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Comments regarding TX PUC Project 54335, ERCOT Reform

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These comments propose an alternate approach to the discussion around reliability capacity markets and the current practice of procuring large amounts of Non-Spin Ancillary Services.

While these current activities will improve the system and resource reliability, they may not produce the right kind of capacity needed to deal with the large real time, intrahour, swings in net load. This volatility will get much more severe as more renewables are added and the heavy inertia fossil resources are retired.

An alternate approach would be to implement changes to allow a greater procurement of synchronized Responsive Reserve Service (RRS). RRS is more valuable than Non-Spin as the resource would be providing continuous frequency and voltage support and can respond faster to system upsets. For the same level of system reliability, a lesser amount of RRS capacity reserves would be needed, compared to Non-Spin reserves.

However, there's 2 obstacles in the current market for considering more RRS:

1. RRS is relatively costly, inefficient and not-so green.

   Currently RRS is provided by mostly gas fired resources, like combined cycle gas turbines. These gas fired units need to be operating – burning gas – and at a less efficient part load in order to have the load pickup headroom.

2. ERCOT does not procure extra RRS because, absent a unit trip, that service can only be deployed during emergency conditions (EEA).

Our alternate approach would be to modify the characteristics, through storage hybridizing, of the existing Quick Start combustion turbines, enabling them to more economically provide RRS, and without burning gas and its attendant emissions/GHG. With these improvements, there would a good reason to change the existing protocol to utilize the more operationally-valuable RRS.

If the Quick Start resources were hybridized and used for RRS, the other gas resources above could be run at their most efficient full load, or perhaps not run at all.

Proposed modifications:

There are approx. 50 existing Quick Start peaking combustion turbines in ERCOT (GE LM6000s, nominal 50 MW each). By hybridizing each with a relatively small (~10 MW) battery/inverter, their operating flexibility and economics would dramatically improve. The battery system would be tightly integrated into the existing controls for a single resource that can provide the GT's full 50 MW capacity as synchronized Responsive Reserve Service (RRS), but without burning gas and with no emissions/GHG.

This approach is essentially a re-purpose of existing gas-fired resources - from delivering on-peak energy, to providing more valuable Ancillary Services that better improve grid resiliency and reliability.

There's presently five hybrid LM6000s operating in CAISO and Alberta that provide spinning reserve capacity. After hybridizing, the unit's gas consumption and emissions were reduced over 60%, along with further system gas & emissions savings by not having to use other resources for spinning reserve. GE and Wellhead Electric co-developed this hybrid technology in 2016 for two of Southern California Edison's peaking combustion turbines, see attached and other reference links.

If ERCOT's ~50 quick start combustion turbines were hybridized, approx. 2400 MW of essentially no-variable-cost, no-gas, RRS would be available. The hybrid storage approach is unique in that 10 MW battery leverages the full 50 MW unit capacity for RRS capacity.

The cost of hybridizing these resources could be significantly less that the current premium in procuring Non-Spin. The hybrid investment could be recovered by the owners thru a similar process to that of Peaker Net Margin used for Energy.

We are recommending that ERCOT evaluate the costs and benefits of:

1. Adding an additional no-gas Hybrid RRS capacity service that would enable storage hybrid Quick Start resources to participate

2. The Hybrid RRS service should be capable of reaching its full capacity in 5 minutes.

   In conjunction, in RRS-PFR operation, the associated Hybrid ramp rate would increase from the normal ~25%/min to the LM6000's max ramp rate of ~50 MW min.

   Also in conjunction, the Hybrid RRS would use the LM6000's short duration, fast response, peak capacity rating - 2 MW in 2.2 sec, for severe frequency excursions.

3. Evaluate the benefits of a dual automatic response, that would provide the normal Primary Frequency Response (RRS-PFR) during milder frequency excursions, but would change the response, under more severe frequency dips, to deliver the battery's full capacity in 15 cycles – essentially combining RRS-PFR and RRS-FFR.

4. Changing the protocol to utilize the faster responding Hybrid RRS with real time frequency and voltage support, before a large unit trip or EEA would occur

With these improvements, the existing Quick Start combustion turbines can be re-purposed and provide these important benefits to ERCOT and its ratepayers:

- The Hybrid RRS service would be to deliver a much faster response – less reserve capacity is needed if it's quicker.
- The associated lower gas consumption, for both the unit and the system, can make a significant contribution toward shifting gas use toward only severe emergency duty.
- Reduced NOx, CO & GHG emissions
- Improve adapting to the changing market as more renewables are added and the heavy inertia fossil resources are retired

Hybrid combustion turbine reference resources:

Supplemental_Info_
EGT_Brochure_Wellh

Hybridizing Gas
Turbine with Battery

https://www.epri.com/research/products/000000003002022317