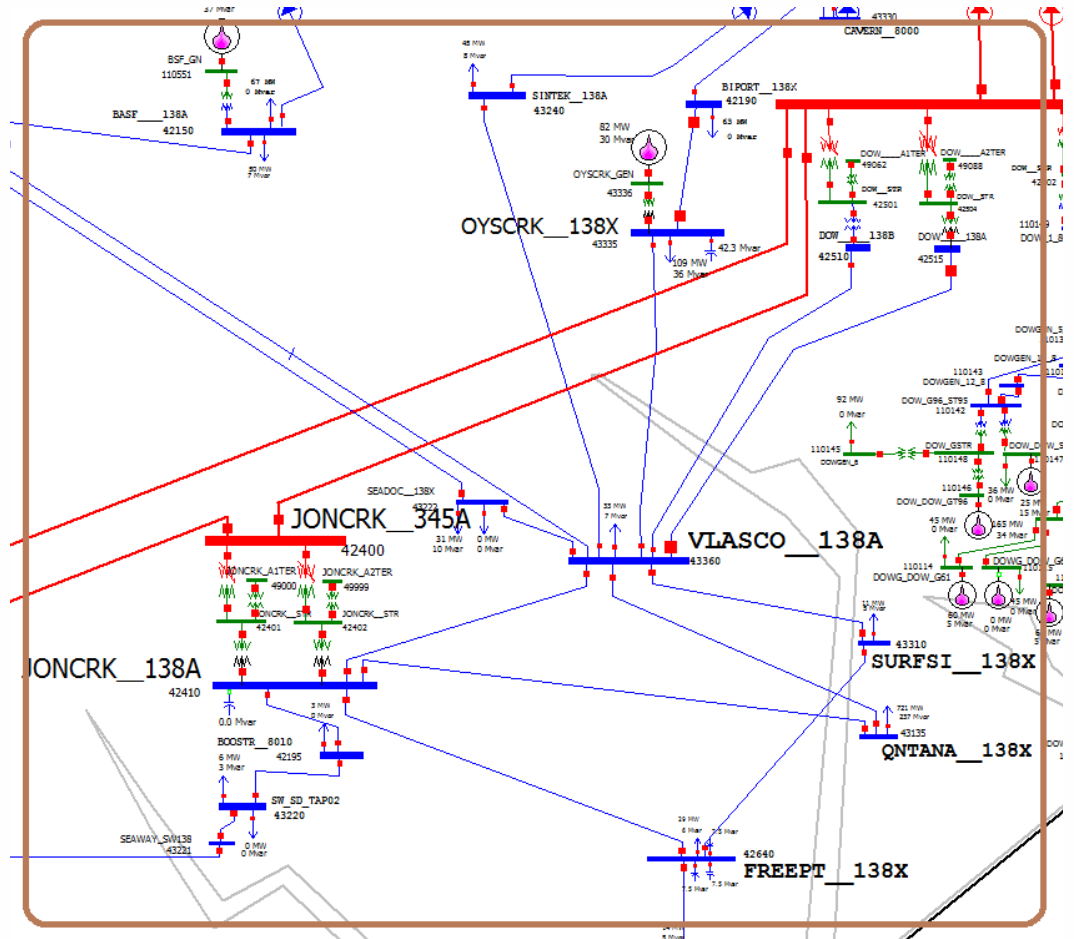
Project Submission

- CenterPoint Energy submitted project for Regional Planning Group review and comment in July 2014
- Project proposal includes new Jones Creek 345/138 kV station and multiple 138 kV system upgrades in the Freeport area

ERCOT Independent Review

Study Results

- Study identified thermal overload and voltage collapse conditions under contingency (reliability criteria violations)
- ERCOT evaluated two options
- Economic analysis did not show additional congestion in the area with proposed project and load addition



