AEPSC
Rio Grande Valley System Improvement Overview for 26RPG009

July 21st 2026

Background

- AEP has signed agreements with approximately 9.5 GW of large load in Rio Grande Valley. This was communicated as ~6.8 GW in the RPG filing, however since filing AEP has executed agreements for additional ~3 GW of load. With the existing loading in the Valley in the range of 2.5 – 2.6 GW this puts the entire loading at nearly 12 GW in peak conditions.

- All signed large loads concentrated in Cameron county on East side of RGV.

- It is expected that after completion of LRGV System Enhancement RPG project (Cruce – San Miguel, Cruce – Reforzar, Reforzar – Ajo, Cruce – Del Sol, Del Sol – Frontera, Cruce – Cenizo) the total load serving capability for valley for peak conditions accounting for N-1 is approximately 8.5 GW. This highlights the huge gap in expected capacity and forecasted demand.

Background

- To address limitations of the load serving capability AEP is proposing construction of a 765 kV loop (two independent paths) into RGV at a station called Puma 765 kV. Location of Puma was chosen due to proximity to nearly 6 GW of the total 9.5 GW of load mentioned in previous slide.

- In addition to the proposed 765 kV paths, 345 kV upgrades were proposed to address more localized thermal & voltage violations identified.

- AEP evaluated two different routes for the proposed east 765 kV path from Howard to Puma. Option one proposes the 765 kV to route through mid-line station at Cruce. Cruce is an existing AEP 345 kV station. Option one contains an estimated 400 miles of 765 kV. Option two proposes the 765 kV to route through mid-line station at Cenizo. Cenizo is an existing AEP 345 kV station. Option two contains an estimated 458 miles of 765 kV.

Option 1

Transmission Line Additions/Modifications

- Build Puma to Blu Lacy a new ~132-mile single circuit 765 kV
- Build Puma to Cruce a new ~102-mile single circuit 765 kV
- Build Cruce to Howard a new ~166-mile single circuit 765 kV
- Build North Ed to Panther new ~30 -mile double circuit 345 kV
- Build Panther to Candela new ~9-mile double circuit 345 kV
- Build Candela to Wren with Two (2) new ~ 0.5 -mile single circuits 345 KV
- Rebuild Rio Hondo to Bonilla ~10-miles single circuit 345 kV

