



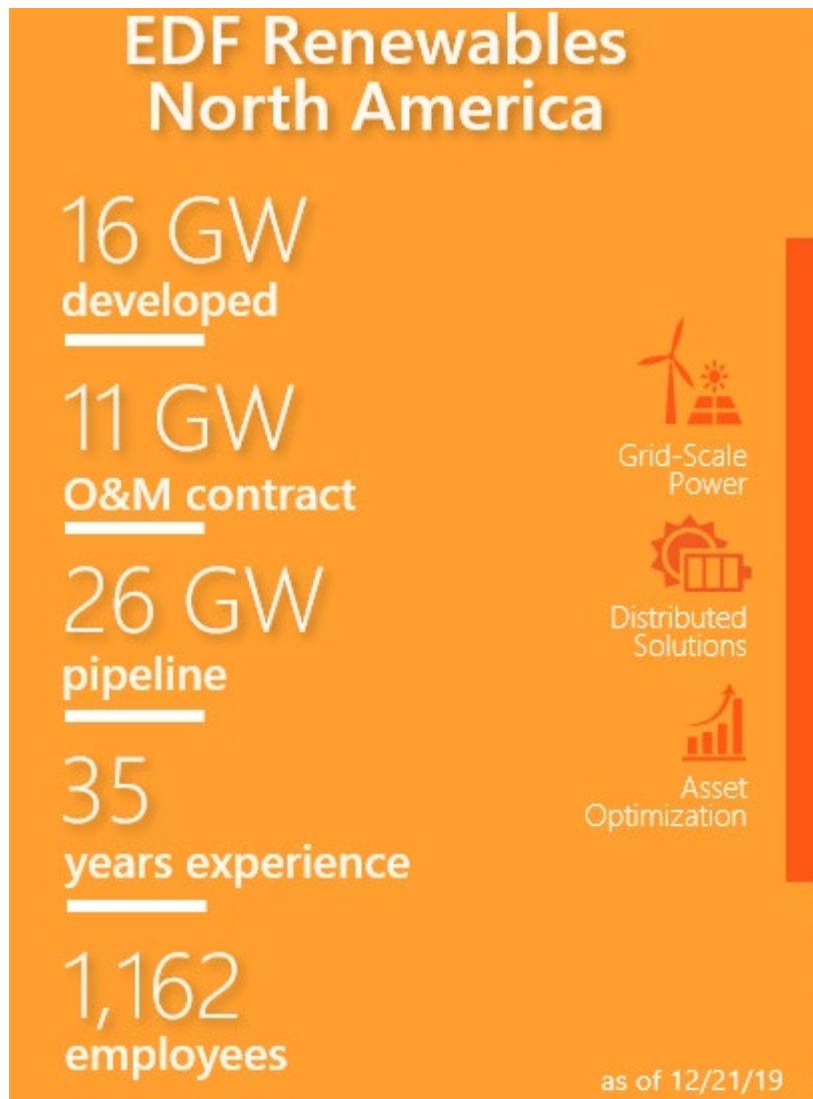
ERCOT Transmission Issues Workshop: The Need To Expand The Evaluation Criteria For GTC Exit Solutions

August 21st, 2020

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- Approximately 60 employees across operating sites and 20 office employees in Houston and Austin
- 9 operating wind projects totaling ~1.4 GW
- 2 wind projects under construction totaling 514 MW
- Development pipeline for 2021 – 2023+ includes 2.2 GW of solar and 1 GW of wind

EDFR's General Concerns on GTCs

- **West CREZ were designed and promoted to accommodate 18.5GW of new renewables**
- **Current and potential GTC developments (e.g. West Texas Export) have the potential to:**
 - Undo the benefits of the existing infrastructure: e.g. 345 kv lines with thermal capacity of 35GW potentially limited to 10.9GW, or 31% utilization
 - Cause financial harm: e.g. a West Texas Export GTC would impact the whole ERCOT West generating fleet (incl. thermal) in the West by depressing West zone LMPs
 - Cause discrimination and harm to generators that might not be responsible for stability issues
 - e.g. A West Texas region wide GTC challenges the principle that stability issues need to be effectively addressed by limiting the worst offenders
- **Lingering uncertainty, one step forward/two steps backwards approaches, and lack of a long-term plan to address stability concerns can only create sunk costs and slow down future renewable development**

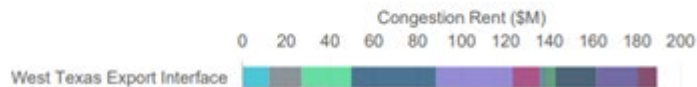
GTC Exit Solutions – Current Approach

- Stability reliability needs are addressed by implementing a GTC in the SCED engine: via economic means
- Identified GTC exit solutions need to meet **economic criteria** in ERCOT's annual Regional Transmission Process (RTP):
 - Looking up to 5-6 years into the future
 - Annual Production Cost (PC) savings need to exceed the first-year annual revenue requirement for the project (~14% of the estimated project cost)

Why Current Approach Is Insufficient?