ERCOT Recommendation

Recommendation

- ERCOT requests Board of Directors endorsement of the Jones Creek Project (Option B in the Independent Review):
 - Construct a new 345/138 kV “Jones Creek” Substation
 - Install two new 800 MVA normal rating / 1000 MVA emergency rating (800/1000 MVA) 345/138 kV autotransformers at the Jones Creek Substation
 - Loop the 345 kV Dow - STP circuit 18 into the Jones Creek Substation
 - Loop the 138 kV Freeport - Velasco circuit 59 into the Jones Creek Substation
 - Upgrade the Velasco 138 kV Substation to a fault duty rating of 63 kA
 - Split and reconfigure circuits in the Freeport area creating: 138 kV Velasco - Surfside - Freeport - Jones Creek circuit 59, 138 kV Velasco - Quintana - Jones Creek circuit 48, and 138 kV Velasco - Jones Creek circuit 59
 - Reconfigure 138 kV Velasco - Franklins Camp circuit 02 to create 138 kV Jones Creek - Franklins Camp circuit 02
 - Upgrade the 138 kV Jones Creek - Quintana circuit 48 and 138 kV Quintana - Velasco circuit 48 with 838 MVA normal rating / 894 MVA emergency rating (838/894 MVA)
- The cost estimate is \$77.8 million
- TAC voted to endorse the Jones Creek Project at its 1/29/15 meeting (no opposed; 2 abstentions – Independent Generator Market Segment).



Date: February 2, 2015
To: Board of Directors
From: Jeff Billo, Manager, Transmission Planning
Subject: Jones Creek Regional Planning Group Project Independent Review

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: February 9-10, 2015

Item No.: 13

Issue:

Whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should accept the recommendation of ERCOT staff to endorse the need for the Jones Creek Regional Planning Group (RPG) Project in order to meet the reliability requirements for the ERCOT system, which ERCOT staff has independently reviewed and which the Technical Advisory Committee (TAC) has voted to support.

Background/History:

Freeport LNG has announced a natural gas liquefaction and export project on Quintana Island, with a total load of 690 MW. With the additional load in the area, the transmission system is projected to exceed reliability limits. CenterPoint Energy submitted a project proposal to meet the needs for the area.

ERCOT performed an Independent Review of the proposal and confirmed the need for a project. ERCOT analyzed two options and determined that the following set of improvements (that is, Option B in the Independent Review) represent the most cost-effective solution to meet the reliability needs for the area.

- Construct a new 345/138 kV “Jones Creek” Substation
- Install two new 800 MVA normal rating/1000 MVA emergency rating (800/1000 MVA) 345/138 kV autotransformers at the Jones Creek Substation
- Loop the 345 kV Dow - STP circuit 18 into the Jones Creek Substation
- Loop the 138 kV Freeport - Velasco circuit 59 into the Jones Creek Substation
- Upgrade the Velasco 138 kV Substation to a fault duty rating of 63 kA
- Split and reconfigure circuits in the Freeport area creating: 138 kV Velasco - Surfside - Freeport - Jones Creek circuit 59, 138 kV Velasco - Quintana - Jones Creek circuit 48, and 138 kV Velasco - Jones Creek circuit 59
- Reconfigure 138 kV Velasco - Franklins Camp circuit 02 to create 138 kV Jones Creek - Franklins Camp circuit 02
- Upgrade the 138 kV Jones Creek - Quintana circuit 48 and 138 kV Quintana - Velasco circuit 48 with 838 MVA normal rating / 894 MVA emergency rating (838/894 MVA)

The cost estimate for these improvements is \$77.8 million.

The ERCOT Independent Review of the Jones Creek RPG Project is attached as Attachment A.

TAC voted to support the Jones Creek RPG Project at its January 29, 2015 meeting with no



opposing votes and two abstentions from the Independent Generator Market Segment.

Key Factors Influencing Issue:

1. Transmission system improvements are needed to meet reliability criteria in the ERCOT System in the Freeport area.
2. The recommended set of improvements (known as Option B in the Independent Review) was found to be the most cost-effective solution for meeting the reliability criteria.
3. TAC voted to endorse the project at its January 29, 2015 meeting.

Conclusion/Recommendation:

ERCOT staff recommends that the Board endorse the Jones Creek RPG Project which ERCOT staff has independently reviewed with the support of TAC.



ELECTRIC RELIABILITY COUNCIL OF TEXAS, INC.
BOARD OF DIRECTORS RESOLUTION

WHEREAS, after due consideration of the alternatives, the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) deems it desirable and in the best interest of ERCOT to accept ERCOT staff's recommendation to endorse the need for the Jones Creek Regional Planning Group (RPG) Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed and which the Technical Advisory Committee (TAC) has voted to support; and

THEREFORE, BE IT RESOLVED, that ERCOT is hereby authorized and approved to endorse the need for the Jones Creek RPG Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed (that is, Option B) and which TAC has voted to support.

