Post-contingency overloads:

- Loma Alta – Carbide Valley line 138 kV (158.3% of contingency rating)
- La Palma – Laureles Sub 138 kV line (118.5% of contingency rating)
- Port Isabel – Laureles Sub 138 kV line (114.1% of contingency rating)
- La Palma 345/138 kV transformer (109.7% of contingency rating)
- Aderhold to Hidalgo Energy Center 138 kV line (100.5% of contingency rating)

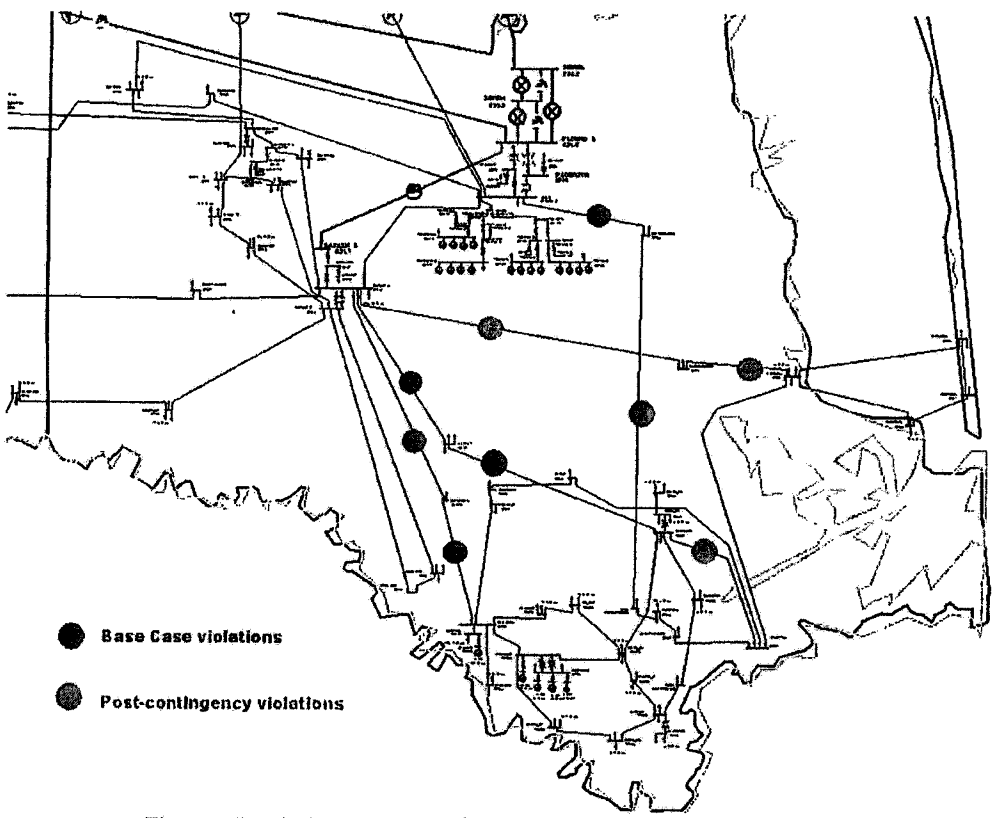


Figure 5: 2016 Thermal overloads in Brownsville Area including the 250 MW load

2016 Summer Peak N-1-1 Reliability analysis without the new 250 MW load

The Brownville system is primarily served by four (4) 138 kV lines originating from the La Palma and Rio Hondo substations. The Rio Hondo 345 kV station is supported by two 345 kV lines from Corpus Christi and North Edinburg, respectively. The N-1-1 contingency involving the loss of the two (2) 345 kV lines supporting the Rio Hondo substation would result in the Brownville area load served by only the 138 kV system from the west side of the LRGV. Without a 345 kV source, the cross Valley 138 kV lines that serve Brownsville will be significantly loaded and the only viable mitigation plan would involve significant load shed in the Brownsville area (even without the industrial load additions in

Brownsville). Similar heavy line loadings were observed for the N-1-1 contingency loss of the La Palma – Rio Hondo 345 kV line and the La Palma – Rio Hondo 138 kV line.

Some of the major post-contingency (> 120%) N-1-1 overloads:

- Weslaco Unit to Stewart Road 138 kV line (159.1 % of contingency rating)
- Weslaco Switching Station to Weslaco 138 kV line (147.9% of contingency rating)
- Aderhold to Hidalgo Energy Center 138 kV line (142.9% of contingency rating)
- Elsa to Aderhold 138 kV line (133.8% of contingency rating)
- Heidelberg to Weslaco 138 kV line (132.3% of contingency rating)
- Burns to Heidelberg 138 kV line (124.6% of contingency rating)
- Wesmer to Weslaco Unit 138 kV line (121.6% of contingency rating)

N-1-1 overloads (>120%) for prior outage of La Palma – Rio Hondo 345kV line

- Harlingen to Oleander 138 kV line (167.24% of contingency rating)
- Rio Hondo – East Rio Hondo 138 kV line (165.2% of contingency rating)
- East Rio Hondo – Central Avenue Sub 138 kV line (157.3% of contingency rating)
- Haine Dr. to Oleander 138 kV line (157% of contingency rating)
- Weslaco Unit to Stewart Road 138 kV line (127.9 % of contingency rating)
- La Palma to Haine Dr. 138 kV line (121.7% of contingency rating)

It was determined that it would require ~365 MW of load shed in the LRGV to mitigate the N-1-1 contingency (loss of the two (2) 345 kV lines supporting the Rio Hondo substation) exceedances to below 100% of the contingency rating. Approximately 290 MW of the 365 MW load shed would affect the Brownsville area which has a peak load forecast of ~627 MW (excluding the new 250 MW load) in 2016. Figure 6 shows the Brownville load area which would be affected by the 290 MW load shed.

Due to the severity of these N-1-1 overloads and the amount and multiple locations of load shed that would be needed to mitigate all the N-1-1 overloads, it is neither practical nor reliable to implement a post-contingency N-1-1 mitigation plan. Some of these N-1-1 overloads are greater than 150% of the contingency rating which could cause uncontrolled tripping and eventually lead to system cascading. In real-time if the first contingency were to occur, the system operators would have to implement mitigation plans for pre-contingency load shed in order to prepare for the next contingency. It is determined that in order to reduce the N-1-1 post contingency overloads to less than 120% of the contingency rating, it would require ~175 MW of load shed in the LRGV following the loss of the first contingency.

With the addition of the 250 MW load in Brownsville, the same N-1-1 contingency would result in a voltage collapse in the Brownsville area. Any mitigation plan to resolve this would require significant pre-contingency load shed (greater than ~175 MW) to prevent the voltage collapse in the Brownsville area.

Figure 7 shows the projected 2016 load duration curve for the Brownsville area that illustrates the load shed exposure for N-1-1 conditions.

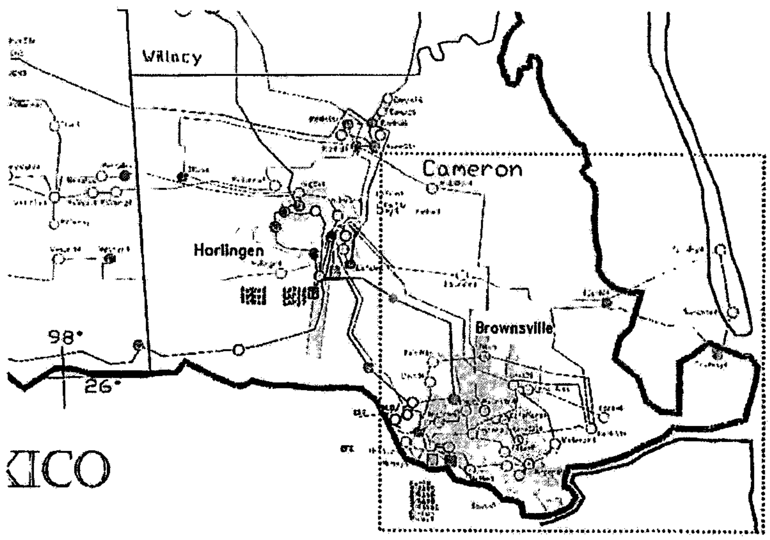


Figure 6: Map of the Brownsville N-1-1 load shed area

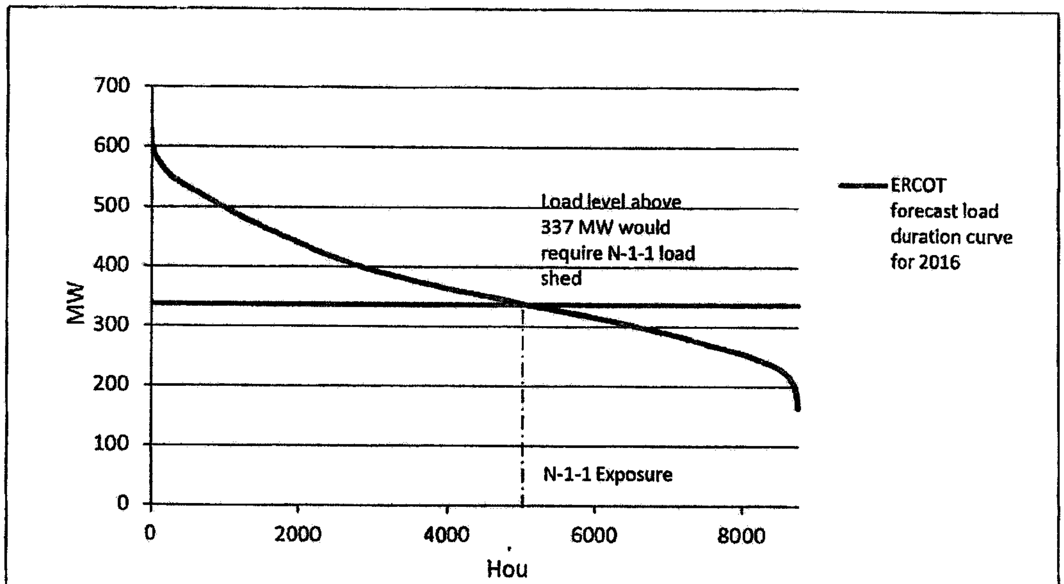


Figure 7: 2016 Load duration curve for Brownsville area (without 250 MW industrial load additions)

Also it is difficult to take a maintenance or construction related outage of one of these lines 345 kV lines at Rio Hondo because the next contingency would leave the Brownsville area exposed to load shed under moderate to high load conditions . Moreover, owners and operators of both generation resources and transmission assets must schedule maintenance and construction outages during short windows in the spring and fall. Figure 8 shows the historical maximum daily peak for 2010-2011 timeframe with the 2012 load level that could be supported for maintenance outages based on the N-1-1 condition. It is estimated that during the 2010-2011 time frame there were ~180 days when the load was low enough to allow for these maintenance outage conditions. It should be noted that based on the 2016 load projections this maintenance outage window will be significantly smaller.

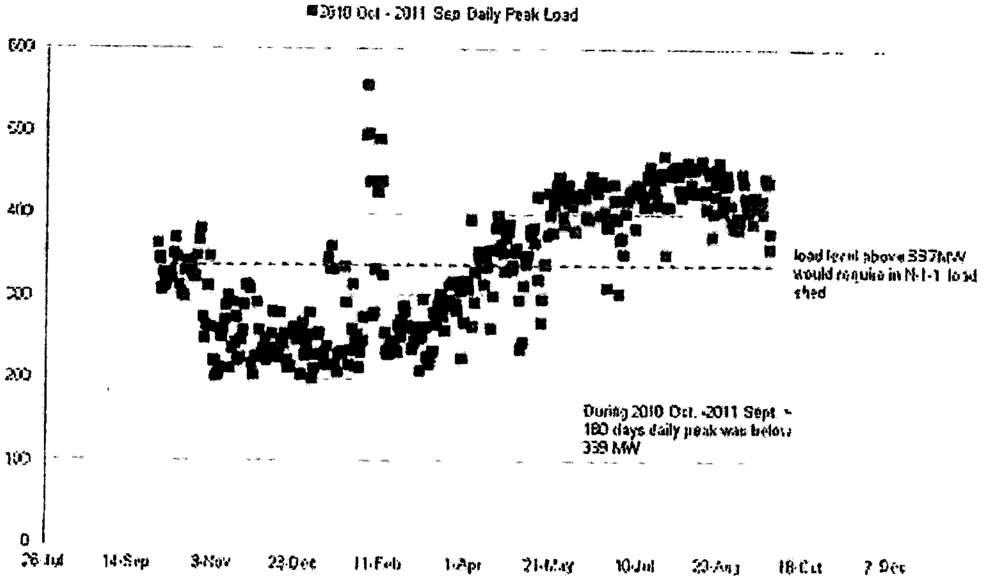


Figure 8: Historical maximum daily peak for 2010-2011for Brownsville Area

Based on the N-1-1 reliability analysis, it is determined that the east LRGV area will be exposed to significant load shed risk for the loss of one 345 kV source (N-1) to the Brownsville area. The N-1-1 risk will be worse with the 250 MW load additions at Brownsville area and cause voltage collapse in the Brownsville area under these conditions if transmission improvements are not made. NERC and ERCOT planning criteria allow for the controlled shedding of load under N-1-1 contingency conditions. The LRGV situation is unique in ERCOT due to the amount of load shed that would be required to keep facilities within their applicable ratings and the proportion of total load in an area that would need to be shed. While there may be a few places in ERCOT with similar amounts of total MW of load shed needed under N-1-1 conditions, nowhere else is the proportion of total load in a metropolitan area so high. This also corresponds to a significant amount of time that the load would be exposed to these conditions which may make it difficult to perform maintenance of the transmission and generation facilities in the area. Further, a substantial amount of load would have to be shed after the first contingency in order to prevent cascading following a second contingency. Due to the above considerations, it was decided to include this N-1-1 contingency as part of the reliability analysis for project consideration.

