Weathering the Storm: Mapping the FEMA National Risk Index to Utility Service Territories

Prepared by:

Tom Dolezal, Senior Consultant
Joshua Nowak, Vice President

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WEATHERING THE STORM: MAPPING THE FEMA NATIONAL RISK INDEX TO UTILITY SERVICE TERRITORIES

As climate volatility increases, utility companies face growing challenges in managing weather-related risks. From hurricanes to wildfires, these events not only disrupt operations but also impact financial performance. The frequency and intensity of these events are continuing to increase; Climate.gov reports that 2024 had the second most number of climate disasters that caused over $1 billion in damages, trailing only 2023.[1]

This white paper describes a practical approach to map the Federal Emergency Management Agency ("FEMA") National Risk Index ("NRI") to utility service territories, enabling better assessment of weather risk and its implications for utilities and customers. The goal is to provide regulators and utility professionals with a data-driven framework to better understand the weather risk that impacts utility service territories and to inform regulatory outcomes that more accurately reflect that risk. A specific application to risk analysis supporting a return on equity ("ROE") determination is presented.

Tom Dolezal
Senior Consultant
tdolezal@ceadvisors.com
ceadvisors.com

Joshua Nowak
Vice President
jnowak@ceadvisors.com
ceadvisors.com

FEMA National Risk Index

The FEMA NRI is a publicly available comprehensive dataset that evaluates the relative risk of natural hazards across counties in the United States.[2] It includes:

- Eighteen different hazard types, as shown in Figure 1 below:

Figure 1: FEMA NRI Hazard Types[3]

NATIONAL RISK INDEX HAZARD TYPES			
1. Avalanche	6. Hail	11. Lightning	16. Volcanic Activity
2. Coastal Flooding	7. Heat Wave	12. Riverine Flooding	17. Wildfire
3. Cold Wave	8. Hurricane	13. Strong Wind	18. Winter Weather
4. Drought	9. Ice Storm	14. Tornado	
5. Earthquake	10. Landslide	15. Tsunami	

- Risk Scores: Indices of Risk Value, between 0 and 100, that are calculated for each of the 18 different hazard types and in aggregate. Risk Values are calculated based on Expected Annual Loss ("EAL") and a Community Risk Factor ("CRF").[4]

$$Risk\ Value = EAL \times CRF \quad [1]$$

where:

$$CRF = f((Social\ Vulnerability)/(Community\ Resilience)) \quad [2]$$

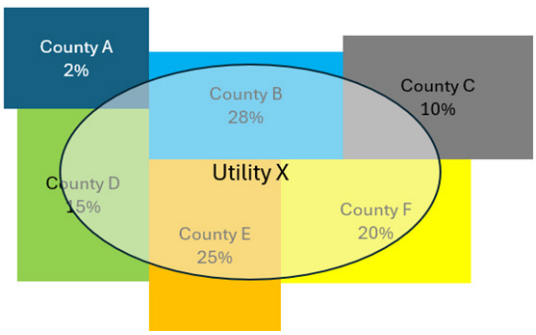
- Expected Annual Loss: Expected economic loss estimates from hazard events.[5]
- Social Vulnerability and Community Resilience: Metrics that contextualize the susceptibility of social groups to the impacts of hazards and the ability of a community to prepare for, withstand, and recover from a hazard.[6]

These Risk Scores are calculated at the county level and can be aligned with utility service territories using county Federal Information Processing Standards ("FIPS") codes.

Mapping the FEMA NRI to Utility Service Territories

To unlock the value of the FEMA NRI for utilities, it is essential to map it to the respective service territories. Independent of FEMA, S&P Global Market Intelligence used Geographic Information System ("GIS") technology to map utility service territories to counties served, creating a proprietary data set that associates county-level FEMA data with utility service areas.[7] This is illustrated in Figure 2 below.

Figure 2: Illustrative Utility/County Overlay



When combined with the FEMA NRI county-level Risk Scores, this creates a weighted average of the FEMA NRI for the utility, as shown in Figure 3 below.

Figure 3: Illustrative Risk Score Calculation for Utility X

County	County Weight	Risk Score	Weighted Risk Score
County A	2%	50	1.00
County B	28%	40	11.20
County C	10%	60	6.00
County D	15%	55	8.25
County E	25%	90	22.50
County F	20%	65	13.00
Utility X	**100%**		**61.95**

Application in ROE Analyses

An effective demonstration of the application of the utility FEMA NRI is in the determination of a fair and reasonable ROE for regulated utilities. Utility regulators establish ROEs for utilities based on the consideration of expert evidence that most often includes analyses of proxy group utilities and relative risk assessments. Risk comparisons between utilities is an important factor that regulators consider in setting a just and reasonable ROE for a utility; higher risk equates to a higher cost of equity, all else equal. Weather events have the potential to disrupt service, require higher operating costs, and potentially cause utilities to incur liabilities. Weather risk to utilities had traditionally been analyzed with qualitative approaches; the FEMA NRI presents an opportunity to enhance this analysis by using a more sophisticated quantitative approach. Specifically, the FEMA NRI for the subject utility can be compared to the FEMA NRI for each utility subsidiary owned by the proxy group holding companies to assess relative weather risk. This is illustrated in Figure 4 below. The conclusion in this illustrative example is that Utility X's service territory has a Risk Score of 61.95, which is 13 percent higher than the proxy group's average Risk Score of 55. For Utility X, the data indicates greater weather-related risk, and consequently, a higher cost of equity, all else equal.

Figure 4: llustrative Comparison of Utility X to the Proxy Group

Utility	Weighted Risk Score
Proxy Utility A	35.00
Proxy Utility B	95.00
Proxy Utility C	50.00
Proxy Utility D	20.00
Proxy Utility E	75.00
Proxy Utility Average	**55.00**
Utility X	**61.95**
Utility X vs. Proxy Group	**13%**

Conclusion

Mapping the FEMA NRI to utility service territories offers a powerful way to understand the weather-related risks of a utility and compare that weather risk to its peers. It is a quantitative tool that could potentially be used to identify operational and business risk for utilities and outage exposure for customers. Regulatory applications potentially include: business risk and cost of capital estimation, sizing weather-related safeguards such as storm-hardening infrastructure, and rate riders for storm cost recovery.

Endnotes

1 Smith, Adam B. "2024: An active year of U.S. billion-dollar weather and climate disasters." NOAA Climate.gov, 10 Jan. 2025, https://www.climate.gov/news-features/blogs/beyond-data/2024-active-year-us-billion-dollar-weather-and-climate-disasters.
2 For more detail on the FEMA NRI, see https://www.fema.gov/sites/default/files/documents/fema_national-risk-index_technical-documentation.pdf.
3 *Id.*, at Section 2.1.
4 *Id.*, at Section 3.1.
5 *Id.*, at Section 4.4.
6 *Id.*, at Sections 4.1 and 4.2.
7 S&P Global Market Intelligence, data prepared for Concentric Energy Advisors, Inc. Percentage of utility that each county covers is based on square miles.