CORPORATE SECRETARY'S CERTIFICATE

I, Vickie G. Leady, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its February 9-10, 2015 meeting, the ERCOT Board passed a motion approving the above Resolution by _____.

IN WITNESS WHEREOF, I have hereunto set my hand this ____ day of February, 2015.

Vickie G. Leady
Assistant Corporate Secretary



ERCOT Independent Review of the CenterPoint Jones Creek Project

Version 1.0

Document Revisions

Date	Version	Description	Author(s)
11/13/2014	1.0	Final	Xiaolong Yu
		Reviewed by	Prabhu Gnanam, Jeff Billo

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1. Introduction

The Freeport area is an industrialized area with several large chemical facilities as well as a major seaport on the Gulf of Mexico. CenterPoint Energy has received inquiries involving significant load growth in this area, among which Freeport LNG has publicly announced a natural gas Liquefaction and Export Project with an associated new 690 MW load. This new load will be served through the ERCOT Region transmission system by the third quarter of 2018.

With the above load addition and using the 2019 summer peak load case, under the X-1+N-1 contingencies when both of Dow–Velasco 345/138 kV autotransformers are out of service the case does not solve, which indicates a system voltage collapse. Additionally, several thermal violations around the Freeport area can be observed under certain N-1 or X-1+N-1 contingencies. Figure 1 shows the area of concern.

