G-PST/ESIG Webinar Series: Cloudy with a Chance of Blackouts or Full of Hot Air?	
Question	**Answer**
Do you also consider forecasting future droughts that can affect Hydropower?	Yes. In ERCOT there is very little hydro, so we did not vary hydro years. However in systems with significant hydro capacity we include a similarly long range of the historical record to vary monthly, seasonal, and annual hydro levels. However, it is less important to keep the correlation to wind, solar, and load because hydro typically varies by season or annually, and is not as correlated on an hourly or daily basis to other power system properties.
Does your RA analysis incorporate storm-based infrastructure damage and load loss that can occur during extreme weather (high winds, wet snow/ice loading)?	No. This is where I would draw the line between resilience and resource adequacy. The former includes both transmission and distribution, and considers mitigation like tree trimming, grid hardening, stronger poles, etc. Resource adequacy should, however, including icing impacts on wind availability, snow cover on solar, etc. because it directly affects the amount of capacity that would be needed.
How did ERCOT handle BTM PV in the case study load forecast.	In this case study it was embedded in the load due to the relatively low amounts of BTM PV on the system currently. When we conduct this analysis in other regions, like California and Hawaii, we always break the BTM PV out as a supply-side resource and model the gross system load. This allows us to capture the weather-dependent resource availability of the BTM solar that is correlated with utility-scale solar resources.
is ERCOT's proposed frequency, magnitude, duration metrics the panacea of resource adequacy?	It's certainly a step in the right direction. I believe it is useful to move past a single, average loss of load metric and characterize individual loss of load events.
Do you climate adjust 1980 weather data to reflect 2030 climate?	In this case study no, but we have introduced climate trends in other studies. That will, on average, mitigate some of the cold weather impacts. However the changes to resource adequacy driven by the changing resource mix and electrification on the demand side are significantly larger that the impacts of climate change.
Was the EUE plot on slides 11 over the whole year rather than just summer? Surprised to see all that loss load in 2030 where the risk was all in winter.	Yes, that is over the entire year. The risk in 2030 is spread across the day for two reasons. 1) the system is energy limited, not capacity limited, and 2) winter cold snaps tend to increase load across the entire day, not just evening peak load periods.
Do you 2030 simulations take into account electrification of heating and vehicles? Does that contribute to the migration of outage risks to the winter ?	It is embedded to a small extent in the load forecast, but the load did not include high levels of electrification and it was developed prior to IRA incentives on EVs and building electrification so it was a modest change.

What was the model used, including spatial and temporal resolution? Thanks!	The model was PLEXOS, and included both spatial and temporal resolution. On the spatial side, we included five zones across ERCOT (Panhandle, West, North, Soth, Houston) and included transmission interfaces between zones. We also had location specific wind, solar, and thermal outages based on local weather. Temporally we ran 8760 hour simulations across all 40 weather years for a minimum of 5.2M sequential hourly simulations per case.
It was noted that summertime risk tends to peak in the evening as people turn on their AC's late in the day. but emerging winter risk peaks last longer (cont) (edited)	Yes, on a relative basis, the winter cold snaps see the entire load increase throughout the winter cold snap event. Summer heat waves tend to see a more pronounced peak and off peak demand period (lower load factor).
RE winter peaks. Why is this? What is the evidence for people having different behavior patterns for heating than they do for cooling?	I am not sure, but one possibility is the efficiency. Most heating in the South is electric resistance heating which is inefficient because it is designed to run sparingly.
What is the source of the data in Slide 7? Is that based out of utilities or publicly available data?	It was based off of the ERCOT Long Term System Assessment from 2020, with some adjustments (additional battery storage, etc.)
There are many other types of common-causes/dependent failures that lead to power outages including major blackouts besides weather.	Natural gas pipeline constraints and cyber attacks could pose a common-cause risk.
Was increasing summer temp due to climate change taken into account in the ERCOT case study?	No. Climate change impacts were not evaluated. See answer above.
Please explain the relationship between solar and wind production versus temperature.	Other experts would have a better answer for this. It depends. There is some correlation to temperature, but it is also driven by many other meteorological factors.
Would realistic stochastic weather datasets designed to capture extreme events (e.g. cold snaps) not included in the historical obs be helpful?	Yes, absolutely. This would fall into the category of evaluating "black swan events" and not necessarily assigning a probability, but testing what if scenarios so that power system planners and the meteorological community can determine whether it is a credible risk.
with generation buildout in 2026, the LOLE events are happening both S&W. 2023 and 2030 makes sense the shift. explain why 2026 showing LOLE events both in s/w	The resource mix is half-way between, so it is both capacity and energy limited.
What about demand side solutions - e.g. replacing resistance heat with cold weather rated heat pumps? Is that part of the solution set?	Certainly, as is better insulation and anything that can improve energy efficiency specifically during winter cold snaps.
If there was a market product to incent perfect generator reliability (i.e. 0 FOR) would that differ, in reliability terms from a service that incents ramping?	Yes. You could have a resource with a very slow ramp rate, but if it is available then it would be very valuable for resource adequacy, but not for other ancillary services.