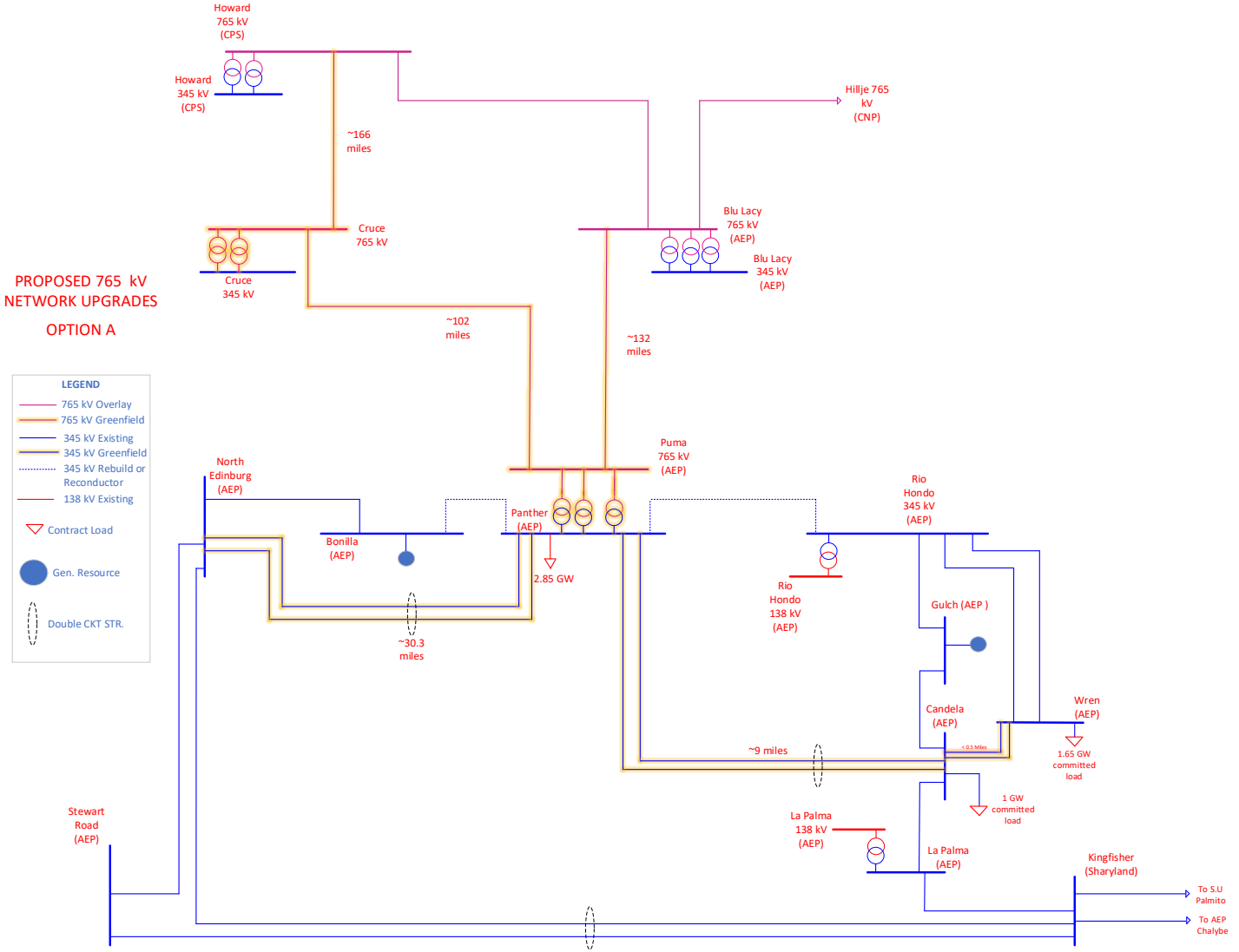
765 KV	345 KV
400 miles	**50 miles**

Station Addition/Expansion

- Puma 765 kV Station (New) - Three– 765 KV 345/138 kV Autos
- Cruce 765 kV Station (New) - Two 765/345 kV Autos
- Blu Lacy 765 kV Station (Expand)
- Howard 765 kV Station (Expand)
- Panther 345 kV Station (New) - Two – 300 MVAR STATCOMS
- North Ed 345 KV Station (Expand)
- Candela 345 kV Station (Expand)
- Wren 345 kV Station (Expand)

TOTAL 2026 DOLLARS	
OPTION 1: Total	**$4.87 B**
AEP TEXAS	$4.13 B
CPS	$0.736 B

Option 1


PROPOSED 765 kV
NETWORK UPGRADES
OPTION A
LEGEND
765 kV Overlay
765 kV Greenfield
345 kV Existing
345 kV Greenfield
345 kV Rebuild or Reconductor
138 kV Existing
Contract Load
Gen. Resource
Double CKT STR.
Howard 765 kV (CPS)
Howard 345 kV (CPS)
~166 miles
Hillje 765 kV (CNP)
Cruce 765 kV
Cruce 345 kV
Blu Lacy 765 kV (AEP)
Blu Lacy 345 kV (AEP)
~102 miles
~132 miles
Puma 765 kV (AEP)
North Edinburg (AEP)
Bonilla (AEP)
Panther (AEP)
2.85 GW
~30.3 miles
Rio Hondo 345 kV (AEP)
Rio Hondo 138 kV (AEP)
Gulch (AEP)
Candela (AEP)
Wren (AEP)
1.65 GW committed load
~9 miles
1 GW committed load
La Palma 138 kV (AEP)
La Palma (AEP)
Kingfisher (Sharyland)
To S.U Palmito
To AEP Chalybe
Stewart Road (AEP)

Option 2

Transmission Line Additions/Modifications

- Build Puma to Blu Lacy a new ~132-mile single circuit 765 kV
- Build Puma to Cenizo a new ~153-mile single circuit 765 kV
- Build Cruce to Howard a new ~173-mile single circuit 765 kV
- Build North Ed to Panther new ~30 -mile double circuit 345 kV
- Build Panther to Candela new ~9-mile double circuit 345 kV
- Build Candela to Wren with Two (2) new ~ 0.5 -mile single circuits 345 KV
- Rebuild Rio Hondo to Bonilla ~10-miles single circuit 345 kV

