

DATE: May 24, 2019
TO: Fuel Security Senior Task Force
FROM: IMM
SUBJECT: Risks and Scenarios

The IMM has identified the following risks and scenarios for evaluation by PJM under the responsibilities of Fuel Security Senior Task Force to quantify risk and energy security.

Scenarios and Risks

Storms and Floods

Scenarios that threaten energy security for the PJM region include hurricanes or other severe storms, which may cause flooding. The likelihood of severe storms and flooding is increasing with climate change. High winds and flooding during storms have created a need for PJM nuclear plants to shut down.¹

Flooding has a variety of impacts to steam plants due to their reliance on water for cooling and proximity to bodies of water. Flooding at a site may create a need to shut down a power plant or may disrupt fuel transportation.²

Associated Risks:

- Nuclear plant shut down
- Steam plant shut down
- Wind turbine trips
- Age related performance degradation, creating increased vulnerability
- Common mode failures
- Wet coal
- Rail or barge transportation disruptions
- Transmission outages

¹ See, for example, NERC, *Hurricane Sandy Event Analysis Report* (January 2014), <https://www.nerc.com/pa/rrm/ea/Oct2012HurricaneSandyEvntAnlyssRprtDL/Hurricane_Sandy_EAR_20140312_Final.pdf>, at p. 21-23.

² See, for example, Omaha Public Power District, *Flash: Historic Flood* (November/December 2011), <<https://stormandoutage.com/wp-content/uploads/2014/10/Flash-Flood-issue-only1.pdf>>.

Extreme Heat

Prolonged extreme heat may cause drought and/or elevated water temperatures. The likelihood of extreme heat is increasing with climate change. The steam power plants in PJM, including plants fueled by nuclear, coal, and gas, rely on cooling water. Water conditions may impact the ability of a steam plant to function. High water temperatures may affect a plant's access to cooling water or ability to release water into a river or lake.³ Drought may limit access to cooling water.⁴

Associated Risks:

- Nuclear plant shut down
- Steam plant shut down
- Age related performance degradation, creating increased vulnerability
- Common mode failures
- High load

Extreme Cold

PJM has completed a study examining cold weather scenarios. To the extent that PJM's previous study did not address all associated risks, the cold weather scenarios should be further evaluated.

Associated Risks:

- Nuclear plant shut down due to freezing
- Steam plant shut down due to freezing
- Wet or frozen coal
- Age related performance degradation, creating increased vulnerability
- Wind turbine blade icing
- Frozen road, rail, or river conditions disrupting fuel transportation
- Limits on natural gas availability due to gas heating load

³ See Kanter, James, "Climate change puts nuclear energy into hot water," *New York Times* (May 20, 2007), < <https://www.nytimes.com/2007/05/20/health/20iht-nuke.1.5788480.html>>.

⁴ See Duke University, "Droughts could hit aging power plants hard," *Science Daily* (March 26, 2019), < <https://www.sciencedaily.com/releases/2019/03/190326160532.htm>>.