Lower Rio Grande Valley (LRGV) System Enhancement Project

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Regional Planning Group Meeting
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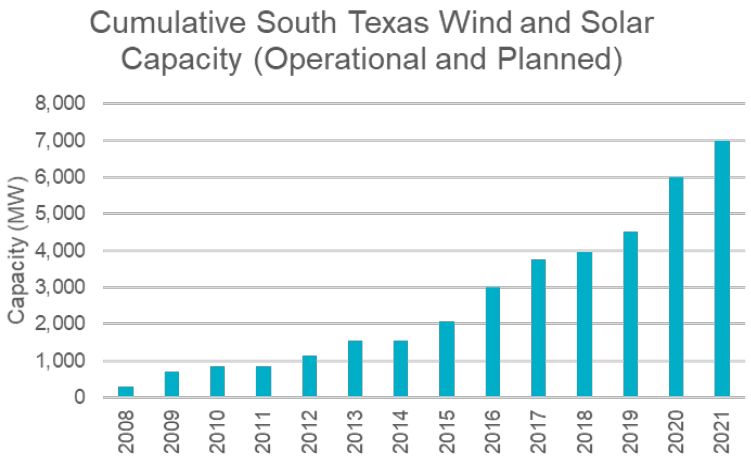
Lower Rio Grande Valley (LRGV)

- Majority of LRGV loads are in the Cameron, Hidalgo, Starr, and Willacy counties.
- LRGV is at the edge of the ERCOT grid and connected to the rest of grid through limited and long-distance transmission circuits.
- This area is also susceptible to tropical storm and hurricane related outages. Three of the top ten congested constraints on the ERCOT system in 2020 were caused by outages related to Hurricane Hanna storm damage.

LGRV (continue)

- Continuous load growth is expected in LRGV. In addition, there have been several large industrial load interconnection requests in the LRGV and Corpus Christi areas.
  - In 2020, the ERCOT Board of Directors endorsed the Corpus Christi North Shore project, which includes new 345-kV lines to meet reliability needs for confirmed industrial load additions of approximately 1,100 MW.
- In LRGV, there are four existing conventional power plants with total of 1,461 MW and no planned conventional generation.

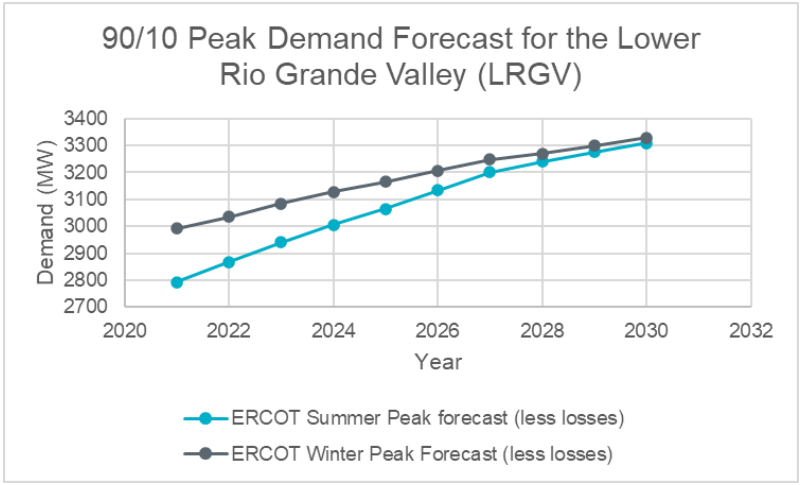
- There has been a significant increase in renewable generation in and close to LGRV.
- The cumulative wind and solar generation capacity is expected to reach ~7 GW by end of 2021.