Station Addition/Expansion

- Puma 765 kV Station (New)
  - Three - 765 KV 345/138 kV Autos
- Cenizo 765 kV Station (New)
  - Two -765/345 kV Autos
- Blu Lacy 765 kV Station (Expand)
- Howard 765 kV Station (Expand)
- Panther 345 kV Station (New)
  - Two – 300 MVAR STATCOMS
- North Ed 345 KV Station (Expand)
- Candela 345 kV Station (Expand)
- Wren 345 kV Station (Expand)

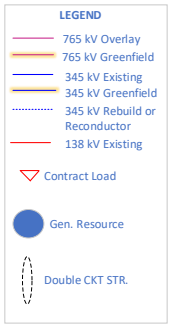
765 KV	345 KV
458 miles	50 miles

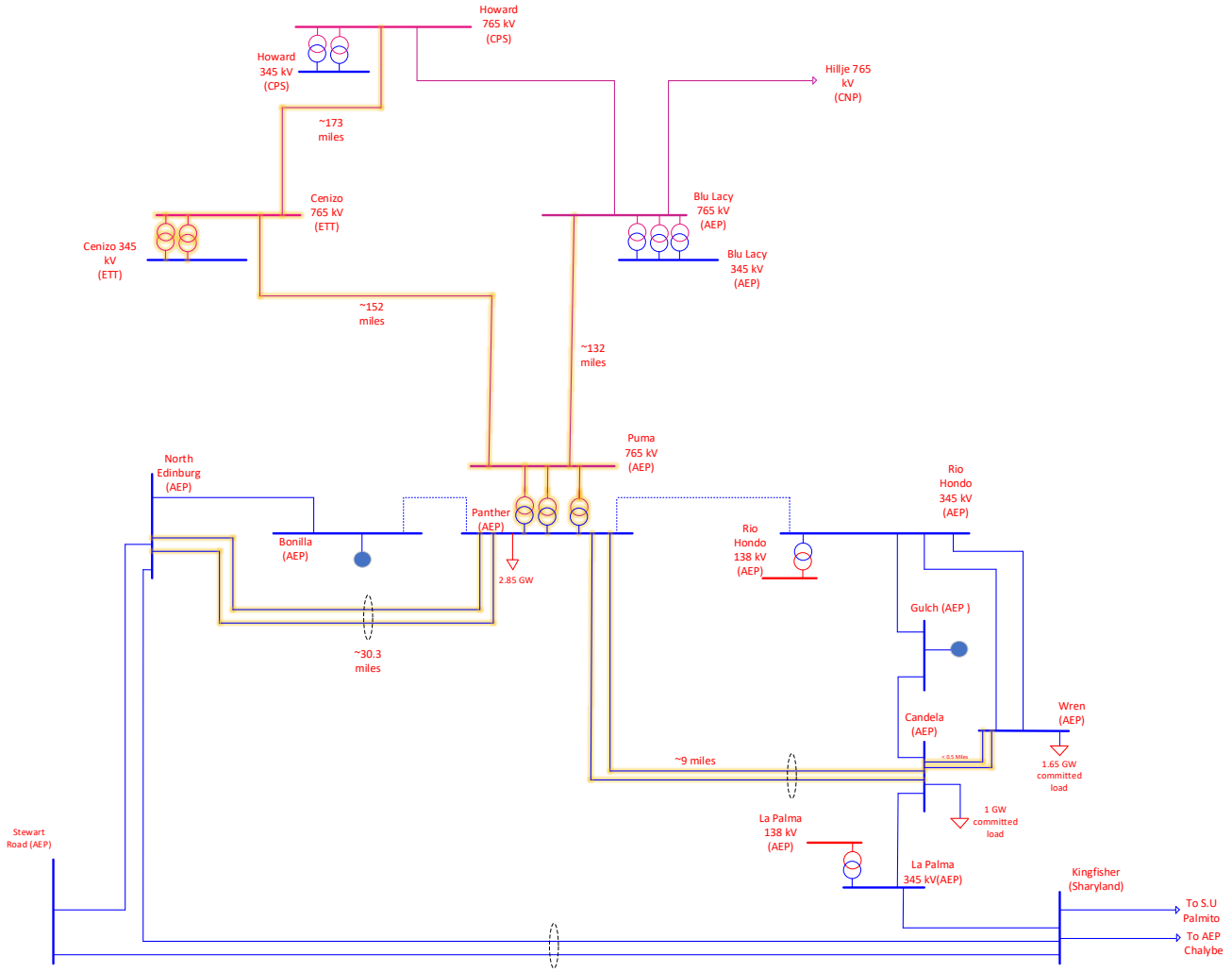
TOTAL 2026 DOLLARS	
OPTION 2:	$4.98 B
AEP TEXAS	$2.72 B
ETT	$1.50 B
CPS	$0.762 B