- As identified by Brattle in its 2013 report with Recommendations for Enhancing ERCOT's Long-Term Transmission Planning Process:
 - ***"Current implementation of economic project process will miss beneficial projects by considering only the first year of a project"***
- ↑ - **Benefits of transmission projects tend to increase over time:** first year production cost savings are generally lower than their levelized value
- ↓ - **Transmission project costs tend to decrease over time as the assets are depreciated:** first year project costs are higher than the levelized costs

2020 RTP: Top Constraints (2022)



2020 RTP: Top Constraints (2025)



Source: 2020 Preliminary LTSA Results

(Congestion rent for West Texas Export Interface in 2020 RTP Preliminary Results: while production cost savings using an upgrade case have not been assessed and reported, higher congestion rents in the out year suggest higher production cost savings for West Texas between year 2022 and year 2025; what are the cost savings further out into the future like 2030)

Why Current Approach Is Insufficient?

- **Economic Analysis of Benefits is done on a too limited window:**
 - ERCOT's current Long-Term system assessment is informational only
 - It assesses "potential needs" of ERCOT's extra high voltage system over a 10-15-year horizon
 - Current RTP's up to 6-year horizon means only reliability needs are identified while economic projects are only looked at from the standpoint of their benefits up to 5-6 years out:
 - If the economic window is expanded, an economic project could replace or defer the need for reliability projects if the economic project provides higher production cost benefits on the long run
 - By comparison, PJM, MISO and SPP look at multiple years into the future and multiple futures/scenarios

Why Current Approach Is Insufficient

Economic Upgrades can provide additional benefits as identified by Brattle in the 2013 study:

- **Additional Production Cost Savings**

- Reduced Reliability Must Run costs and conditions
- Mitigation of extreme events and system contingencies
- Reduced impact of forced generation and transmission outages

- **Reliability and Resource Adequacy Benefits:**

- Reduced loss of load probability
- Reduced planning reserve margin
- Increased reliability and operational flexibility
- Improving dynamic performance and grid stability during extreme events
- Avoided or deferred reliability projects (e.g. some economic projects could be advanced if they replace the need for reliability upgrades on the

short term)

- Improved utilization of transmission corridors
- Improving operating practices
- Increased system robustness
- Replace aging infrastructure or provide for an efficient use of existing rights-of-way
- Synergies with future transmission projects

- **Employment and Economic Stimulus Benefits:**

- Increased employment, economic activity and tax revenues

- **Market Benefits:**

- Increased competition and market liquidity
- Mitigation of market power
- Reduced price volatility

- **Environmental Benefits:**

- Reduced emissions of air pollutants

Expanding Benefits Beyond PC

- **Reduced planning reserve margin:**

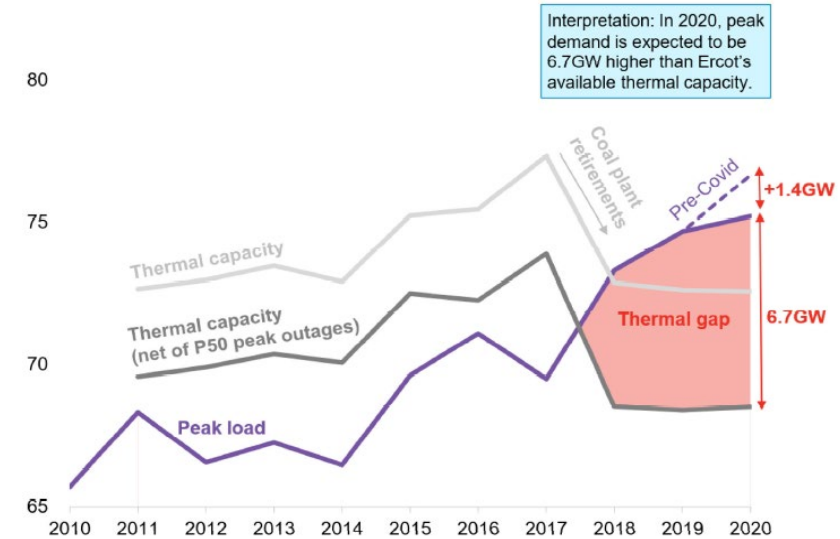
- Wind and solar make up a substantial amount of ERCOT's planned generator capacity, but the GTC risks threaten their development in the West zone.
- If less renewable buildout materializes in the future due to higher transmission cost risk, impact on reserve margins could be severe: e.g. 3-4.7% drop if 50% less West renewable projects than projected in the May 2020 CDR

ERCOT Reserve Margin Outlook Using May 2020 CDR						
Percent of Wind & Solar MW in the West & Panhandle zones with IA signed assumed to reach COD	2021	2022	2023	2024	2025	
100%	17.4%	20.7%	19.0%	16.9%	15.1%	Reference case - May 2020 CDR
75%	15.9%	18.5%	16.7%	14.6%	12.9%	
Delta from Base	-1.5%	-2.2%	-2.3%	-2.3%	-2.2%	
50%	14.4%	16.2%	14.3%	12.3%	10.6%	
Delta from Base	-3.0%	-4.5%	-4.7%	-4.6%	-4.5%	
25%	12.9%	14.0%	12.0%	10.0%	8.4%	
Delta from Base	-4.5%	-6.7%	-7.0%	-6.9%	-6.7%	
0%	11.4%	11.8%	9.7%	7.8%	6.1%	
Delta from Base	-6.0%	-8.9%	-9.3%	-9.1%	-9.0%	2020 ERCOT CTC Workshop - 10