4. Description of Project Alternatives and Reliability Analysis

Multiple project alternatives were studied to solve the reliability criteria exceedances in two separate scenarios. The two scenarios and corresponding project alternatives are discussed below:

Scenario 1:

Scenario 1 assumed 2016 load conditions without the 250 MW load additions in Brownsville. The options studied for Scenario 1 are described as follows:

Submitted Option- Sharyland and BPUB proposal

- Construct a new 345kV bus at the Loma Alta station with two (2) 345/138kV autotransformers
- Construct a new 345kV bus at the Frontera station with one 345/138kV autotransformer
- Construct a new La Palma-Loma Alta 345kV line (~14 miles) on new ROW using double circuit capable towers with one circuit in place
- Construct a new Frontera-Loma Alta 345kV line (~59 miles) on new ROW using double circuit capable towers with one circuit in place

The cost estimate for the Submitted Option is $259.9M. It should be noted that Sharyland Utilities and BPUB reviewed and updated the cost estimate during the ERCOT Independent Review which resulted in the cost estimate stated above which is higher than what was originally submitted to the RPG. Additionally, both AEP and Sharyland Utilities provided ERCOT with cost estimates for new 345 kV line construction. AEP's estimate was approximately $2.4M per mile for double circuit capable towers with one circuit in place. The Sharyland Utilities estimate for similar construction was $2.06M per mile. In order to be consistent all estimates used in this report for new 345 kV line construction assumed the higher estimate ($2.4M per mile).

Below are the contingency analysis results with the Submitted Option implemented in the study model:

N-1-1 Post-contingency overloads: (prior outage of the Rio Hondo-Ajo 345 kV line)

- Aderhold to Hidalgo Energy Center 138 kV line (110.2% of contingency rating)
- Elsa to Aderhold 138 kV line (101.4% of contingency rating)

Approximately 48 MW of load would need to be shed in order to resolve the above overloads.

N-1-1 Post-contingency overloads: (prior outage of the La Palma-Rio Hondo 345 kV line)

- Rio Hondo – East Rio Hondo 138 kV line (116.3% of contingency rating)
- East Rio Hondo – Central Avenue Sub 138 kV line (108.7% of contingency rating)
- Harlingen to Oleander 138 kV line (102.2% of contingency rating)

Approximately 64 MW of load would need to be shed in order to resolve the above overloads.

While the above N-1-1 contingency results would still require some load shed, the amount of load shed is considered feasible to execute and the loading on the lines are low enough such that pre-contingency load shed would not be required. There were no other post-contingency overloads in the LRGV in Scenario 1 with the Submitted Option.

Several additional options were studied in order to resolve the reliability criteria exceedances. In order to reduce or eliminate the load shed for the N-1-1 contingency condition it was found that a new 345 kV source from the west side of the LRGV was required. Alternatives were analyzed for originating a 345 kV line from North Edinburg 345 kV station, Frontera 138 kV station, Railroad 138 kV station, and South McAllen 138 kV station. The Railroad and South McAllen stations were found to be less effective in reducing the N-1-1 overloads.

However, it is recommended that the line be routed near the existing South McAllen 138 kV station in order to support the long-term needs of the west side of the LRGV. This is explained further in Section 5. Also, for this reason, the option of sourcing the 345 kV line from South McAllen was kept as a project alternative in the study.

In order to support the long-term needs of the Brownsville/ Harlingen area, two termination points were considered feasible: La Palma 345 kV station and Loma Alta 138 kV station. When terminating at La Palma 345 kV station, an additional 138 kV line improvement was found to be necessary to support the load growth in the Brownsville area (excluding the 250 MW load addition). The following three 138 kV project alternatives were considered:

Option A

- Rebuild La Palma-Cavazos-Military Highway 138 kV line (~21 miles) with a rating of at least 430 MVA
- Rebuild La Palma-Los Fresnos-Loma Alta 138 kV line (~22 miles) with a rating of at least 430 MVA

The cost estimate for Option A is $87.3M.

Option B

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new Right of Way (ROW) with a rating of at least 215 MVA

The cost estimate for Option B is $18.5M.

Option C

- Rebuild and convert La Palma-Brownsville SS-Brownsville City 69 kV line (~22 miles) to a 138 kV line
- Add a 138 kV ring bus and new 138/69 kV autotransformer at Brownsville

The cost estimate for Option C is $54.3M.

Option D

- Rebuild a portion of the existing La Palma-Brownsville (via Cavazos) 69 kV line for 138 kV operation with a rating of at least 215 MVA and terminate the line into the existing Military Highway to Palo Alto 138 kV transmission line at a new substation or the existing Olmito or Palo Alto 138 kV substations (~18.5 miles, partial new ROW)
- Add a 69 kV bus and a 138/69 kV autotransformer at the 138 kV termination point and construct a 69 kV line out of the substation to connect to the existing 69 kV line to Brownsville

The cost estimate for Option D is $30.8M.

All four project alternatives solved the reliability criteria exceedances. Since Option B had a significantly lower capital cost when compared to the other options it was the preferred alternative even though it will require new ROW. Therefore, Option B was incorporated into all of the project alternatives that terminate at the La Palma 345 kV station (Options 1, 2 and 4).

The following project alternatives were evaluated for Scenario 1:

Option 1

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA
- Construct a new La Palma-Frontera 345 kV line (double circuit capable with one circuit in place) routed in proximity to the existing South McAllen Substation (~ 56.6 miles) on new ROW
- Construct a new 345kV bus at the Frontera station with one 345/138kV autotransformer

The cost estimate for Option 1 is $204.2M. Below are the contingency analysis results with Option 1 implemented in the study model:

N-1-1 Post-contingency overloads: (prior outage of the Rio Hondo-Ajo 345 kV line)

- Aderhold to Hidalgo Energy Center 138 kV line (111.4% of contingency rating)
- Azteca to Hidalgo Energy Center 138 kV line (102.8% of contingency rating)
- Elsa to Aderhold 138 kV line (102.5% of contingency rating)

Approximately 53 MW of load would need to be shed in order to resolve the above overloads.

N-1-1 Post-contingency overloads: (prior outage of the La Palma-Rio Hondo 345 kV line)

- Rio Hondo – East Rio Hondo 138 kV line (124.6% of contingency rating)
- East Rio Hondo – Central Avenue Sub 138 kV line (116.9% of contingency rating)
- Harlingen to Oleander 138 kV line (105.2% of contingency rating)
- Azteca to Hidalgo Energy Center 138 kV line (100.5% of contingency rating)

Approximately 123 MW of load would need to be shed in order to resolve the above overloads.

There were no other post-contingency overloads in the LRGV in Scenario 1 with Option 1.

Option 2

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA
- Construct a new La Palma-South McAllen 345 kV line (double circuit capable with one circuit in place) (~ 42.2 miles) on new ROW
- Construct a new 345kV bus at the South McAllen station with one 345/138kV autotransformer

The cost estimate for Option 2 is $168.2M. Below are the contingency analysis results with Option 2 implemented in the study model:

N-1-1 Post-contingency overloads: (prior outage of the Rio Hondo-Ajo 345 kV line)

- Aderhold to Hidalgo Energy Center 138 kV line (118.3% of contingency rating)
- Elsa to Aderhold 138 kV line (109.4% of contingency rating)
- West McAllen to North McAllen 138 kV line (107.7% of contingency rating)
- Azteca to Hidalgo Energy Center 138 kV line (106% of contingency rating)
- Azteca to SE Edinburg 138 kV line (103% of contingency rating)

Approximately 152 MW of load would need to be shed in order to resolve the above overloads.

N-1-1 Post-contingency overloads: (prior outage of the La Palma-Rio Hondo 345 kV line)

- Rio Hondo – East Rio Hondo 138 kV line (129.6% of contingency rating)
- East Rio Hondo – Central Avenue Sub 138 kV line (121.9% of contingency rating)
- Harlingen to Oleander 138 kV line (113.5% of contingency rating)
- Azteca to Hidalgo Energy Center 138 kV line (102.6% of contingency rating)
- Aderhold to Hidalgo Energy Center 138 kV line (100.2% of contingency rating)

Approximately 167 MW of load would need to be shed in order to resolve the above overloads.

There were no other post-contingency overloads in the LRGV in Scenario 1 with Option 2.

Option 3

- Construct a new North Edinburg-Loma Alta 345 kV line (double circuit capable with one circuit in place) routed in proximity to the existing South McAllen Substation(~ 106.5 miles) on new ROW
- Construct a new 345kV bus at the Loma Alta station with one 345/138kV autotransformer

The cost estimate for Option 3 is $256.2M. Below are the contingency analysis results with Option 3 implemented in the study model:

N-1-1 Post-contingency overloads: (prior outage of the Rio Hondo-Ajo 345 kV line)

- None

N-1-1 Post-contingency overloads: (prior outage of the La Palma-Rio Hondo 345 kV line)

- None

There were no other post-contingency overloads in the LRGV in Scenario 1 with Option 3.

Option 4

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA
- Construct a new North Edinburg-La Palma 345 kV line (double circuit capable with one circuit in place) routed in proximity to the existing South McAllen Substation(~ 89.9 miles) on new ROW

The cost estimate for Option 4 is $234.8M. Below are the contingency analysis results with Option 4 implemented in the study model:

N-1-1 Post-contingency overloads: (prior outage of the Rio Hondo-Ajo 345 kV line)

- None

N-1-1 Post-contingency overloads: (prior outage of the La Palma-Rio Hondo 345 kV line)

- Rio Hondo – East Rio Hondo 138 kV line (104.7% of contingency rating)

Approximately 24 MW of load would need to be shed in order to resolve the above overload.

The above N-1-1 contingency results would still require some load shed, but the amount of load shed is considered feasible to execute and the loading on the lines are low enough such that pre-contingency load shed would not be required. There were no other post-contingency overloads in the LRGV in Scenario 1 with Option 4.

All of the project alternatives studied solved the G-1 + N-1 post-contingency overloads. Options 1 and 2 would still require a significant amount of load shed under N-1-1 conditions and were not considered further. While Option 3 resulted in no N-1-1 post-contingency overloads, Option 4 and the Submitted Option had minimal overloads and the post-contingency load shed required for these options would be feasible. Because Option 4 had acceptable performance and a lower capital cost when compared to Options 3 and the Submitted Option ($21.4M and $25.1M, respectively) it is the preferred solution for Scenario 1.

Scenario 2:

Scenario 2 assumed 2016 load conditions with the 250 MW load additions in Brownsville. In order to reduce or eliminate the load shed for the N-1-1 contingency condition it was found that a new 345 kV source from the west side of the LRGV was required as discussed in Scenario 1. However, terminating the 345 kV line at La Palma 345 kV station was found to be deficient for supporting the load addition in Brownsville. Hence, the most reasonable termination point was the Loma Alta 138 kV station.

In addition, a 138 kV improvement was found to be necessary to solve the G-1 + N-1 contingency overloads (except for the Submitted Option). Based on the analysis discussed in Scenario 1, the La Palma-Palo Alto 138 kV line (Option B) was assumed to be the preferred 138 kV improvement in Options 5 and 6.