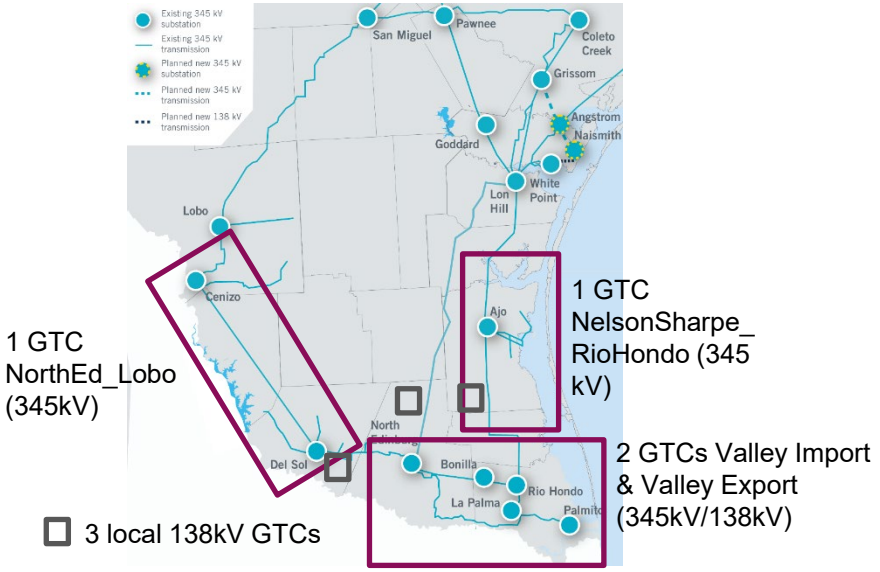


LRGV Existing System Condition

- ERCOT's assessment indicated the existing system can reliably serve summer peak load in LRGV up to 3,200 MW. System improvements are required prior to 2027.
  - Potential industrial load additions (generally large load with limited lead time) could trigger the need of system improvements prior to 2027.

- Seven of the 16 existing Generic Transmission Constraints (GTCs) used to maintain grid stability in Operations are in the LRGV area.





LRGV Existing System Conditions

- Because there is limited conventional generation and transmission infrastructure serving LRGV, extreme weather or extended outages (transmission and/or generation) could significantly reduce the LRGV's load serving capability.
  - Outage of the largest conventional plant accounts for 45% of total conventional generation capacity
  - Outage of the two largest conventional plants accounts for 77% of total conventional generation capacity
  - Outage of one primary 345-kV circuit could reduce the Valley Import capability up to ~40% and Valley Export capability up to ~70%
  - Under-voltage load shedding is implemented in LRGV as a safety net for extreme events

LRGV Reliability Assessment Results – Existing System

#	Base Case	System Events	Reliability Need Year
			Existing System
1	No Outages (Business as Usual, BAU)	NERC and ERCOT Planning Events(4)	2027(1)
2	Outage of one 345-kV import circuit		Current(2)
3	Outage of two 345-kV import circuits		Current(2)
4	Outage of two conventional plants in LRGV		Current(2)
5	Very Low Wind Conditions(3)		Current(2)

(1). System improvements are needed prior to 2027
(2). Reliability issues are identified based on the existing system conditions
(3). Nodal Protocol Section 3.15(4)(e) …For Intermittent Renewable Resources (IRRs), the Reactive Power requirements shall be available at all MW output levels at or above 10% of the IRR's nameplate capacity
(4). Including major single and multiple contingencies, e.g., N1(circuit outage), G1(plant outage), and/or combination of N1 and G1

System Improvements to LRGV

- Two short-listed long-term system improvement options for LRGV were developed to:
  - improve LRGV load serving capability – to reliably serve LRGV load (projected load growth and potential industrial load additions)
  - improve stability constraints
  - improve resiliency under normal conditions (all components are in service) and other conditions, such as generation outages, transmission outages, and the intermittence of renewable generation