Option 2

PROPOSED 765 kV NETWORK UPGRADES

OPTION B





Study Assumptions – Steady State

- ERCOT 2024 RTP were used in assessment. 2024RTP_2030_SUM_TX765STEP / 2024RTP_2030_MaintenanceOutage_765STEP.
- Bonilla – Candela 345 kV double circuit line removed from service.
- Bypassed series capacitors at Cenizo, Del Sol, Rio Hondo, North Edinburg.
- Corrected topology at Blu Lacy & Amber.
- Modified 765/345 kV transformer ratings at Hillje/Blu Lacy/Howard to 2250 MVA (750 MVA per phase).
- Verified inclusion of contracted loads in case. Switched out of service any non-contracted loads which were present.

- Inclusion of 6.9 compliant generation.

    - Angstrom and Lon Hill D1 generators will remain in the case as is.
        - Resaca Oasis BESS (27INR0399)
        - Monte Alto Wind (19INR0022) / (19INR0023)
        - Half Moon Solar (28INR0127)
        - Grapefruit Solar (27INR0044)
        - Arroyo Solar (24INR0306)

Study Assumptions – Steady State

Study subsystem is defined as at a minimum encompassing RGV and surrounding regions (Cameron, Hidalgo, Starr, and Willacy counties). More specifically for all steady state contingency analysis performed the monitored subsystem will be at a minimum of 6 busses from Panther 345 kV bus. The contingency subsystem will similarly be set to 6 busses from Panther 345 kV bus. This will also ensure that adjacent TSPs (STEC, Sharyland, PUB) facilities will be captured in analysis.

The normal system conditions (P0) as well as study area contingencies outlined in the ERCOT Planning Guide (ERCOT1, ERCOT2, and ERCOT3) and the NERC reliability standard TPL-001-5.1 (P1 through P7) were studied. In addition, P1/P7 + P7 contingencies were studied for all study cases, but transmission upgrades for P6 and P1/P7+P7 violations were only proposed for the off-peak case in accordance with the ERCOT Planning Guide, section 4.1.1.8, Maintenance Outage Reliability Criteria requirement.

Steady State Results

SUMMER CASE RESULTS

Contingency Category	Base Case	Option 1	Option 2
P0	No Violations	No Violations	No Violations
*P1,P2.1, P7	No Violations	No Violations	No Violations
P2.2,P2.3, P4	2 Thermal Violations	No Violations	No Violations
*§P3 (N-G-1) / ERCOT 2	4 Thermal Violations	No Violations	No Violations
P5	No Violations	No Violations	No Violations
*P6.2 (N-X-1) / ERCOT 3	5 Thermal Violations	3 Thermal Violation	3 Thermal Violations
*xP6.1 (Maintenance Criteria)	33 Thermal Violations 1 voltage violation	6 Thermal Violations	6 Thermal Violations

* - Includes double circuit contingencies
§ - Includes Combined Cycle Train outages
x - P6.1 violations for Peak are shown for transparency but outside of planning criteria.

MAINTENANCE CASE RESULTS

Contingency Category	Base Case	Option 1	Option 2
P0	No Violations	No Violations	No Violations
*P1,P2.1, P7	No Violations	No Violations	No Violations
P2.2,P2.3, P4	No Violations	No Violations	No Violations
*§P3 (N-G-1) / ERCOT 2	No Violations	No Violations	No Violations
P5	No Violations	No Violations	No Violations
*P6.2 (N-X-1) / ERCOT 3	4 Thermal Violations	2 Thermal Violations	2 Thermal Violations
*P6.1 (Maintenance Criteria)	31 Thermal Violations	No Violations	No Violations

* - Includes double circuit contingencies
§ - Includes Combined Cycle Train outages

Steady State Results

Review of the performed steady state analysis indicates a potential to overload the 765/345 kV autotransformers at CNP Hillje still persists in both options under specific N-X-1 scenarios.