Three project alternatives were considered for solving the reliability criteria exceedances in Scenario 2:

Submitted Option- Sharyland and BPUB proposal

- Construct a new 345 kV bus at the Loma Alta station with two (2) 345/138kV autotransformers
- Construct a new 345 kV bus at the Frontera station with one 345/138 kV autotransformer
- Construct a new La Palma-Loma Alta 345 kV line (~14 miles) on new ROW using double circuit capable towers with one circuit in place
- Construct a new Frontera-Loma Alta 345 kV line (~59 miles) on new ROW using double circuit capable towers with one circuit in place

The cost estimate for the Submitted Option is estimated to be $259.9M. Below are the contingency analysis results with the Submitted Option implemented in the study model:

N-1-1 Post-contingency overloads: (prior outage of the Rio Hondo-Ajo 345 kV line)

- Aderhold to Hidalgo Energy Center 138 kV line (125.6% of contingency rating)
- Elsa to Aderhold 138 kV line (117.6% of contingency rating)
- Weslaco Unit to Stewart Road 138 kV line (116.7 % of contingency rating)
- Azteca to Hidalgo Energy Center 138 kV line (110.0% of contingency rating)
- Frontera 345/138 kV transformer (109.7% of contingency rating)
- Weslaco Switching Station to Stewart 2 138 kV line (108.4% of contingency rating)
- Azteca to SE Edinburg 138 kV line (107.0% of contingency rating)
- Weslaco Switching Station to Weslaco 138 kV line (102.8% of contingency rating)
- Elsa to Weslaco 138 kV line (101.9% of contingency rating)

Approximately 216 MW of load would need to be shed in order to resolve the above overloads.

N-1-1 Post-contingency overloads: (prior outage of the La Palma-Rio Hondo 345 kV line)

- Rio Hondo – East Rio Hondo 138 kV line (149.6% of contingency rating)

- East Rio Hondo – Central Avenue Sub 138 kV line (141.8% of contingency rating)
- Harlingen to Oleander 138 kV line (135.7% of contingency rating)
- Haine Dr. to Oleander 138 kV line (107.3% of contingency rating)

Approximately 314 MW of load would need to be shed in order to resolve the above overloads.

There were no other post-contingency overloads in the LRGV in Scenario 2 with the Submitted Option.

Option 5 (same as Option 3 with the addition of the La Palma-Palo Alto 138 kV line)

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA
- Construct a new North Edinburg-Loma Alta 345 kV line (double circuit capable with one circuit in place) routed in proximity to the existing South McAllen Substation (~106.5 miles) on new ROW
- Construct a new 345 kV bus at the Loma Alta station with one 345/138 kV autotransformer

The cost estimate for Option 5 is $274.7M. Below are the contingency analysis results with Option 5 implemented in the study model:

N-1-1 Post-contingency overloads: (prior outage of the Rio Hondo-Ajo 345 kV line)

- Aderhold to Hidalgo Energy Center 138 kV line (107.8% of contingency rating)
- Weslaco Unit to Stewart Road 138 kV line (102.8 % of contingency rating)

Approximately 61 MW of load would need to be shed in order to resolve the above overloads.

N-1-1 Post-contingency overloads: (prior outage of the La Palma-Rio Hondo 345 kV line)

- Harlingen to Oleander 138 kV line (118.38% of contingency rating)
- Rio Hondo – East Rio Hondo 138 kV line (115.5% of contingency rating)
- East Rio Hondo – Central Avenue Sub 138 kV line (107.7% of contingency rating)

Approximately 135 MW of load would need to be shed in order to resolve the above overloads.

There were no other post-contingency overloads in the LRGV in Scenario 2 with Option 5.

Option 6

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA
- Construct a new Frontera-Loma Alta 345 kV line (double circuit capable with one circuit in place) routed in proximity to the existing South McAllen Substation(~ 73.2 miles) on new ROW

- Construct a new 345kV bus at the Frontera station with one 345/138kV autotransformer
- Construct a new 345kV bus at the Loma Alta station with one 345/138kV autotransformer

The cost estimate for Option 6 is $245.4M. Below are the contingency analysis results with Option 6 implemented in the study model:

N-1-1 Post-contingency overloads: (prior outage of the Rio Hondo-Ajo 345 kV line)

- Aderhold to Hidalgo Energy Center 138 kV line (128.43% of contingency rating)
- Elsa to Aderhold 138 kV line (119.5% of contingency rating)
- Weslaco Unit to Stewart Road 138 kV line (114.4 % of contingency rating)
- Azteca to Hidalgo Energy Center 138 kV line (111.3% of contingency rating)
- Weslaco Switching Station to Weslaco 138 kV line (109..6% of contingency rating)
- Azteca to SE Edinburg 138 kV line (108.4% of contingency rating)
- Elsa to Weslaco 138 kV line (104.6% of contingency rating)
- West McAllen to North McAllen 138 kV line (100.3% of contingency rating)

Approximately 282 MW of load would need to be shed in order to resolve the above overloads.

N-1-1 Post-contingency overloads: (prior outage of the La Palma-Rio Hondo 345 kV line)

- Harlingen to Oleander 138 kV line (148.4% of contingency rating)
- Rio Hondo – East Rio Hondo 138 kV line (144.1% of contingency rating)
- East Rio Hondo – Central Avenue Sub 138 kV line (136.3% of contingency rating)
- Haine Dr. to Oleander 138 kV line (119.6% of contingency rating)
- Haine Dr. to La Palma 138 kV line (103.5% of contingency rating)
- Azteca to Hidalgo Energy Center 138 kV line (106.3% of contingency rating)
- Azteca to S. Edinburg 138 kV line (103.3% of contingency rating)
- Weslaco Unit to Stewart Road 138 kV line (101.1% of contingency rating)

Approximately 341 MW of load would need to be shed in order to resolve the above overloads.

There were no other post-contingency overloads in the LRGV in Scenario 2 with Option 6.

All three project alternatives solved the G-1 + N-1 post-contingency overloads. The Submitted Option and Option 6 still had a significant amount of load shed that would be required under N-1-1 conditions and may require load shed after the first contingency in order to prevent cascading following the next contingency due to the high line loadings. While Option 5 had some load shed, it is considered feasible for N-1-1 conditions and may not require load shed after the first contingency in order to prevent cascading following the next contingency. Therefore, Option 5 was considered the preferred option for Scenario 2.

5. Long-Term Considerations for the Lower Rio Grande Valley

The Long-Term Assessment 2020 summer peak base case (updated in April 2011) was evaluated to determine if there were any reliability criteria exceedances in the LRGV beyond 2016. This base case was modified with the following changes to create the 2020 study case:

- Add a new 163 mile, single circuit 345 kV line from Laredo Lobo to Rio Bravo to North Edinburg with 50% series compensation
- Reconductor the existing Lon Hill-Nelson Sharpe-Ajo-Rio Hondo 345 kV line and Lon Hill-North Edinburg 345 kV line to 1988/2426 MVA normal/emergency rating
- Upgrade the South McAllen to Las Milpas to Stewart 138 kV line to 395/476 MVA normal/emergency rating (identified as Reliability Project in 2011 Five-Year Transmission Plan)
- The dispatch of the Penascal, Gulf Wind, Magic Valley Wind Project and Los Vientos wind plants were set at 10% of their capacity
- Silas Ray Unit 5 (10 MW) was turned off
- All other generation in the LRGV was set at maximum output with the exception of the hydro powered units which were left at their base case output
- Add 250 MW load at Loma Alta (Brownsville)
- Construct a new 345kV bus at the Loma Alta station with one 345/138kV autotransformer
- Construct a new Rio Hondo-Loma Alta 345kV line (~27.4 miles) on new ROW
- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA

The Rio Hondo-Loma Alta 345 kV line was added as a proxy to support the load addition in the Brownsville area in order to evaluate the cross-Valley reliability needs in 2020. The following are the contingency analysis results for this case for the LRGV.

G-1 + N-1 (prior outage of the largest Silas Ray unit) post-contingency overloads:

- Azteca to Hidalgo Energy Center 138 kV line (112.4% of contingency rating)
- Azteca to SE Edinburg 138 kV line (108.5% of contingency rating)
- Aderhold to Hidalgo Energy Center 138 kV line (107.2% of contingency rating)
- La Palma to Rangerville 138 kV line (102.5% of contingency rating)

<u>Other lines with post contingency flows > 90% of the contingency rating</u>

- Weslaco Unit to Stewart Road 138 kV line (97.0 % of contingency rating)
- Elsa to Aderhold 138 kV line (95.4% of contingency rating)
- S. Edinburg to Pharr Sub. 138 kV line (93.6% of contingency rating)
- North Edinburg to Rio Hondo 345 kV line (90.5% of contingency rating)

G-1 + N-1 (prior outage of the largest Frontera unit) post-contingency overloads:

- Azteca to Hidalgo Energy Center 138 kV line (116.4% of contingency rating)
- Azteca to SE Edinburg 138 kV line (112.8% of contingency rating)
- Aderhold to Hidalgo Energy Center 138 kV line (106.5% of contingency rating)
- La Palma to Rangerville 138 kV line (102.5% of contingency rating)

Other lines with post contingency flows > 90% of the contingency rating

- S. Edinburg-Pharr Sub. 138 kV line (97.9% of contingency rating)
- Edinburg- McColl 138 kV line (96.8 % of contingency rating)
- Weslaco Unit to Stewart Road 138 kV line (96.8 % of contingency rating)
- Elsa to Aderhold 138 kV line (94.8% of contingency rating)
- West McAllen to North McAllen 138 kV line (94.5% of contingency rating)
- North McAllen to Edinburg 138 kV line (92.7% of contingency rating)
- North Edinburg to Rio Hondo 345 kV line (91.4% of contingency rating)

The total cost estimate to upgrade each of the overloaded lines except the La Palma to Rangerville 138 kV line is approximately $35.4M. The total cost estimate to upgrade each of the lines loaded 92% or higher (except the La Palma to Rangerville 138 kV line and the Weslaco Unit to Stewart Road 138 kV line) is approximately $95M. An alternative solution would be to construct a North Edinburg to South McAllen 345 kV line with a new 345 kV bus and autotransformer at South McAllen. The Frontera station was considered as an alternative to South McAllen, but terminating the line at South McAllen showed a greater reduction in loading on the overloaded elements. This alternative would relieve all of the above overloaded lines except for the La Palma to Rangerville 138kV line and the Weslaco Unit to Stewart Road 138 kV line. Further, this alternative would provide for a better long-term solution because it would significantly reduce the north to south flow on other highly loaded transmission lines on the west side of the LRGV. Therefore, connecting a 345 kV source from North Edinburg into the South McAllen 138 kV substation will defer or eliminate the need to implement a significant amount of 138 kV line upgrades. Any 345 kV lines that are constructed between the west part of the LRGV and the east part of the LRGV should be constructed and routed in anticipation of a 345/138 kV connection at the existing South McAllen station.

The above analysis also showed that both the North Edinburg to Rio Hondo 345 kV line and the Weslaco Unit to Stewart Road 138 kV line were more than 90% post-contingency loaded by 2020 without an additional cross-Valley 345 kV line.

Based on this analysis it can be concluded that a 345 kV line from North Edinburg to the east side of the LRGV (with a future connection at South McAllen) will likely defer multiple line upgrades that would be needed between 2016 and 2020. Hence, Options 3, 4 and 5, which incorporate such a line, will not only meet the reliability needs identified in 2016, but will also solve the long-term reliability problems in the LRGV.

6. Summary of Project Alternatives

Below is a summary of the project alternatives considered in this study:

Project Options	Project Description	Cost Estimate ($M)	N-1-1 load shed amount
Submitted Project	• La Palma-Loma Alta 345 kV line • Frontera-Loma Alta 345 kV line • New 345/138kV autos at Loma Alta and Frontera	$259.9	64 MW
1	• La Palma-Palo Alto 138 kV line • La Palma-Frontera 345 kV line via South McAllen • New 345/138kV auto at Frontera	$204.2	123 MW
2	• La Palma-Palo Alto 138 kV line • La Palma-South McAllen 345 kV line • New 345/138kV auto at South McAllen	$168.2	167 MW
3	• North Edinburg-Loma Alta 345 kV line via South McAllen • New 345/138kV auto at Loma Alta	$256.2	0 MW
4	• La Palma-Palo Alto 138 kV line • North Edinburg-La Palma 345 kV line via South McAllen	$234.8	24 MW

Table 1: Summary of project alternatives analyzed for Scenario 1 (excluding the 250 MW load)

Project Options	Project Description	Cost Estimate ($M)	N-1-1 load shed amount
Submitted Project	• La Palma-Loma Alta 345 kV line • Frontera-Loma Alta 345 kV line • New 345/138kV autos at Loma Alta and Frontera	$259.9	314 MW
5	• La Palma-Palo Alto 138 kV line • North Edinburg-Loma Alta 345 kV line via South McAllen • New 345/138kV auto at Loma Alta	$274.7	135 MW
6	• La Palma-Palo Alto 138 kV line • Frontera-Loma Alta 345 kV line via South McAllen • New 345/138kV autos at Frontera and Loma Alta	$245.4	341 MW

Table 2: Summary of project alternatives analyzed for Scenario 2 (including the 250 MW load)

Figures 9 through 15 show the location of each of the project alternatives.