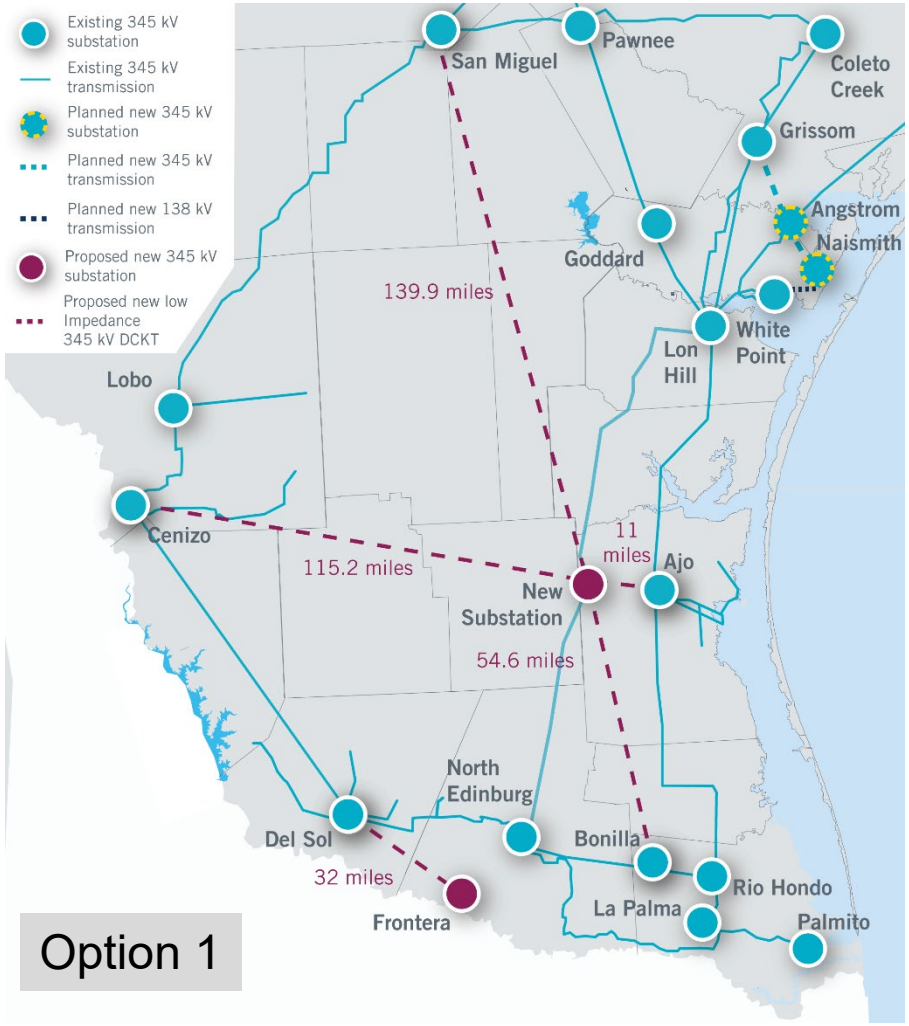
Assumptions

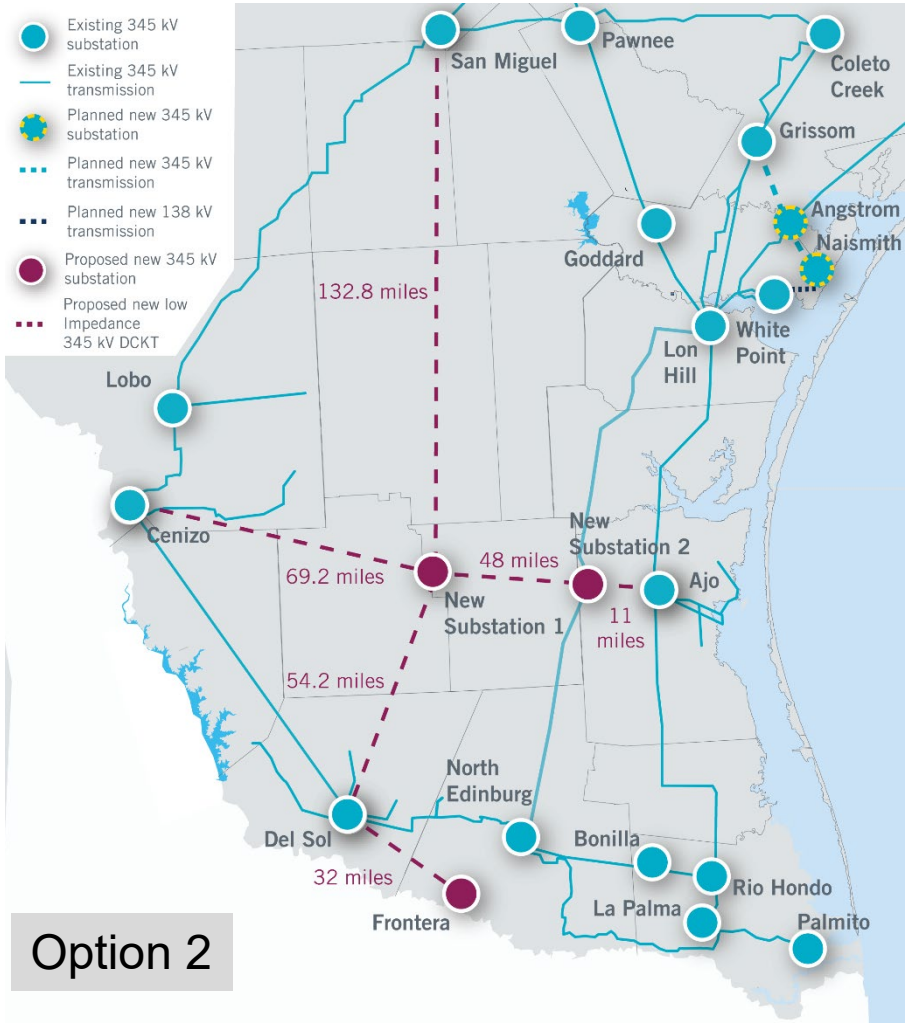
- LGRV load was scaled up proportionally in the reliability assessment to identify the load serving capability
- Dynamic load model was used in the dynamic assessment for summer peak condition to represent the anticipated load characteristics during the disturbance
- No reactive support if renewable generation (wind and solar) output is below 10% of the maximum rating
- New circuit distance was estimated as 120% of point-to-point distance

Consideration of Ultra-High-Voltage (UHV) AC Circuit

- Consideration of new AC circuit technology:
  - Typical 345-kV circuits require series capacitors to effectively support long-distance power transfer.
    - All three existing 345-kV LRGV import circuits are series-compensated to effectively reduce the circuit impedance and improve the transfer capability.
    - However, the subsynchronous resonance (SSR) vulnerability to both synchronous generators (i.e., gas and coal power plants) and inverter-based resources (wind, solar, and battery) must be assessed and mitigated.
  - 500-kV AC circuits provide better long-distance power transfer capability but will require more right-of-way and result in higher cost.
  - Low impedance 345-kV circuit technology has been developed in recent years and is assumed in this assessment for the developed system improvements.
    - It provides better transfer capability compared to typical 345-kV circuits.
    - It is expected to require less cost and right-of-way compared to 500-kV circuits.