AEPSC recommends two options to mitigate the potential thermal overload of Hillje 765/345 kV autos under the maintenance of one of the Hillje autos and loss of a second auto under contingency:

1. Apply a ratings methodology to increase the emergency thermal ratings of autos to mitigate the overload
2. Add a fourth 765.345 kV auto (3 single phase banks)

* Hillje 765/345 kV Autos are single phase units with two hot spares available to be switched for loss of any single phase

Load Serving Capabilty

Condition	Additional Load Serving Capability (GW)		Total Load Serving Capability (GW)	
	Option 1	Option 2	Option 1	Option 2
Summer Base Case (N-0)	6.2	6.2	15.7	15.7
Summer Base Case (N-1)	4.0	4.0	13.5	13.4
Maintenance Base Case (N-0)	6.8	6.8	15.5	15.6
Maintenance Base Case (N-1)	4.6	4.6	13.2	13.2
Maintenance Base Case (N-1-1)	2.4	2.4	11.0	11.1

Dynamic Analysis Study Assumptions

Dynamic stability analysis was carried out using the Summer Peak and Maintenance Outage cases utilized during the steady state study. The AEP-area generation dispatch remained unchanged from the cases utilized during the steady state study. The following additional modifications were made to these cases:

- Added new large load dynamic model for Eneus and Las Majadas
- CMLD load models were used to represent the dynamic load characteristics of AEP loads.
- The dynamic models for the units identified below were excluded from all scenarios due to their poor dynamic performance during dynamic stability analysis as a result of modeling issues:

Bus Number	Bus Name in PSSE	Id
8573	BONILLA7A	W1
8573	BONILLA7A	W2
134491	HILO_W1	W1
134492	HILO_W5	W1
134493	HILO_W2	W2
134494	HILO_W3	W3
134495	HILO_W4	W4
134851	HILO_W6	W1
134852	HILO_W7	W1
143016	VERA_W1	W1
150751	TRI_TH1_BUS1	W1
150752	TRI_TH1_BUS2	W2
943106	LNGPNT_BES1	B1
998023	HALF_MOON_S	S1
998705	ARROYO_SOLAR	S1

Dynamic Models Excluded

Dynamic Analysis Study Assumptions

AEP selected a subset of dynamic events considered to be most impactful to generator stability, transient voltage recovery, and power oscillations in the study area. Final substation design was not known at the time of this study so conservative assumptions were used to develop the delayed clearing dynamic events. Fully redundant system protection was assumed; thus, NERC Category P5 events were not considered. Extreme events were considered outside the scope of this study and were not studied. The following NERC Category contingencies expected to produce more severe System impacts in the study area were considered for analysis:

- NERC Category P1
- NERC Category P3
- NERC Category P4
- NERC Category P6
- NERC Category P7 and ERCOT Category 1 at select non-765-kV locations. (765-kV transmission Facilities will not be constructed on common towers.)
- ERCOT2
- ERCOT3
- Large Load Drop

Dynamic Analysis Results

The dynamic stability analysis revealed several severe stability violations during the Summer Peak and Maintenance Outage bench case scenarios that appeared across all contingency category events, which included violations in voltage recovery, frequency deviation, and power oscillation damping. The scenarios with either RPG project option modeled resulted in mitigation of all stability violations observed in the bench case.

To determine whether a dynamic simulation was stable, AEP followed the requirements in the NERC TPL-001-5.1 reliability standard as well as ERCOT Planning Guide criteria as defined in **Figure 15**.

Observations of the stability analysis results indicated the following:

- Transient voltage recovery violations occurred in both the Maintenance Outage and Summer Peak bench cases
- Power oscillation damping performance violations were observed in both the Maintenance Outage and Summer Peak bench cases
- Frequencies deviated beyond acceptable levels in both the Maintenance Outage and Summer Peak bench cases
- No loss of synchronism occurred
- No stability violations occurred in the RPG project Option 1 and Option 2 cases

Recommendation

After reviewing cost, performance, and miles of greenfield transmission, **Option 1** is recommended. In accordance with ERCOT's Nodal Protocols Section 3.11.4.3.1(a), this project is submitted as a Tier 1 initiative and will require multiple CCN filings.

Estimated Cost: $ 4.87 Billion
Estimated In-Service Date: 5/2031