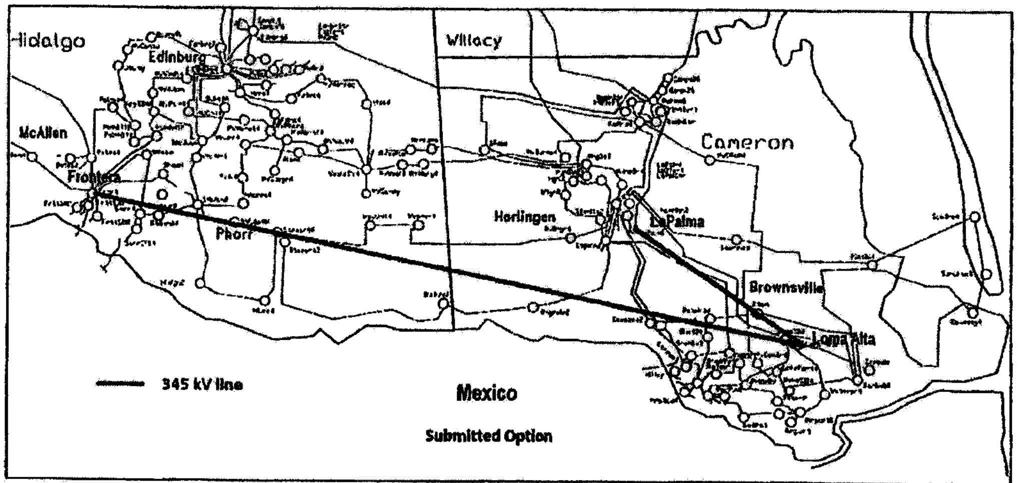


Figure 9: Submitted Option

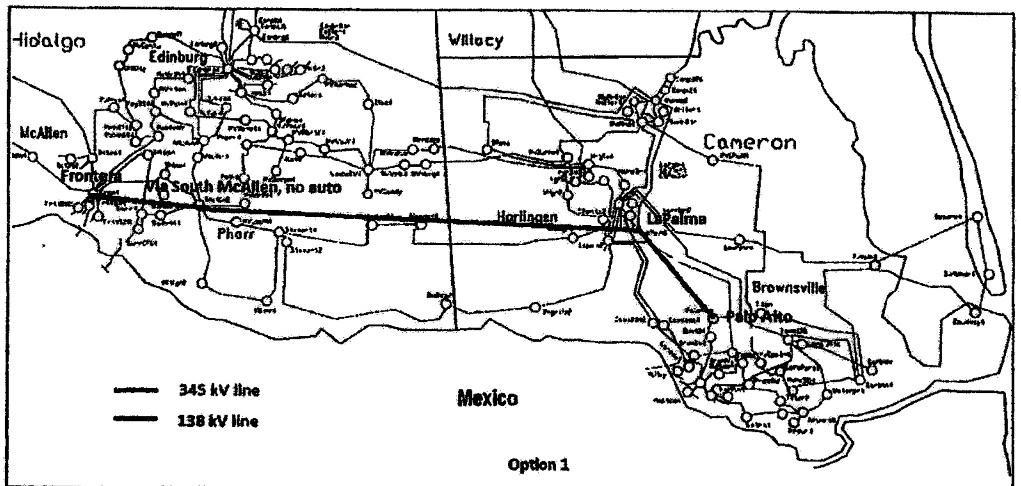


Figure 10: Option 1

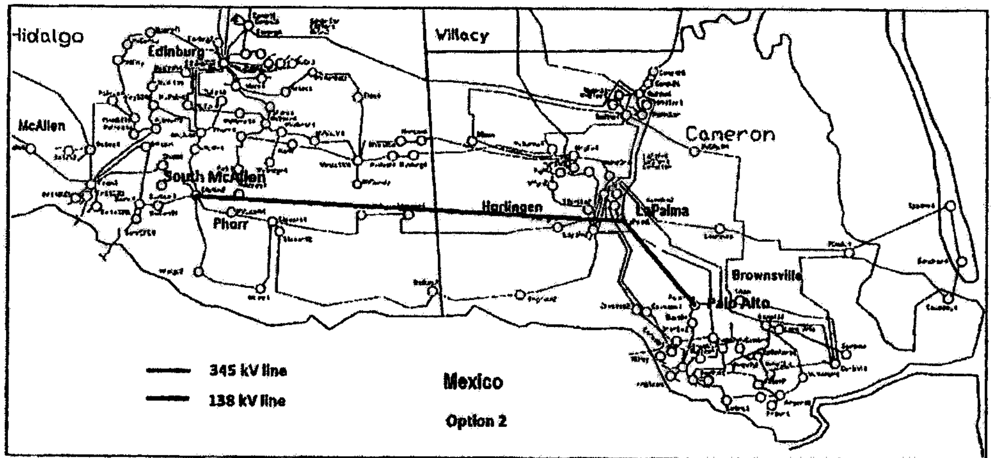


Figure 11: Option 2

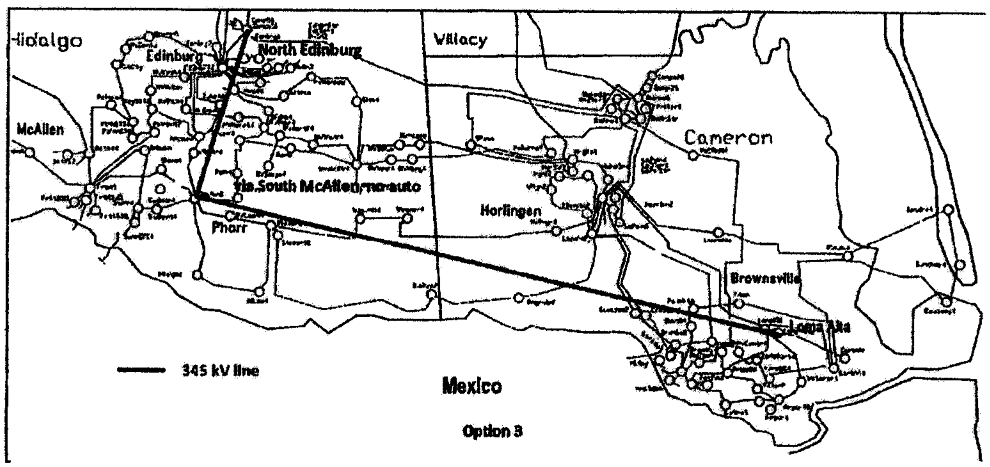


Figure 12: Option 3

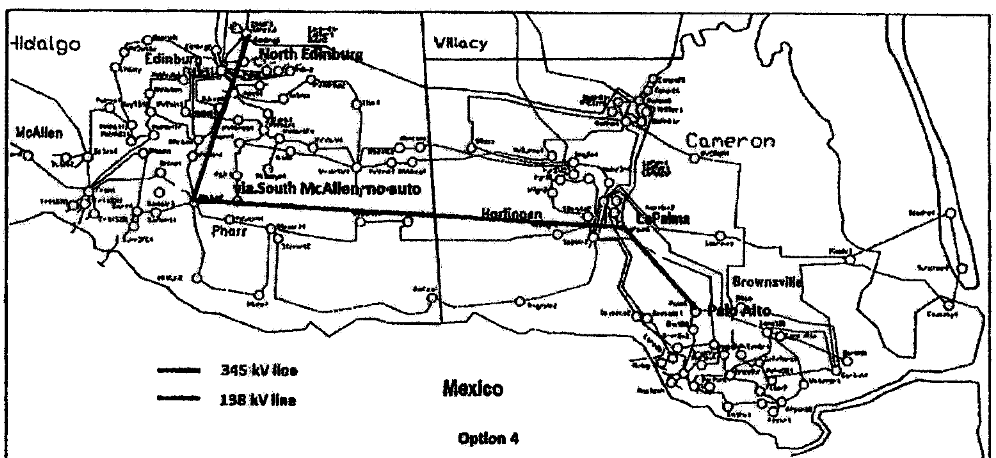


Figure 13: Option 4

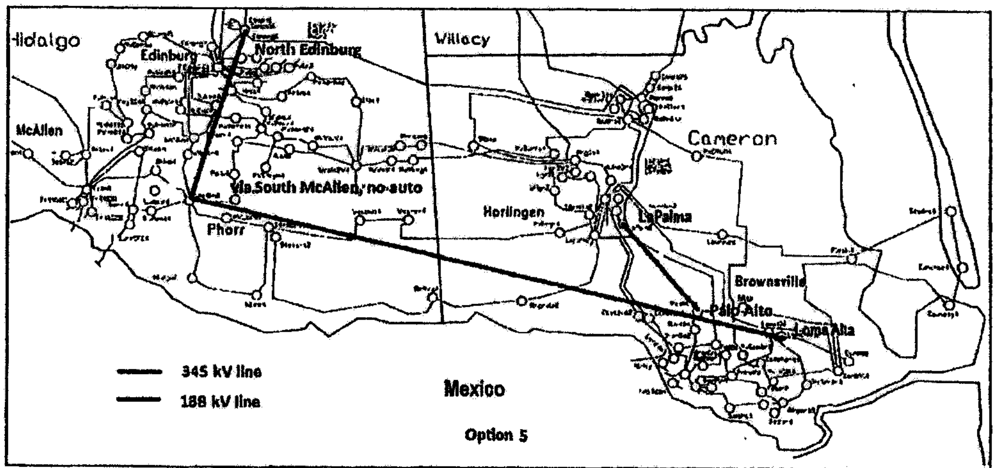


Figure 14: Option 5

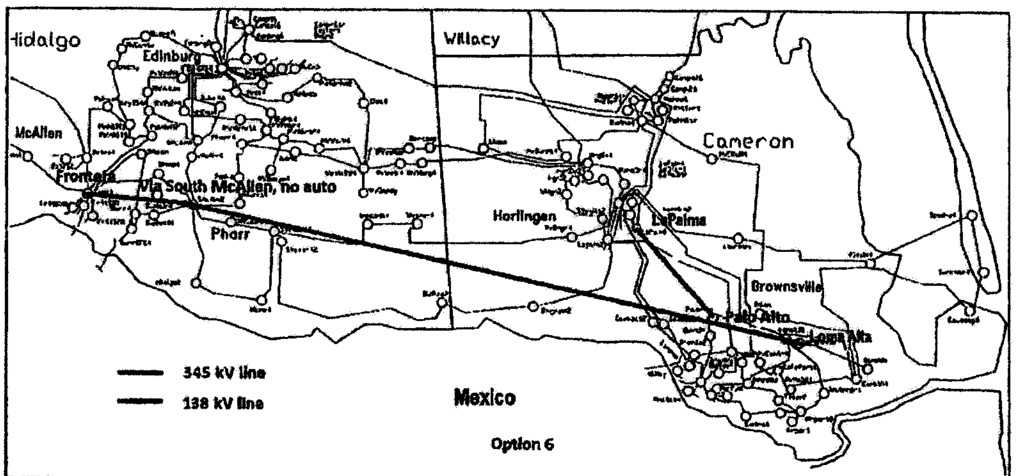


Figure 15: Option 6

7. Conclusion

The results presented in this report are indicative of the following:

- A 345 kV source from the west side to the east side of the LRGV is necessary to limit the N-1-1 load shedding to within acceptable and/or manageable levels. The N-1-1 conditions correspond to the loss of the 345 kV sources supporting the Rio Hondo station
- The need for the 345kV source into the Brownsville region under the aforementioned N-1-1 conditions is independent of the assumed 250 MW load additions at Loma Alta station
- In order to support the long-term reliability needs of the Brownsville region, routing the 345kV source in proximity to the existing South McAllen Substation is recommended

However, the decision concerning which project set to recommend hinges on the assumption of the 250 MW load additions in Brownsville. During the RPG comment period for this project, two market participants commented on the appropriateness of the inclusion of the 250 MW load additions. BPUB indicated that they had a new potential industrial customer that was planning to add 250 MW of load at the Port of Brownsville; however, the customer chose to locate in another state due to the lack of electrical energy infrastructure in Brownsville. The Brownsville Economic Development Council indicated that this has occurred multiple times in the past. At this time, BPUB is reviewing new industrial customer projects with similar loads wishing to locate at the Port of Brownsville, but does not have a committed customer that will add this magnitude of load at the time of this review. For this reason Texas Industrial Energy Customers commented that it would be inappropriate to plan transmission facilities for the addition of "speculative future loads."