Two Short-listed System Improvement Options





LRGV Reliability Assessment Results – With System Improvements

#	Base Case	Reliability Need Year	
		Existing System	With System Improvements
1	No Outages (Business as Usual, BAU)	2027	> 2040(1)
2	Outage of one 345-kV import circuit	Current(3)	> 2040(1)
3	Outage of two 345-kV import circuits	Current(3)	~ 2030(2)
4	Outage of two conventional plants in LRGV	Current(3)	~ 2030(2)
5	Very Low Wind Conditions	Current(3)	2027(2)

(1). Both Option 1 and 2 are estimated to improve the LRGV load serving capability up to 2040 assuming 2% annual load growth in LRGV (LRGV load forecast by 2030 and 2040 are 3.3 GW and 4 GW, respectively)
(2). Additional voltage support in LRGV may be required
(3). Reliability issues are identified based on the existing system conditions

Impact of Stability Constraints

- Based the results of this assessment, both Option 1 and 2 will improve existing 345-kV related GTCs in LRGV(1).
  - Valley Import GTC is estimated to increase by more than 1000 MW under normal condition (Business as Usual)
  - No stability constraint for NelsonSharpe_RioHondo GTC under normal condition
  - Both Valley Export and NorthEd_Lobo GTCs are improved to support up to 80% of total wind and solar generation capacity in the LRGV area (additional local voltage support may further increase the export limit)

(1). This assessment includes the most recent generation resources, including ~7 GW wind and solar, in the LRGV area that meet planning guide requirements to be modeled in the planning studies.

