Pattern

Transitioning the World to Renewable Energy

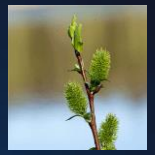
ERCOT GTC Workshop

August 21st 2020

Pattern

Global Portfolio and Company Values

June 2020



Environment

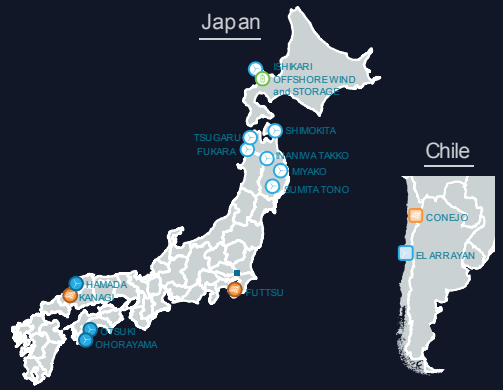
We aim to exceed industry standards in mitigating environmental impacts and advancing best practices.

Community

We participate in and contribute to our local project communities.

Safety

Our top priority is protecting the safety of the public, our employees, and everyone who works with us.



Projects and Facilities

	WIND	SOLAR	STORAGE	T-LINE
OPERATIONAL	●	●	●	●
DEVELOPMENT	●	●	●	●
ASSET SOLD TO THIRD PARTY	●	●	●	●

Corporate Offices
- Headquarters
- Office

Pattern Energy

Pattern Energy is one of the world's largest privately-owned developers and operators of wind, solar, transmission, and energy storage projects. Its operational portfolio includes 28 renewable energy facilities that use proven, best-in-class technology with an operating capacity of 4.4 GW in the United States, Canada and Japan. Pattern Energy is guided by a long-term commitment to serve customers, protect the environment, and strengthen communities.

Projects shown are only those under construction or in advanced public stages, and maps do not represent the full extent of Pattern Energy's project pipeline. Pattern Energy retains whole or partial ownership of most of its operational facilities. Some transmission projects including Western Spirit and SunZia are owned by third-party development partners. Maps are for illustration purposes only, countries are not drawn comparatively to scale.

Major GTCs in ERCOT

- ERCOT has several GTCs, some local (impacting one generator) and some regional wide (impacting a cluster of generation)
- Examples of GTCs that impact clusters
  - Panhandle
  - South Texas
  - West to Central
- Impacts to asset owners , future development and grid
  - Leads to unclear scenario for development, leads to uncertainty.
  - **Everchanging landscape** – new generation is proposed to be added to the Grid, full FIS studies are not available on the secure portion of the MIS, which means very little visibility to Resource Entities to assess impacts of new generation build out
  - **QSA Studies** -It is not till the QSA that someone is able to decipher if a new GTC is going be enforced. Further the QSA studies only look at a single snapshot. As QSA studies do not go into detail it is difficult to assess the impact of curtailment.
    - Timing of the QSA study does not help comes late into the process.
  - Many times Resource Entities have to frequently look for refresh of the respective GTC documents, some times GTCs are changed with a notification that does not give enough time to even assess the change. e.g. Panhandle GTC document went through couple of revisions within a month.
  - Non availability of Dynamic Study Cases leads to Resource Entities: means no analyses can be performed by any other entity.

Degradation Example of GTC

- Panhandle
  - Panhandle has about 4400MWs behind the GTC
  - It is no secret that the Panhandle GTC has eroded over time and this has happened not just because of build in Panhandle but in recent times mostly because of build outside of it.
    - it makes the case that the generation in Panhandle is being penalized to accommodate generation outside of it.
    - we have seen this GTC drop under system intact conditions from 3800 to 3400.
  - With ERCOT implementing GTCs at 95% of the calculated ratings, the new level represents the a level of export of about 3200MWs and translates to possible 1200MWs of renewable curtailment within the pocket.
- South
  - Similarly – for south we have observed that GTCs have degraded by over 100 MWs over specific revisions.

Aspects from ERCOT that help

- **The System Needs and Constraints Report** – details what to expect in the long term works really well on what to expect on the transmission system
- **Dynamic Models-**ERCOT has worked with the stakeholders to improve modeling representation for generation fleet, the way we see is that the benefit of this change is yet to be quantified
- **System studies for GTCs (e.g. Panhandle, West to Central)**
  - Timely posting of these studies is very informative,
  - however we would like these studies
    - to not only demonstrate the reliability impact,
    - also include potential economic impact including renewable curtailment and identify implementable solutions to the issues.
- Ability of anyone to propose an improvement project e.g. Frio Co. project for consideration for improving transmission conditions.
  - For us external parties this is easily determined when the constraints and impacts are local. However, it becomes very difficult when there is a regional impact.

Aspects where we like to seek improvement

- **Economic Planning** – we would like to urge ERCOT to discuss in detail about SCED assumptions including how ERCOT bids in the renewable generation in it's long term assessment
  - Possibly ease or revise the C/B calculation to enable new transmission buildout, especially that solves the generation cluster issues.
  - Some metrics may include renewable curtailment (MWh), congestion rent etc. into these calculations.
  - If studies are performed reflective of typical bidding behavior it can be observed that the congestion rent collected over a period of time may be more than the actual upgrade itself
    - As a note – about $430M in congestion rent has been accumulated on the Panhandle GTC from 2016 to June 2020 (Sourced from ERCOT IMM Reports and ROS postings)
- **Lubbock Integration** – a detailed GTC document for Panhandle representing various outage conditions is yet to be made available
  - This directly plays into the CRR auction as we do not know what limits will be used for these auctions
- **GTC Variability** – we have witnessed an uptick on these changes especially for Panhandle where the limits have a very wide range. It will be helpful if ERCOT can provide details for GTC especially under outage conditions.
  - Clear communication about commencement of GTC studies and potentially impacted generation pockets
- ERCOT only has obligation to identify an exit strategy for GTC, we would like to see more follow through on this from ERCOT and see how this exit strategy is implemented.
- Documentation on how shift factors for interfaces are calculated.

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