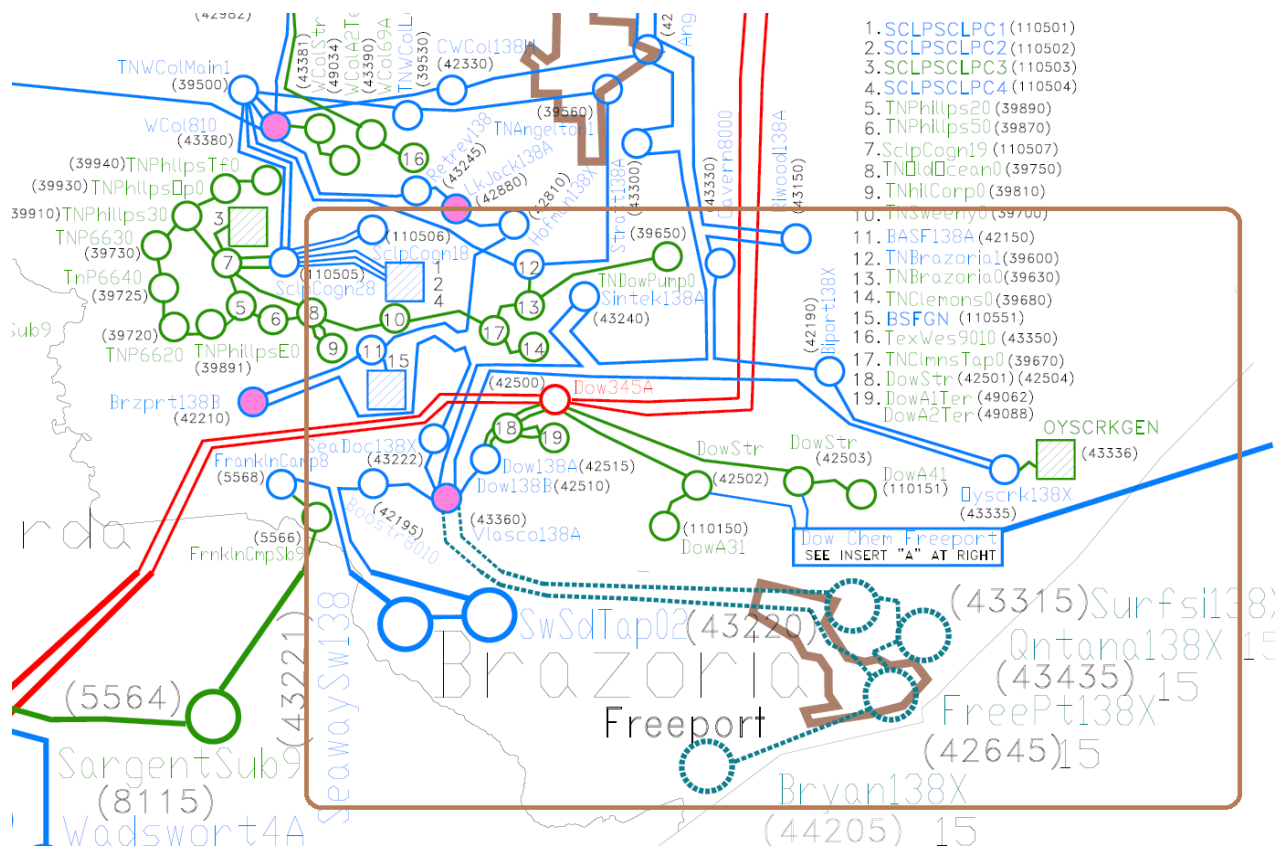


Figure 1: Area of Concern

In order to provide transmission infrastructure that meets ERCOT reliability criteria and serves future load growth in the Freeport area, CenterPoint Energy proposed the following improvements in the area of concern:

- Construct a new 345/138 kV “Jones Creek” Substation;
- Install two new 800 MVA normal rating / 1000 MVA emergency rating (800/1000 MVA) 345/138 kV autotransformers at the Jones Creek Substation;
- Loop the 345 kV Dow - STP circuit 18 into the Jones Creek Substation;

- Loop the 138 kV Freeport - Velasco circuit 59 into the Jones Creek Substation;
- Upgrade the Velasco 138 kV Substation to a fault duty rating of 63 kA;
- Split and reconfigure circuits in the Freeport area creating: 138 kV Velasco - Surfside - Freeport - Jones Creek circuit 59, 138 kV Velasco - Quintana - Jones Creek circuit 48, and 138 kV Velasco - Jones Creek circuit 59;
- Reconfigure 138 kV Velasco - Franklins Camp circuit 02 to create 138 kV Jones Creek - Franklins Camp circuit 02;
- Upgrade the 138 kV Jones Creek - Quintana circuit 48 and 138 kV Quintana - Velasco circuit 48 with 838 MVA normal rating / 894 MVA emergency rating (838/894 MVA);
- Install a new 138 kV 120 MVAR capacitor bank at the Jones Creek Substation.

The total cost for this project is estimated to be \$79.8 million and it is anticipated that the project can be completed by the second quarter of 2017.

2. Study Approach

The analysis of the system primarily focused on the steady-state thermal and voltage reliability of the ERCOT transmission system in the Freeport area to meet the projected load growth. The latest 2013 Regional Transmission Plan (RTP) model for the year 2018 served as the starting case of this analysis.

From the starting case, the following changes are applied to form the base case for this study.

Base case Transmission system changes:

- Adjust load level to reflect the latest load forecast for the year of 2019, e.g. the total load in CenterPoint Energy TSP area is 23078 MW.
- Install a second 800 MVA normal rating / 1000 MVA emergency rating 345/138 kV autotransformer at the Dow-Velasco Substation, and build a second autotransformer 138 kV lead from Dow-Velasco to Velasco Substation at a minimum 800/1000 MVA rating.
- Add 138 kV Oyster Creek Substation with 146 MW load, 82 MW generator, and 40 MVAR capacitor bank.
- Add 690 MW load at Quintana substation.

As part of the ERCOT independent review, several transmission improvement options were studied and compared in order to identify a reliable while economical solution. The evaluation of these options mainly consisted of N-1 contingency analysis. In addition, selected G-1+N-1 (single generator unavailable followed by N-1) contingency analysis, X-1+N-1 (single 345/138 kV transformer unavailable followed by N-1) contingency analyses, and N-1-1 contingency analysis were performed in accordance with NERC and ERCOT reliability criteria.

3. Reliability Analysis of the Base Case

AC N-1 contingency analysis of the base case was performed using PowerWorld Simulator. Table 1 lists the thermal violations revealed by this study.

Contingency (N-1)	Monitored Facility	Rate B (MVA)	Worst % Loading
Freeport – Velasco 138 kV Circuit 48	Quintana – Surfside Beach 138 kV Circuit 59	562	143%
Surfside – Velasco 138 kV Circuit 59	Freeport – Quintana 138 kV Circuit 47	562	141%

Table 1 Thermal Violations in N-1 Contingency Analysis

The X-1+N-1 analysis reveals a few unsolved or limiting conditions for the study area. Table 2 shows the results of the reliability analysis for these conditions.