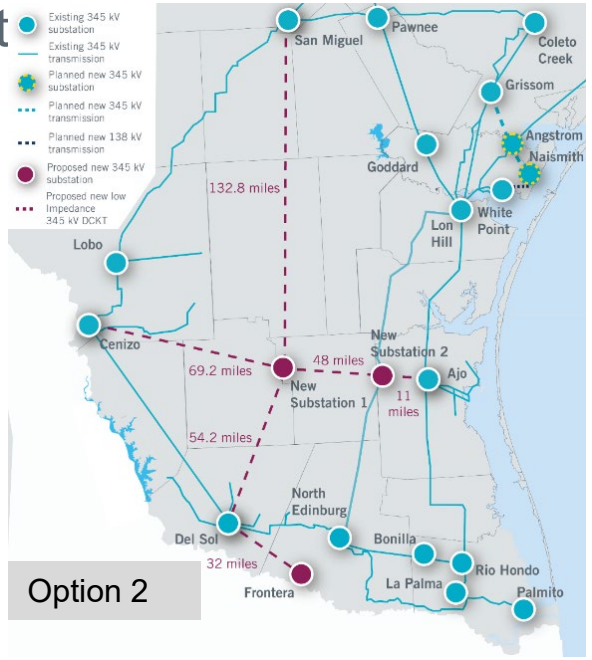
Comparison of System Improvement Concepts

Items	System Improvement	
	Option 1	Option 2
Estimated new 345-kV right of way (miles)	357	351
Estimated cost ($Billion)(1)	$1.34	$1.28
LRGV load serving capability (BAU)	> 2040(2)	> 2040(2)
Improve system resilience and operation flexibility	Yes	Yes
Improve stability constraints	Yes	Yes, Better(3)
Reduce SSR vulnerability	Yes	Yes, Better(3)
Reduce the impact of hurricane	Yes	Yes, Better(4)
Future load and generation integration	Yes	Yes

(1). Based on the estimates provided by TSPs and may be revised with further updated information from TSPs if applicable
(2). Both Option 1 and 2 are estimated to improve the LRGV load serving capability up to 2040 assuming 2% annual load growth in LRGV (LRGV load forecast by 2030 and 2040 are 3.3 GW and 4 GW, respectively)
(3). Option 2 provides one more circuit connected to the existing Lobo-North Edinburg 345-kV line compared to Option 1
(4). Option 2 is further away from costal area compared to Option 1

Conclusion

- Option 2 is the preferred long-term improvement option based on the following considerations:
  - Improve load serving capability in LRGV
  - Improve system resilience, including extreme weather and generation/transmission outages
  - Improve stability constraints in LRGV
  - Provide reliable long-term infrastructure in LRGV for future load and generation development
  - Minimize the construction impact to the existing system
  - Estimated cost: ~$1.28 Billion
  - Estimated new right of way: 351 miles
  - Anticipated implementation: by 2027



- Based on the actual load and generation growth, additional local system improvements within LRGV may be identified in the future planning assessments.