In ERCOT, the Transmission and Distribution Service Providers (TDSPs) provide the load forecast assumptions used in the planning models. While ERCOT does perform system-wide load forecasts for use in planning studies, ERCOT has not historically made judgment on the validity of specific load additions in the study models and relies upon the TDSPs to assess the likelihood of those specific additions. Accordingly, the recommendation of this review will assume the 250 MW load addition in Brownsville based on BPUB's input. Ultimately, the transmission providers who will construct the new facilities will be required to obtain a Certificate of Convenience and Necessity and/or cost recovery from the Public Utility Commission of Texas (PUCT). However, in order to satisfy the comments received through the RPG process, ERCOT has provided analysis in this report on the transmission needs in the area assuming normal load growth without the 250 MW load addition.

For these reasons ERCOT recommends that the facilities associated with Option 5 be constructed in order to meet the needs of the Brownsville area for 2016 and beyond. This recommendation is further supported by the fact that the North Edinburg to South McAllen 345 kV line portion of this project will be needed by 2020 and the South McAllen to east LRGV 345 kV line portion will most likely be needed sometime in the 2020s for N-1 contingency conditions. Hence, these facilities will meet both near-term and long-term needs for the entire LRGV. The following are the recommended transmission system improvements associated with Option 5:

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA
- Construct a new North Edinburg-Loma Alta 345 kV line (double circuit capable with one circuit in place) routed in proximity to the existing South McAllen Substation (~106.5 miles) on new ROW
- Construct a new 345kV bus at the Loma Alta station with one 345/138kV autotransformer

It should be noted that ERCOT recommends that the Loma Alta 345/138 kV autotransformer be rated at least 600 MVA and the North Edinburg-Loma Alta 345 kV line have an emergency rating of at least 1600 MVA.

This project is needed in order to ensure reliability for the Brownsville area, specifically to prevent a large amount of load shed under N-1-1 contingency conditions. While this load shed is allowed under NERC and ERCOT planning criteria, the required amount of load shed is not appropriate for the Brownsville area. Additionally, the cold weather event of February 2011 highlighted the fact that load in this area has grown more than previously forecasted. For these reasons, and given the long-lead time necessary to implement the transmission upgrades, it is suggested that the 345 kV line portion of the project be deemed critical to reliability per PUCT Substantive Rule 25.101 (b)(3)(D).

In addition, the analysis of the transmission system needs without the 250 MW load addition (Scenario 1) should serve as a guide if the assumption on the new load changes.

8. Designated Provider of Transmission Facilities

In accordance with the ERCOT RPG Planning Charter and Procedures Section 2.3.4, 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.

Both Brownsville Public Utilities Board and American Electric Power Texas Central Company (AEP TCC) own endpoints of the new 138 kV line from La Palma to Palo Alto and the new 345 kV line from North Edinburg to Loma Alta listed in the project scope of this recommendation. Therefore, ERCOT designates both Brownsville Public Utilities Board and American Electric Power Texas Central Company (AEP TCC) as co-providers of the 138 kV and 345 kV transmission facilities recommended in this report.

Appendix A

Cost Estimates for Project Alternatives

Project option	Project description		Cost $ (in millions)
1	New La Palma – Palo Alto 138 kV line (~12 mi)		$12.60
	Palo Alto Station Work		$0.50
	La Palma Station Work		$5.40
	New 345 kV transmission line from Frontera to La Palma (~56.6 mi)		$141.00
	Build Frontera 345 kV ring bus substation with one 345/138 kV auto and 2 - 345 kV line terminals		$26.80
	Add new 345 kV terminal at La Palma station		$17.90
		Total Cost	$204.20
2	New La Palma – Palo Alto 138 kV line with (~12 mi)		$12.60
	Palo Alto Station Work		$0.50
	La Palma Station Work		$5.40
	New 345 kV transmission line from South McAllen to La Palma (~42.15 mi)		$105.00
	Build South McAllen station with one 345/138 kV auto and 1 - 345 kV line terminal (expandable to 3 bkr ring)		$24.10
	Add new 345 kV South McAllen station terminal		$2.70
	Add new 345 kV terminal at La Palma station		$17.90
		Total Cost	$168.20
3	New 345 kV transmission line from N.Edinburg to Loma Alta (~106.5 mi)		$235.00
	Add new 345 kV terminal at North Edinburg		$3.40
	Add new 345 kV Loma Alta station with one 345/138kV auto with 345 kV line terminal		$17.80
		Total Cost	$256.20

Cost Estimates for Project Alternatives

Project option	Project description		Cost $ (in millions)
4	New La Palma – Palo Alto 138 kV line (~12 mi)		$12.60
	Palo Alto Station Work		$0.50
	La Palma Station Work		$5.40
	New 345 kV transmission line from N.Edinburg to La Palma (~89.9 mi)		$195.00
	Add new 345 kV terminal at North Edinburg		$3.40
	Add new 345 kV terminal at La Palma station		$17.90
		Total Cost	$234.80
5	New La Palma – Palo Alto 138 kV line (~12 mi)		$12.60
	Palo Alto Station Work		$0.50
	La Palma Station Work		$5.40
	New 345 kV transmission line from N.Edinburg to Loma Alta (~106.5 mi)		$235.00
	Add new 345 kV terminal at North Edinburg		$3.40
	Add new 345 kV Loma Alta station with one 345/138kV 450 MVA auto with 345 kV line terminal		$17.80
		Total Cost	$274.70
6	New La Palma – Palo Alto 138 kV line (~12 mi)		$12.60
	Palo Alto Station Work		$0.50
	La Palma Station Work		$5.40
	New 345 kV transmission line from Frontera to Loma Alta (~73.2 mi)		$182.30
	Build Frontera 345 kV ring bus substation with one 345/138 kV auto and 2 - 345 kV line terminals		$26.80
	Add new 345 kV Loma Alta station with one 345/138kV auto with 345 kV line terminal		$17.80
		Total Cost	$245.40
Sharyland BPUB Submitted Project	New 345 kV transmission line from Frontera to Loma Alta (~73.2 mi)		$182.30
	New 345 kV transmission line from La Palma to Loma Alta (~14.0 mi)		$35.60
	Add new 345 kV Loma Alta station with two 345/138kV autos with 345 kV line terminal		$24.10
	Add new 345 kV terminal at La Palma station		$17.90
		Total Cost	$259.90

NERC
NORTH AMERICAN ELECTRIC
RELIABILITY CORPORATION

Reliability Concepts

Discussions about:

- *Managing Risks*
- *Credible Contingencies*
- *Acceptable Performance*
- *Timeframes*
- *Boundary Conditions*
- *System Operating Limits*

The simultaneous failure of multiple elements that are not physically or electrically related by design is not likely and therefore not a credible contingency. However, if those elements become physically or electrically linked, either accidentally or on purpose, their simultaneous failure could be a multiple-element credible contingency. Therefore, the system operator must know if that dependency exists.

Likelihood

So now the question becomes: Which kinds of contingencies are the most likely to occur and which are less likely? How does the likelihood of a contingency affect our planning and operation of the Interconnection? How do we want the Interconnection to respond to the most likely contingencies, and why and how do our expectations change for those contingencies that are less likely? The table on the right illustrates this point; it's not absolute, and we could add many more contingencies and then debate their relative likelihood of occurring. And there's a point at which the likelihood is so low that the event is not credible at all.

Contingency	Likelihood
Single transmission line or generator failure.	Decreasing ↓
Double-circuit failure on same tower.	
Single line failure + stuck breaker (delayed fault clearing)	
Trip of all multiple generators at the same plant.	
Failure of two transmission lines feeding substation	
Substation failure	

Likelihood as a function of design. From experience, and simple common sense, we know that single-element contingencies are considerably more likely to occur than multiple element contingencies because the generation and transmission system is designed to contain equipment failures through substation and generating plant design. Breaker configuration, protection logic, generating plant controls and station service are designed to prevent equipment failures from spreading to other parts of the plant or substation and cascading into multiple outages.

What's the worst contingency? The worst contingency is limited only by our imagination. But, for practical reasons, this isn't an open-ended scale. On the other hand, contingencies that we imagine are extremely unlikely still happen, and when we investigate those events may find that the "trigger" is more common than we thought. Again, experience will tell.

But there is no single transmission system design specification, nor do we propose there be one. While breaker-and-a-half substations are inherently better at containing equipment failures than ring-bus substations, they are also much more expensive. It may or may not be practical to connect multiple generators at the same plant to different parts of the transmission system. Therefore, multiple-element contingencies that may not be credible in some parts of the transmission system may be credible in others because of the difference in transmission system substation design or transmission line topology or generator connections. But differences in transmission design philosophy does not necessarily mean differences in customer reliability. It does mean the system planner, operations planner, and operator must know which contingencies are more likely, and which ones aren't, and be able to manage the risks of both.

ERCOT

Date: January 10, 2012
To: Board of Directors
From: Jeff Billo, Manager of Mid-Term Planning
Subject: Cross Valley 345kV Regional Planning Group Project – Updated as of January 12, 2012

EXHIBIT
AUG 2 9 2013
Billo 3 KP

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: January 17, 2012
Agenda Item No.: 10

Issue:
Whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should accept the recommendation of ERCOT staff, which the Technical Advisory Committee (TAC) has voted to support, to: (1) endorse the need for the Cross Valley 345 kV Regional Planning Group (RPG) Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed ~~and recommends for Board endorsement and TAC has voted to support~~; and (2) deem the North Edinburg-Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D).

Background/History:
Sharyland Utilities and Brownsville Public Utilities Board (BPUB) submitted a project to meet the reliability needs of Brownsville and the surrounding areas. ERCOT performed an Independent Review and found that ERCOT planning reliability criteria would be exceeded by 2016 without system upgrades. ERCOT analyzed the proposed project as well as several alternative projects. Of these, Option 5 was identified as the preferred option for the Cross Valley 345kV Project. The improvements included in Option 5 are described as follows:

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA;
- Construct a new North Edinburg-Loma Alta 345 kV line (double circuit capable with one circuit in place) routed in proximity to the existing South McAllen Substation (~106.5 miles) on new ROW; and
- Construct a new 345 kV bus at the Loma Alta station with one 345/138 kV autotransformer.

The cost estimate for these improvements is $274.7 million. Option 5 would resolve the reliability criteria exceedances identified in the study. BPUB requested that ERCOT deem the North Edinburg-Loma Alta 345 kV line critical to reliability pursuant to the Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D) in order to mitigate reliability risk as soon as possible.

The ERCOT Independent Review of the Sharyland and BPUB Cross Valley Project is attached as Attachment A.

ERCOT

Key Factors Influencing Issue:

1. A Cross Valley 345 kV line is needed to meet the reliability requirements for the ERCOT System (specifically, to prevent a large amount of load shed in the Brownsville area under N-1-1 contingency conditions).
2. BPUB projected a large industrial load addition to their system. RPG could not come to a consensus on the appropriateness of including this load addition in the analysis. ERCOT performed the Independent Review with and without the load addition.
3. ERCOT relies on the TDSPs to provide forecasts of discrete load addition assumptions in the planning models. Hence, the recommendation in the ERCOT Independent Review of Option 5 was based on the assumption of 250 MW of industrial load additions in Brownsville.
4. TAC voted to recommend Option 5.

Alternatives:

1. Endorse the need for the Cross Valley 345 kV RPG Project to meet reliability requirements in the ERCOT System ~~as recommended by ERCOT staff and as supported by TAC~~ and deem the North Edinburg to Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D), both as recommended by ERCOT staff and as supported by TAC.
2. Remand to ERCOT staff with instructions.

Conclusion/Recommendation:

ERCOT staff respectfully recommends, with the support of TAC, that the Board of Directors: (1) endorse the need for the Cross Valley 345 kV RPG Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed ~~and recommends for Board endorsement and TAC has voted to support~~; and (2) deem the North Edinburg-Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D).

ERCOT

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

WHEREAS, staff of Electric Reliability Council of Texas, Inc. (ERCOT) has prepared the Independent Review of the Sharyland and BPUB Cross Valley Project, which is attached hereto as *Attachment A*;

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, which TAC has voted to support, to: (1) endorse the need for the Cross Valley 345 kV Regional Planning Group (RPG) Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed ~~and recommends for Board endorsement and TAC has voted to support~~; and (2) deem the North Edinburg-Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D);

THEREFORE, BE IT RESOLVED, that the Board hereby: (1) endorses the need for the Cross Valley 345 kV RPG Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed and recommends for Board endorsement and TAC has voted to support; and (2) deems the North Edinburg-Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D).

CORPORATE SECRETARY'S CERTIFICATE

I, Vickie G. Leady, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its January 17, 2012 meeting, the ERCOT Board passed a motion approving the above Resolution by ______.

IN WITNESS WHEREOF, I have hereunto set my hand this ___ day of January, 2012.