Expanding Benefits Beyond PC

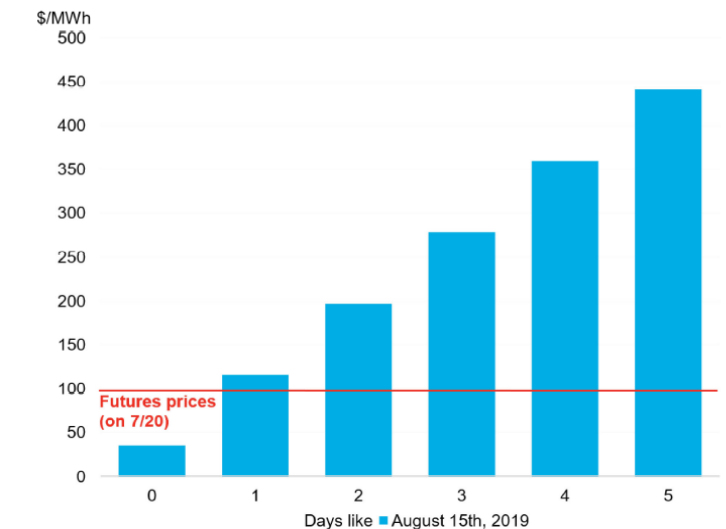
- **Increased Scarcity Conditions:** lower reserve margins and lower renewable output can increase the ORDC adder risk
 - For instance, a report from Bloomberg New Energy Finance (BNEF) dated July 22, 2020 demonstrates that it only takes a few high-priced intervals to increase a month's average price
 - ERCOT cannot meet peak demand by relying on conventional power alone with BNEF estimating that 2020 peak demand is expected to be 6.7 GW higher than ERCOT's available thermal capacity
 - The ORDC adder is in play when reserves are low – this can happen for instance when demand is high and wind/solar output is not optimized

Ercot summer thermal capacity and peak load
Gigawatts



It would take just one extreme day to blow past current futures prices

August on-peak prices based on occurrence of extreme pricing days



Source: BNEF, Ercot

Note: Ercot on-peak hours are non-holiday weekdays, 6-10pm.

Expanding Benefits Beyond PC

- **Increased employment, economic activity and tax revenues**

Economic benefits lost when a solar project isn't constructed, 300MWac example case:

- **Property Taxes** – County, Hospital, School District including Maintenance & Operations (M&O) and Interest & Sinking (I&S) payments totaling **~\$49.1 million** over 35-year project life
- **Landowner Payments** – rents totaling **~\$31.9 million**
- **Job Creation** – **~400** full time employees during construction phase with an average wage of **~\$52,500/yr.** 1-2 full time employees during operations with a minimum annual wage of **~\$44,000/yr**
- **Capital Investment** – estimated total project cost of **>\$300 million**

Potential Economic Losses If West Solar/Wind Projects Are Not Built			
2023 (cumulative)	25% of May CDR Capacity	50% of May CDR	75% of May CDR
Wind	1984 MW	3969 MW	5953 MW
Solar	2006 MW	4012 MW	6018 MW
Estimated Total Local Economic Loss	\$1,667mm (wind)	\$3,334mm (wind)	\$5,000mm (wind)
	\$746mm (solar)	\$1,492mm (solar)	\$2,238mm (solar)
	\$2,413,000,000	\$4,826,000,000	\$7,238,000,000

Additional Considerations

- **Use of long-term scenarios and multiple futures** (e.g. LTSA for approving upgrades)
- **Consider uncertainties:** extreme weather, extreme events (e.g. major transmission or generation outages), extreme low/high wind generation
- **Consider specific outage conditions:** an assessment only during “normal” system conditions or not tailored to the GTC risk profile will under-estimate the range of full benefits, as GTC limits can be considerably lower under specific outage conditions

GTC Limits in N-0 and N-1 Conditions

	GTC1	GTC2
Base	4178	3403
Worst N-1	2393	2185
Average N-1	3600	2555

-> Assess range of benefits based on MORE than ONE 5-year out/normal conditions

Final Thoughts and Recommendations

- **High risk cost environment threatens renewable development**, and projects' financeability and economic viability.
- **It is imperative for ERCOT to provide certainty and a long-term plan to address stability concerns:**
 - Identify potential wires and non wire solutions
 - Transmission projects require at least 5-10 years to plan, develop and build
- **Follow through with top Brattle recommendations to enhance the transmission planning process:**
 - Combine annual RTP with the long-term assessment for GTC solutions; assess economic solutions on both short and long term; use levelized metrics for costs and benefits.
 - Expand the range of benefits – identify top categories applicable to solving the stability issues and develop corresponding metrics via future stakeholders-ERCOT workshops.