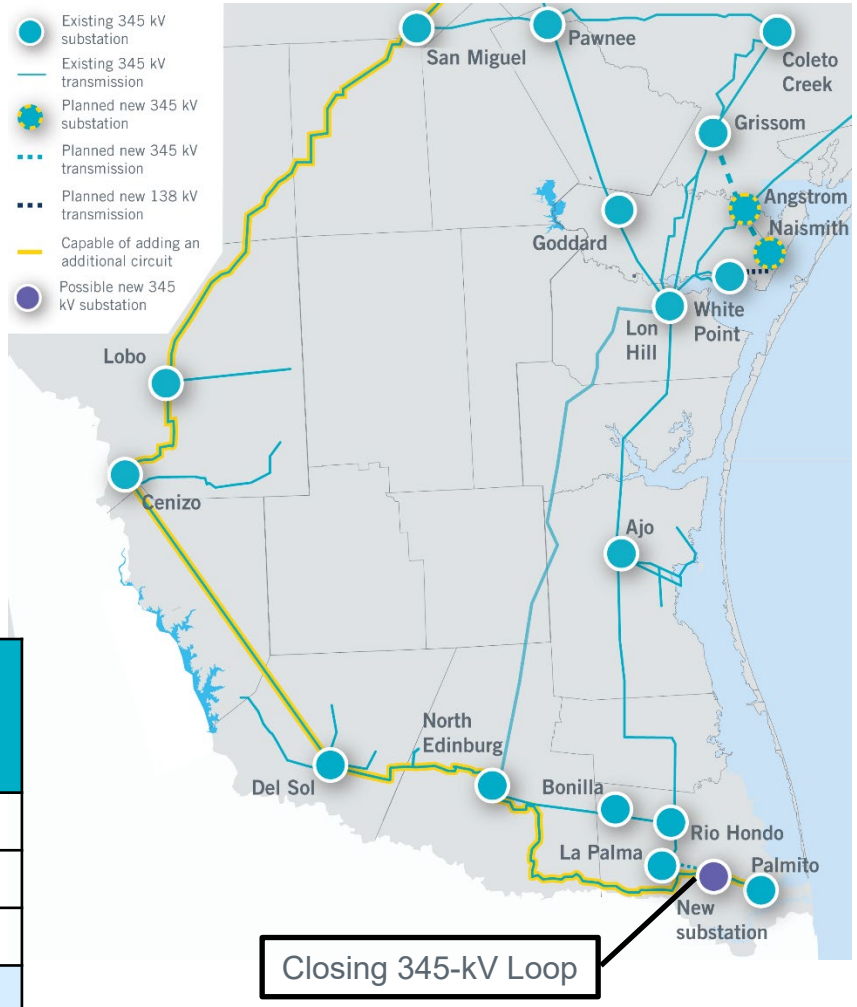
Next Steps

- The preferred option 2 is considered as a Tier 1 RPG project.
- Please provide comments to REGPLANGROUP@LISTS.ERCOT.COM by October 6, 2021
- Tentative Schedule
  - Provide a status update at future RPGs if needed
  - Seek for TAC review and BOD endorsement in 4Q, 2021

Other System Improvement Options - Require Limited or No New Right Of Way

- In addition to the two short-listed options, other options require limited or no new right of way were also evaluated.
  - Add 2nd circuit to the existing major 345-kV transmission lines if available
  - Closing 345-kV loop in LRGV: add ~7 miles 345-kV line from La Palma to a new tap location on the existing 345-kV line from North Edinburg to Palmito

Existing Double Circuit Capable 345-kV Line	Total circuit miles	2nd ckt addition availability (miles)
San Miguel - Lobo	105	105
Lobo-North Edinburg	155	94
North Edinburg-Palmito	95	95
Total	355	294



Other System Improvement Options -- Require Limited or No New Right Of Way

#	System Improvements	Reliability Need Year
		No Outages (BAU)(1)
0	None (Existing System)	2027
A	Closing the 345-kV Loop in LRGV	2028
B	Add 2nd ckt from San Miguel-Lobo-North Edinburg	2030
C	Add 2nd ckt from North Edinburg to Palmito	2030
A+B+C	Add 2nd ckt from San Miguel-Lobo-North Edinburg-Palmito	2033

(1). Assume 2% annual load growth in LRGV
(2). TSPs are in the process to review these options, including the cost and implementation estimates