____
Vickie G. Leady
Assistant Corporate Secretary

ERCOT

Date: January 10, 2012
To: Board of Directors
From: Jeff Billo, Manager of Mid-Term Planning
Subject: Cross Valley 345kV Regional Planning Group Project

EXHIBIT
AUG 29 2013
Billo 4 KP

Issue for the ERCOT Board of Directors

ERCOT Board of Directors Meeting Date: January 17, 2012
Agenda Item No.: 10

Issue:
Whether the Board of Directors (Board) of Electric Reliability Council of Texas, Inc. (ERCOT) should: (1) endorse the need for the Cross Valley 345 kV Regional Planning Group (RPG) Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed and recommends for Board endorsement and TAC has voted to support; and (2) deem the North Edinburg-Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D).

Background/History:
Sharyland Utilities and Brownsville Public Utilities Board (BPUB) submitted a project to meet the reliability needs of Brownsville and the surrounding areas. ERCOT performed an Independent Review and found that ERCOT planning reliability criteria would be exceeded by 2016 without system upgrades. ERCOT analyzed the proposed project as well as several alternative projects. Of these, Option 5 was identified as the preferred option for the Cross Valley 345kV Project. The improvements included in Option 5 are described as follows:

- Construct a new La Palma-Palo Alto 138 kV line (~12 miles) on new ROW with a rating of at least 215 MVA;
- Construct a new North Edinburg-Loma Alta 345 kV line (double circuit capable with one circuit in place) routed in proximity to the existing South McAllen Substation (~106.5 miles) on new ROW; and
- Construct a new 345 kV bus at the Loma Alta station with one 345/138 kV autotransformer.

The cost estimate for these improvements is $274.7 million. Option 5 would resolve the reliability criteria exceedances identified in the study. BPUB requested that ERCOT deem the North Edinburg-Loma Alta 345 kV line critical to reliability pursuant to the Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D) in order to mitigate reliability risk as soon as possible.

Key Factors Influencing Issue:
1. A Cross Valley 345 kV line is needed to meet the reliability requirements for the ERCOT System (specifically, to prevent a large amount of load shed in the Brownsville area under N-1-1 contingency conditions).
2. BPUB projected a large industrial load addition to their system. RPG could not come to a consensus on the appropriateness of including this load addition in the analysis. ERCOT

ERCOT

performed the Independent Review with and without the load addition. 3. ERCOT relies on the TDSPs to provide forecasts of discrete load addition assumptions in the planning models. Hence, the recommendation in the ERCOT Independent Review of Option 5 was based on the assumption of 250 MW of industrial load additions in Brownsville. 4. TAC voted to recommend Option 5.
Alternatives: 1. Endorse the need for the Cross Valley 345 kV RPG Project to meet reliability requirements in the ERCOT System as recommended by ERCOT staff and as supported by TAC and deem the North Edinburg to Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D). 2. Remand to ERCOT staff with instructions.
Conclusion/Recommendation: ERCOT staff respectfully recommends that the Board of Directors: (1) endorse the need for the Cross Valley 345 kV RPG Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed and recommends for Board endorsement and TAC has voted to support; and (2) deem the North Edinburg-Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D).

ERCOT

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: (1) endorse the need for the Cross Valley 345 kV Regional Planning Group (RPG) Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed and recommends for Board endorsement and TAC has voted to support; and (2) deem the North Edinburg-Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D);

THEREFORE, BE IT RESOLVED, that the Board hereby: (1) endorses the need for the Cross Valley 345 kV RPG Project to meet the reliability requirements for the ERCOT System which ERCOT staff has independently reviewed and recommends for Board endorsement and TAC has voted to support; and (2) deems the North Edinburg-Loma Alta 345 kV line critical to reliability of the ERCOT System pursuant to Public Utility Commission of Texas Substantive Rule 25.101(b)(3)(D).

CORPORATE SECRETARY'S CERTIFICATE

I, Vickie G. Leady, Assistant Corporate Secretary of ERCOT, do hereby certify that, at its January 17, 2012 meeting, the ERCOT Board passed a motion approving the above Resolution by ______.

IN WITNESS WHEREOF, I have hereunto set my hand this ___ day of January, 2012.

____
Vickie G. Leady
Assistant Corporate Secretary

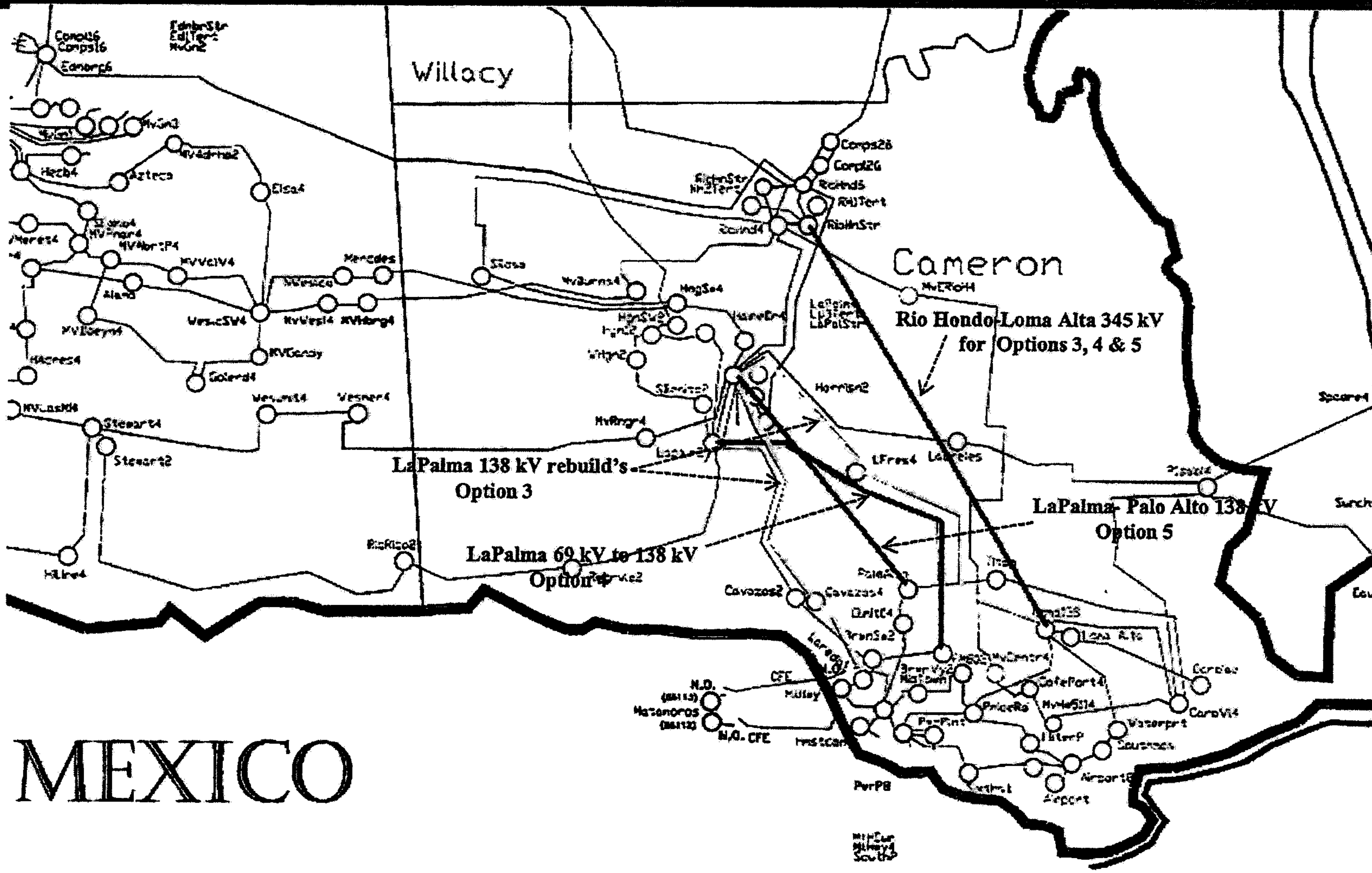
ERCOT

Cross Valley Brownsville Loop Project – Status report

RPG Meeting

Nov 11, 2011

LRGV/Brownsville Area Transmission system



Project Options

Option 1 – (Sharyland and BPUB proposal)

- New 345kV Loma Alta station with two (2) 345/138kV 450 MVA auto
- ~14 mile 345kV transmission line from existing 345kV La Palma station to new 345kV Loma Alta station
- ~59 mile 345kV transmission line from new 345kV Loma Alta station to new 345kV Frontera station across the valley
- Total project cost estimate ~ $126.0 million*

Option 3

- New 345kV Loma Alta station with one 345/138kV auto ($24.1 M)
- ~27.4 mile 345kV transmission line from existing 345kV RioHondo station to new 345kV Loma Alta station ($ 71.4 M)
- Rebuild LaPalma-Cavazos-Military Highway with 2-795 ACSR ($47.2 M)
- Rebuild LaPalma-Los Fresnos-LomaAlta with 2-795 ACSR ($40.1 M)
- Total project cost estimate ~ $182.8 million

* Cost estimates are subjected to be revised

Project Options (Cont.)

Option 4

- New 345kV Loma Alta station with one 345/138kV auto ($24.1 M)
- ~27.4 mile 345kV transmission line from existing 345kV RioHondo station to new 345kV Loma Alta station ($71.4 M)
- Rebuild and convert LaPalma to Brownsville 69 kV line to a 138 kV line; Remove 69 kV terminal at Brownsville, and add 138 kV ring bus and add new 138/69 kV auto at Brownsville (for 69 kV line from Brownsville City to LaPalma) ($54.3 M)
- Total project cost estimate ~ $149.8 million

Option 5

- New 345kV Loma Alta station with one 345/138kV auto ($24.1 M)
- ~27.4 mile 345kV transmission line from existing 345kV RioHondo station to new 345kV Loma Alta station ($ 71.4 M)
- ~12 mile new 138kV transmission line from LaPalma – Palo Alto with 2-795 ACSR ($11.3 M*)
- Total project cost estimate ~ $106.8 million*

* Cost estimates are subjected to be revised

345 kV Project Option for N-1-1

- New 345 kV Line from North Edinburg to South McAllen ($ 93.4 M)
- New 345 kV transmission line from South McAllen to Loma Alta ($147.7 M))
- New 345kV Loma Alta station with one 345/138kV auto ($24.1 M)
- Build South McAllen station or Frontera 345 kV station with one 345/138 kV auto and 1 - 345 kV line terminal ($24.1 M) - needed by 2020
- Total project cost estimate ~ $289.3 million

2016 Power Flow Results N-1-1 (without the new 250 MW load)

Prior Outage of either the Ajo-Rio Hondo 345 kV or Rio Hondo-N. Edinburg 345 KV:

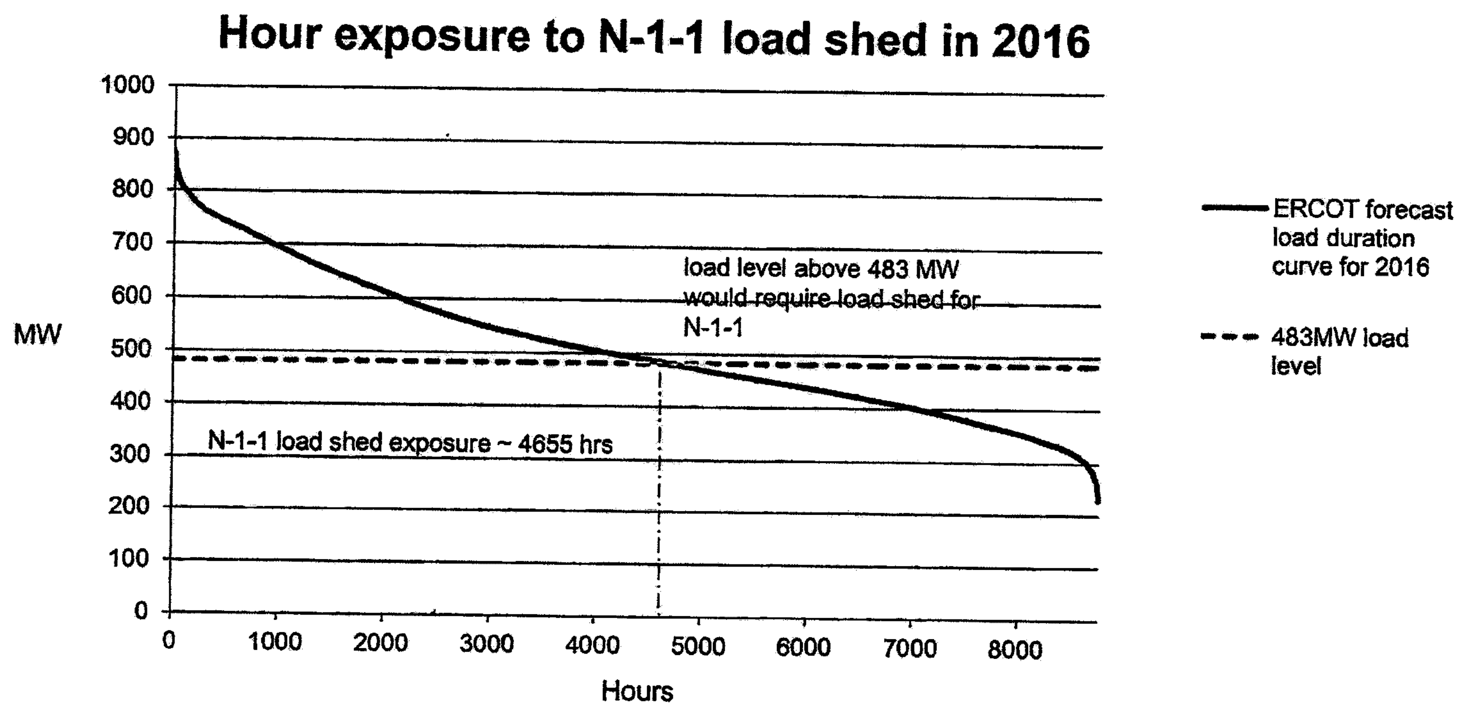
The loss of the next 345 kV @ Rio Hondo would cause severe overloads on several 138 kV and 69 kV lines (cross valley lines serving Brownsville area).

