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Resiliency of Electric Power Markets and Systems during Extreme Weather Events

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As we experience more extreme weather events, are we learning from these events to improve our systems and infrastructure to be able to withstand future ones? Will we be able to minimize the impact of these devastating extreme weather events?

The power systems and markets in the US are designed with the expectation that the reserve margin results in loss of load probability of one day in 10 years. In other words, we expect to not have power one day every ten years. Otherwise, for 100% reliability, the cost of delivering power to consumers could be prohibitively high.

The recent events in Texas (ERCOT) raise many questions, and will drive significant changes in the electric power industry and markets (technology and weatherization, market design and policy, operational rules and requirements, etc..) with significant financial and maybe legal implications.

Is the criterion of one day loss of load in 10 years acceptable to society given our increased dependency on electricity?

If ERCOT and Texas followed the recommendations from FERC/NERC after 2011 on winterization of generation units, forecast of generation units output during anticipated severe weather events, dual fuel capabilities, etc…, would they have avoided this problem today? How many of these recommendations were implemented, if any?

https://www.nerc.com/pa/rrm/ea/ColdWeatherTrainingMaterials/FERC%20NERC%20Findings%20and%20Recommendations.pdf

How much would be the cost of following these FERC/NERC recommendations compared to the societal cost of the recent interruptions? Is the true value of unmet energy really at $9000/MWh for ERCOT consumers, and can consumers respond to it?

Could have ERCOT done anything better especially ex-ante operationally when they saw the cold weather coming?

Would Texas have benefited from a stronger interconnections with neighboring systems? How much interconnection capacity to avoid the interruptions?

In the northeast, we are used to cold weather and well prepared (equipment is winterized and space heating is mostly natural gas and fuel oil). In Texas, they are not well prepared (Why? Very low probability event) and heating is mostly electric (high demand) and with equipment freezing they lost all types of power generation (renewables as well as thermal).

After the Sandy storm in the Northeast in 2012 many utilities responded by improving their infrastructure to handle these kinds of storms, by hardening transmission and distribution systems and raising substations and power plants above flood levels, etc…

After the polar vortex in 2014, the Northeast ISOs changed the performance rules for capacity market and incentivized generation units to increase their availability during very cold weather by either firm up natural gas delivery (with additional natural gas pipeline capacity) or dual fuel capability for generation units.