First Contingency (X-1)	Second Contingency (N-1)	Monitored Facility	Rate B (MVA)	Worst % Loading
345/138 kV autotransformer A1 in Dow-Velasco	345/138 kV autotransformer A2 in Dow-Velasco	NA	NA	Unsolved
345/138 kV autotransformer A1 in Dow-Velasco	Dow – Velasco 138 kV Circuit 83	NA	NA	Unsolved
345/138 kV autotransformer A1 in Dow-Velasco	Freeport – Velasco 138 kV Circuit 48	Quintana – Surfside Beach 138 kV Circuit 59	562	146%
345/138 kV autotransformer A1 in Dow-Velasco	Surfside – Velasco 138 kV Circuit 59	Freeport – Quintana 138 kV Circuit 47	562	143%
345/138 kV autotransformer A1 in Dow-Velasco	Retrieve – West Columbia 138 kV Circuit 02	Dow – Velasco 138 kV Circuit 83	1000	109%

Table 2 Reliability Analysis Results for Selected X-1+N-1

It should be noted that the above contingency analyses also revealed other post-contingency overloaded elements that were regional problems. These elements were discarded from this analysis since these were either not related to the new load addition, were very far from the area of concern, or will be addressed by subsequent projects. More details of the contingency analysis results for the base case can be found in Appendix A.

4. Reliability Analysis of Project Options

The existing substations feeding the Freeport area are the 345 kV / 138 kV Dow-Velasco Substation and the 138 kV Velasco Substation. Since neither of these two substations has space to accommodate more transmission devices, a new substation is needed to support the projected load growth in this area. Based on the existing electric network topology around the Freeport area, two types of projects are proposed: 1) upgrade 138 kV circuits to support the load addition; or 2) add more 345 kV / 138 kV autotransformers to support the load addition. Since all the three 138 kV circuits serving the Freeport area are long lines and need to be upgraded, the estimated installation

cost of this option is much higher than adding more 345 kV / 138 kV autotransformers; hence only the second type is thoroughly studied using simulations.

Two transmission improvement options were analyzed using PowerWorld Simulator to identify a reliable and economical solution to serve new load addition in Freeport area. These two options and the reliability analysis results are listed below:

Option A (Option 2 in CenterPoint Energy's RPG Submittal)

- Construct a new 345/138 kV "Jones Creek" Substation;
- Install two new 800 MVA normal rating / 1000 MVA emergency rating (800/1000 MVA) 345/138 kV autotransformers at the Jones Creek Substation;
- Loop the 345 kV Dow - STP circuit 18 into the Jones Creek Substation;
- Loop the 138 kV Freeport - Velasco circuit 59 into the Jones Creek Substation;
- Upgrade the Velasco 138 kV Substation to a fault duty rating of 63 kA;
- Split and reconfigure circuits in the Freeport area creating: 138 kV Velasco - Surfside - Freeport - Jones Creek circuit 59, 138 kV Velasco - Quintana - Jones Creek circuit 48, and 138 kV Velasco - Jones Creek circuit 59;
- Reconfigure 138 kV Velasco - Franklins Camp circuit 02 to create 138 kV Jones Creek - Franklins Camp circuit 02;
- Upgrade the 138 kV Jones Creek - Quintana circuit 48 and 138 kV Quintana - Velasco circuit 48 with 838 MVA normal rating / 894 MVA emergency rating (838/894 MVA);
- Install a new 138 kV 120 MVAR capacitor bank at the Jones Creek Substation.

The total cost estimate for Option A is approximately \$79.8 million.

N-1 AC contingency analysis showed no overloads with Option A.

G-1+N-1 AC contingency analysis (the first outage is the loss of a single unit at STP substation, 1375 MW, or the loss of a single unit at WAP substation, 658MW, or the loss of all steam turbines at AMOCO substation, 350 MW) showed no overloads in the study area.

X-1+N-1 AC contingency analysis (loss of the 345/138 kV autotransformer A1 in Dow-Velasco as the first outage) showed no overloads in the study area.

N-1-1 AC contingency analysis (loss of the STP – Dow 345 kV circuit 27 as the first outage) showed no overloads in the study area.