Some of the major post-contingency (> 120%) N-1-1 overloads:

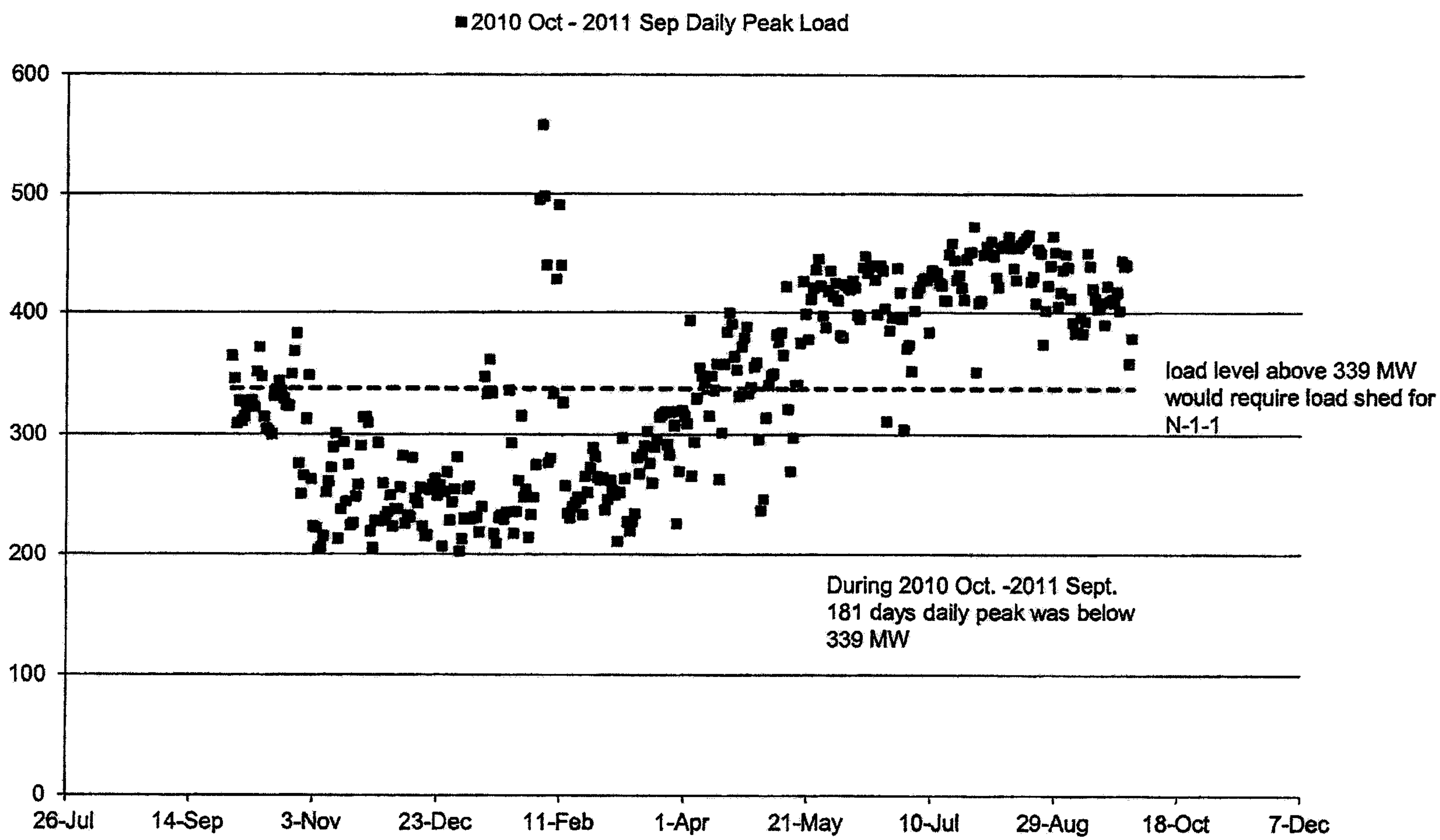
- Weslaco Unit to Steward Road 138 kV line (158.4 %)
- Weslaco Switching Station to Weslaco 138 kV line (149.7%)
- Aderhold to HEC Energy Center 138 kV line (142.7%)
- Heidelberg to Weslaco 138 kV line (134.0%)
- Elsa to Aderhold 138 kV line (133.6%)
- Burns to Heidelberg 138 kV line (126.3%)
- South McAllen to Las Milpas 138 kV line (124.5%)
- Wesmer to Weslaco Unit 138 kV line (120.7%)

2016 system peak system condition would require ~ 387 MW of load shed in the East Valley to relieve all N-1-1 overloads.

2016 East Valley Load duration curve (without the 250 MW)



2010-2011 Brownsville Area Load



2020 Power Flow Results N-1 & G-1 with 250 MW load

With Option 5 (without the Cross-Valley 345 kV line)

- New 345kV Loma Alta station with one 345/138kV auto
- ~27.4 mile 345kV transmission line from existing 345kV RioHondo station to new 345kV Loma Alta station
- ~12 mile new 138kV transmission line from LaPalma – Palo Alto with 2-795 ACSR

Some of the post-contingency overloads following for N-1 & G-1:

South McAllen to Las Milpas 138 kV line (114.5%)
HEC to Azteca 138 kV line (111.7 %)
HEC to Aderhold 138 kV (108%)
Azteca to South Edinburg 138 kV line (107.8 %)

Study status/update

- We are comparing the project costs and reliability impact of the following four sensitivities to make a final project recommendation:
  - N-1+ G-1 without the new 250 MW load
  - N-1+ G-1 with the new load 250 MW load
  - N-1-1 & N-1+G-1 without the new 250 MW load
  - N-1-1 & N-1+G-1 with the new 250 MW load
- Working on the study report
- The tentative date for the study report is revised to November 22, 2011

Questions?

ERCOT

Cross Valley 345 kV Project

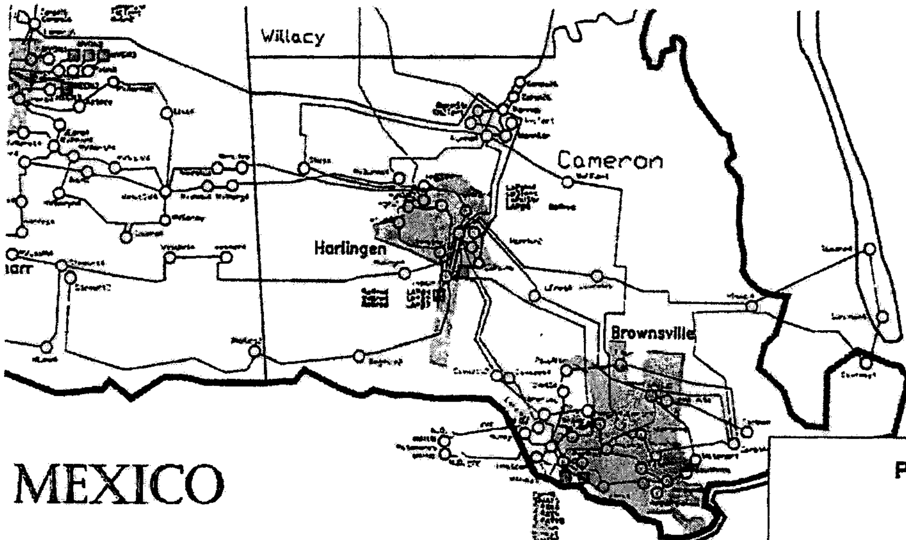
Jeff Billo
Manager, Mid-Term Planning

TAC

January 5, 2012

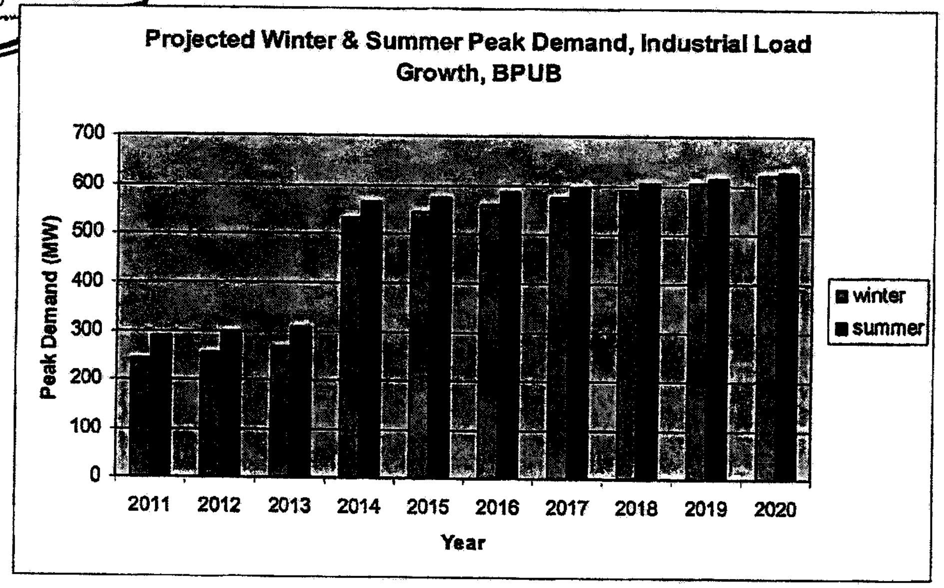
EXHIBIT
AUG 2 9 2013
Billo 6 KP

Cross Valley Background



Brownsville area is served by (4) 138 kV lines and the Silas Ray plant (~120 MW)

Brownsville Public Utility Board (BPUB) projects 250 MW of industrial load additions at the Port of Brownsville



RPG Review

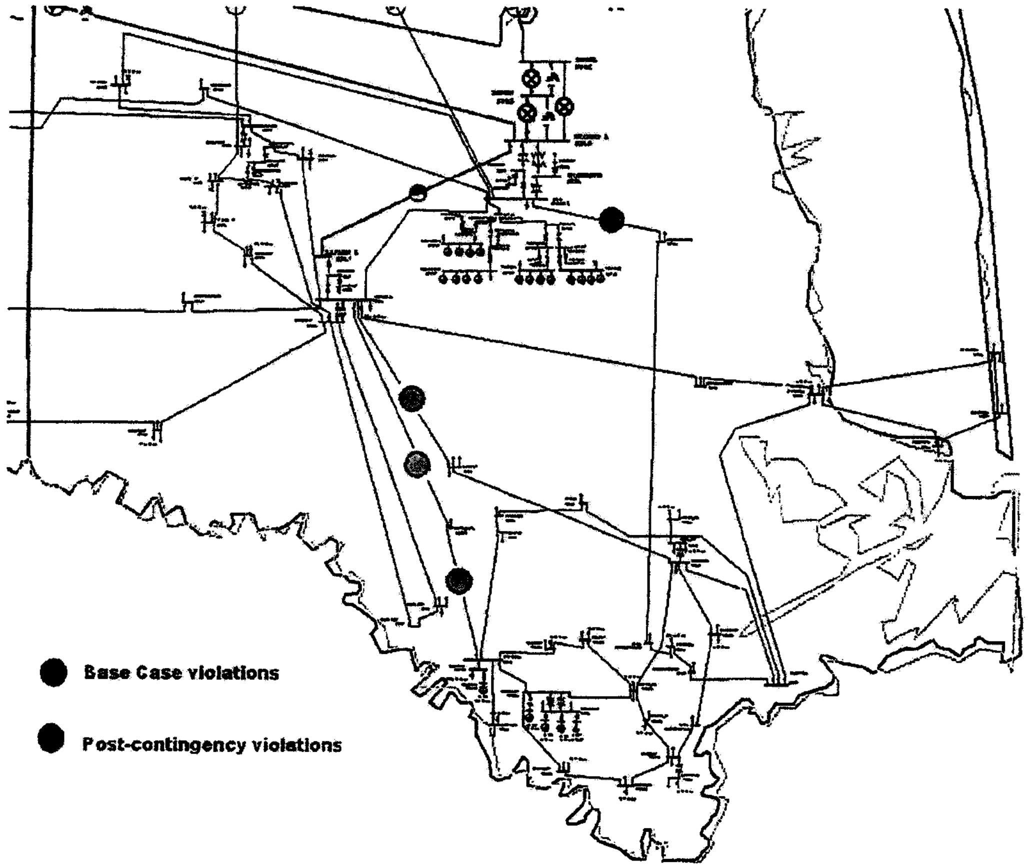
- Sharyland Utilities (SU) and BPUB proposed Cross Valley 345 kV project to address normal load growth in East Valley, Port of Brownsville industrial load additions, and maintenance outage issues