Option B

- Construct a new 345/138 kV "Jones Creek" Substation;
- Install two new 800 MVA normal rating / 1000 MVA emergency rating (800/1000 MVA) 345/138 kV autotransformers at the Jones Creek Substation;
- Loop the 345 kV Dow - STP circuit 18 into the Jones Creek Substation;
- Loop the 138 kV Freeport - Velasco circuit 59 into the Jones Creek Substation;
- Upgrade the Velasco 138 kV Substation to a fault duty rating of 63 kA;
- Split and reconfigure circuits in the Freeport area creating: 138 kV Velasco - Surfside - Freeport - Jones Creek circuit 59, 138 kV Velasco - Quintana - Jones Creek circuit 48, and 138 kV Velasco - Jones Creek circuit 59;

- Reconfigure 138 kV Velasco - Franklins Camp circuit 02 to create 138 kV Jones Creek - Franklins Camp circuit 02;
- Upgrade the 138 kV Jones Creek - Quintana circuit 48 and 138 kV Quintana - Velasco circuit 48 with 838 MVA normal rating / 894 MVA emergency rating (838/894 MVA).

The total cost estimate for Option B is approximately \$77.8 million.

N-1 AC contingency analysis showed no overloads with Option B.

G-1+N-1 AC contingency analysis (the first outage is the loss of a single unit at STP substation 1375 MW, or the loss of a single unit at WAP substation 658MW, or the loss of all steam turbines at AMOCO substation 350 MW) showed no overloads in the study area.

X-1+N-1 AC contingency analysis (loss of the 345/138 kV autotransformer A1 in Dow-Velasco as the first outage) showed no overloads in the study area.

N-1-1 AC contingency analysis (loss of the STP – Dow 345 kV circuit 27 as the first outage) showed no overloads in the study area.

More details of the contingency analysis results for Option B can be found in Appendix B.

As a minor variation of Option A, Option B does not include adding the 120 MVAR capacitor bank in Jones Creek substation. ERCOT did not find any NERC or ERCOT planning criteria violations due to the absence of this capacitor bank.

5. Economic Analysis of the Preferred Project

For Option B, to reveal potential congestion under economical operation conditions with different flow patterns, security-constrained production cost analysis was performed using UPLAN. To see the impacts of the load addition in Freeport area and the selected project, the monthly congestion results in the Coast weather zone were compared with those in the 2018 economic case obtained from the 2013 RTP studies. No new significant congestion was identified.

6. Conclusion

In conclusion, ERCOT recommends the following transmission upgrades studied as Option B, which constitute the most effective solution to serve the projected load growth in the Freeport area:



- Construct a new 345/138 kV “Jones Creek” Substation;
- Install two new 800 MVA normal rating / 1000 MVA emergency rating (800/1000 MVA) 345/138 kV autotransformers at the Jones Creek Substation;
- Loop the 345 kV Dow - STP circuit 18 into the Jones Creek Substation;
- Loop the 138 kV Freeport - Velasco circuit 59 into the Jones Creek Substation;
- Upgrade the Velasco 138 kV Substation to a fault duty rating of 63 kA;
- Split and reconfigure circuits in the Freeport area creating: 138 kV Velasco - Surfside - Freeport - Jones Creek circuit 59, 138 kV Velasco - Quintana - Jones Creek circuit 48, and 138 kV Velasco - Jones Creek circuit 59;
- Reconfigure 138 kV Velasco - Franklins Camp circuit 02 to create 138 kV Jones Creek - Franklins Camp circuit 02;

- Upgrade the 138 kV Jones Creek - Quintana circuit 48 and 138 kV Quintana - Velasco circuit 48 with 838 MVA normal rating / 894 MVA emergency rating (838/894 MVA).

7. Designated Providers of Transmission Facilities

In accordance with ERCOT Protocol Section 3.11.4.8, ERCOT staff is to designate transmission providers for projects reviewed in the RPG. These providers can agree to provide or delegate the new facilities or inform ERCOT if they do not elect to provide them. For the project scope recommended in this report CenterPoint Energy is the sole designated provider of all transmission facilities.

8. Appendix

<p>Appendix A: Contingency Analysis Results of Base Case</p>	 <p>Appendix A.xlsx</p>
<p>Appendix B: Contingency Analysis Results of Option B</p>	 <p>Appendix B.xlsx</p>