- RPG participants could not come to consensus about appropriateness of including new 250 MW industrial load addition in the study case (modeled at Loma Alta 138 kV substation)

- ERCOT performed Independent Review of project
  - Analysis conducted with and without 250 MW load addition
  - Analysis focused on steady-state reliability needs in 2016
  - Long-term (2020) sensitivity analysis performed

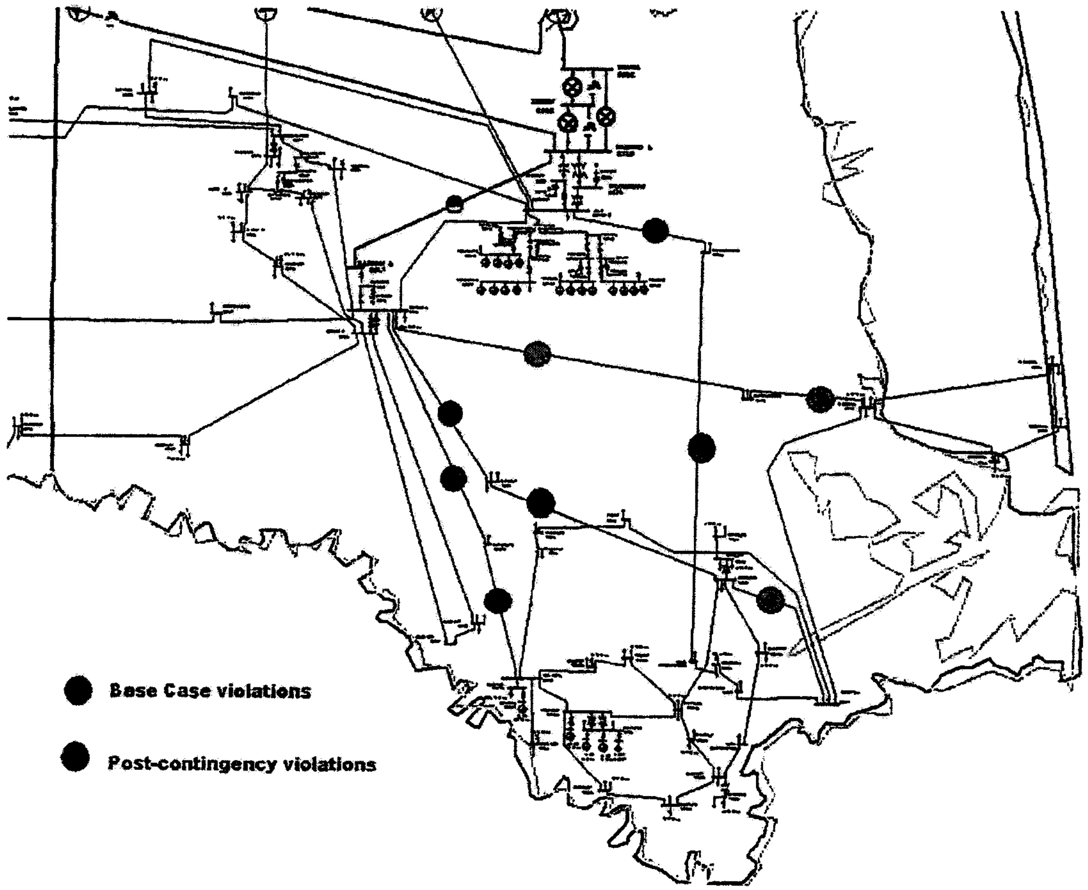
Independent Review Reliability Analysis

- Without 250 MW load additions there was one N-0 thermal violation and multiple N-1 violations for 2016:



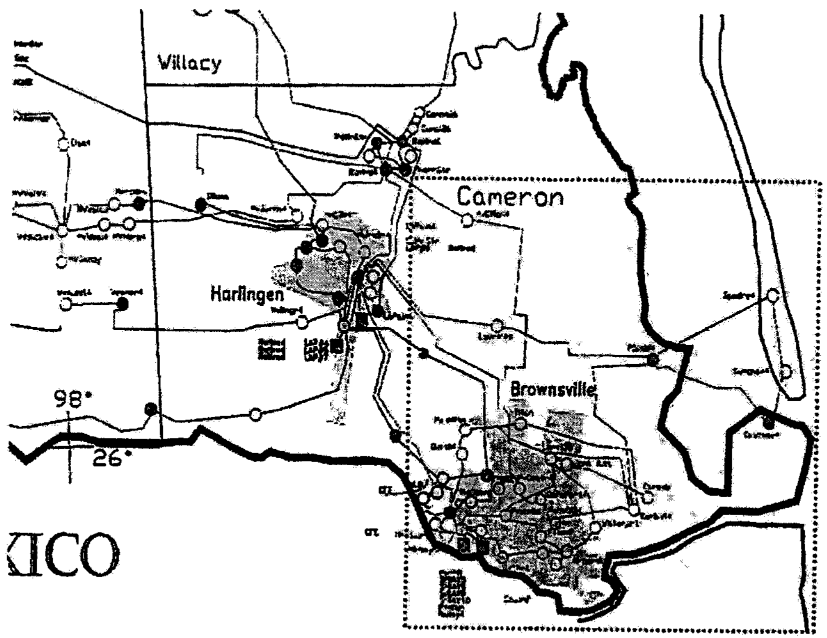
Independent Review Reliability Analysis

- With 250 MW load additions there were multiple N-0 and N-1 thermal violations for 2016:



Reliability Analysis: N-1-1

- **Multiple N-1-1 (Category C) contingency overloads**
  - Highest post-contingency overload is 167.2% of emergency rating (12 lines loaded >120%) - without 250 MW load additions



~175 MW would need to be shed following the first contingency

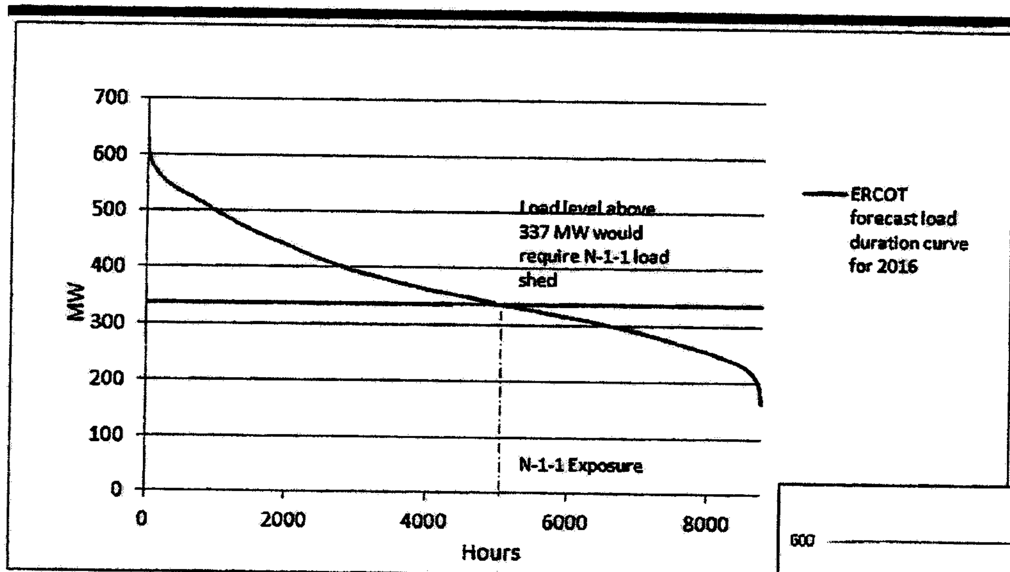
Additional ~190 MW would need to be shed following the second contingency

80% (290 MW) of the 365 MW total load shed needed for N-1-1 would be in the shaded area

2016 peak in this shaded area is 627 MW

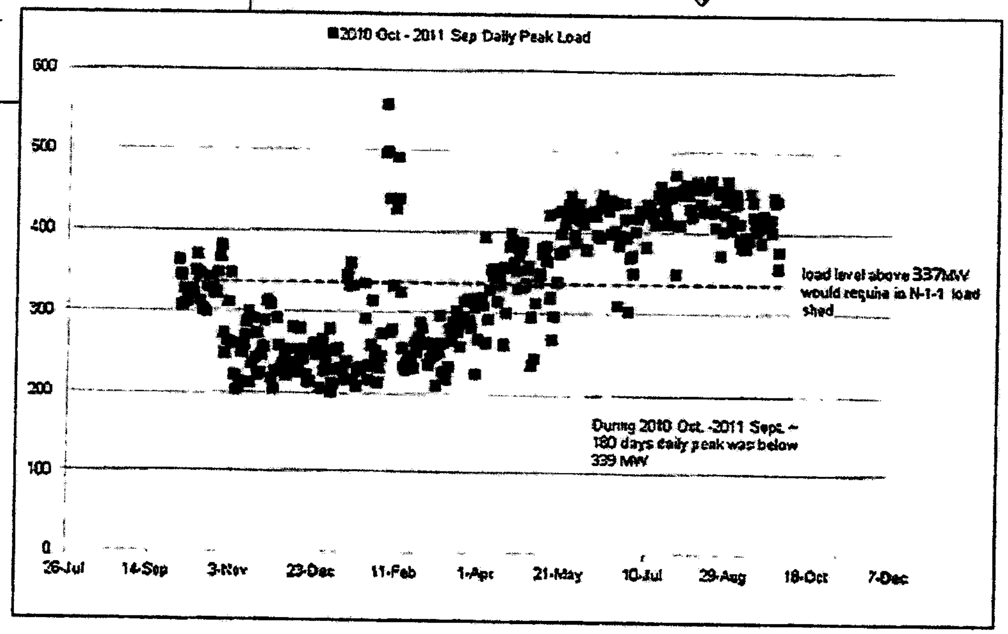
❖ Load shed allowed under NERC and ERCOT planning criteria for Category C contingency events, but exposure and extent of load shed is not practical or desirable

N-1-1 Load Shed Exposure



2016 load duration curve for Brownsville area showing N-1-1 load shed threshold

2010-11 actual daily peaks for Brownsville area



Cross Valley 345 kV line needed to reduce N-1-1 load shed risk

Long Term Considerations

- 2020 ERCOT Long Term Study DOE case analyzed to determine long-term reliability needs in Valley
- Results showed multiple west Valley 138 kV line overloads or near overloads under G-1 + N-1 conditions
- A North Edinburg to South McAllen 345 kV line would solve most of these constraints
  - Resolves ~ $95M worth of 138 kV line upgrades
- Conclusion:
  - Any Cross Valley 345 kV line should be routed in proximity to South McAllen to account for long term needs in the west Valley area

Port of Brownsville Industrial Load Additions

- **RPG did not come to consensus about appropriateness of including the 250 MW industrial load additions in the study case**
  - BPUB and Brownsville Economic Development Council (BEDC) indicated that load modeled is representative of previous industrial customer projects that have chosen to locate elsewhere due to lack of electric infrastructure in area
    - Has occurred multiple times according to BEDC
  - TIEC commented that it would be inappropriate to plan transmission facilities for the addition of "speculative future loads"
- **TDSPs have responsibility for providing forecasts of discrete load addition assumptions in ERCOT planning models**
  - ERCOT performs system-wide forecasts
  - ERCOT has not historically judged the validity of specific load additions
- **250 MW load addition in Port of Brownsville assumed in ERCOT's recommendation, while providing a sensitivity performed without it**