**Comments by Jupiter Intelligence
in Response to the U.S. Department of Energy's
Request for Information
on Formula Grants to States and Indian Tribes for Preventing Outages and Enhancing the
Resilience of the Electric Grid
June 2, 2022**

Jupiter Intelligence (Jupiter) appreciates the opportunity to submit these comments in response to the U.S. Department of Energy's (DOE) Request for Information (RFI) on "Formula Grants to States and Indian Tribes for Preventing Outages and Enhancing the Resilience of the Electric Grid."[1]

The objective of this Program is for states and Tribes "to improve the all-hazards resilience of their electric grids" against a disruptive event,[2] which is defined in Section 40101(a)(1) of the *Bipartisan Infrastructure Law* (BIL) "as an event in which operations of the electric grid are disrupted, preventively shut off, or cannot operate safely due to extreme weather, wildfire, or a natural disaster."[3] The North American Reliability Corporation (NERC) in its *2022 Summer Reliability Assessment (Assessment)* warns of predicted "above normal temperatures for much of North America," that threaten the reliability of the electric system, particularly when combined with more severe weather events, drought, and wildfires that also are expected, along with other human-caused threats.[4] The National Oceanic and Atmospheric Administration (NOAA) also has projected an above-average hurricane season.[5] The *Assessment* thus urges grid operators to anticipate the "elevated or high risk of energy shortfalls during peak summer conditions" and to prepare by mitigating to the greatest extent possible these risks. So, this and subsequent DOE programs to help states and Tribes enhance grid resilience could not be more timely and vital.

Jupiter is responding to Question #3 in the RFI: "What additional data sources are you aware of that may help DOE prepare the award formula?"

In terms of data sources that might assist DOE and/or the state and Tribal grant applicants, Jupiter wishes to make DOE and its Grid Deployment Office aware in this context that it has developed a world-class ClimateScore™ risk platform that predicts impacts from extreme

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[1] U.S. Department of Energy's (DOE) Grid Deployment Office, "Notice of Request for Information on Formula Grants to States and Indian Tribes for Preventing Outages and Enhancing the Resilience of the Electric Grid," 87 Fed. Reg. 26191-26192 (May 3, 2022), available at: https://netl.doe.gov/sites/default/files/2022-05/IIJA%2040101d%20-%20Federal%20Register%20RFI.pdf (hereinafter referred to as RFI).
[2] DOE, "Notice of Intent (No. DE-FOA-0002764) to Issue Formula Grant Administrative and Legal Requirements (ALRD) Announcement No. DE-FOA-0002736, Modification 000001," available at: https://netl.doe.gov/sites/default/files/2022-05/IIJA%2040101d%20-%20Notice%20of%20Intent.pdf (hereinafter referred to as NOI).
[3] DOE, "ATTACHMENT 1—Statement of Project Objectives (SOPO): Preventing Outages and Enhancing the Resilience of the Electric Grid," available at: https://netl.doe.gov/sites/default/files/netl-file/IIJA%2040101d%20-%20DRAFT%20SOPO.pdf (hereinafter referred to as SOPO).
[4] North American Electric Reliability Corporation (NERC), *2022 Summer Reliability Assessment,* May 2022, available at: www.nerc.com/pa/RAPA/ra/Reliability%20Assessments%20DL/NERC_SRA_2022.pdf (hereinafter referred to as *Assessment*).
[5] National Oceanic and Atmospheric Administration (NOAA), "NOAA predicts above-normal 2022 Atlantic Hurricane Season," May 24, 2022, available at: www.noaa.gov/news-release/noaa-predicts-above-normal-2022-atlantic-hurricane-season.

weather and climate events – at exceptionally high spatial resolutions – on infrastructure ranging from individual assets to total portfolios, and over time horizons ranging from a few hours to several decades into the future.

An array of public and private sector entities, including state and local governments, electric utilities, and the nation's largest lenders and insurance companies already use Jupiter's data analytics to help assess and manage the physical risks of extreme weather and climate events, often referred to as perils, including, but not limited to, floods, wildfires, droughts, heat, and hurricanes.[6] Jupiter's products combine weather, climate, and engineering models, cutting-edge machine learning analyses, and cloud computing. Jupiter is not the only company or entity with this type of tool, though it is widely regarded as one of the leaders in offering these types of analytics and services.

Jupiter commends the inclusion of "advanced modeling technologies" among the eligible Program activities in the underlying Statute and in the Program implementation documents available thus far.[7] In addition, Jupiter has consistently recommended that the Federal government – and other entities – **consider current and future-looking, rather than solely historic, data** to enhance the resilience of any financial or physical assets. To this end, Jupiter strongly supports DOE's focus in this RFI, and in the Section 40101(d) Formula Grant Program itself, to help states and Tribes address "current and future all-hazards resilience needs," including through "an objectives-led planning process."[8]

Jupiter encourages DOE to avail itself of this type of modeling tool and the associated data. For example, DOE could use this tool as part of the technical assistance it provides states and Tribes under this Program. Another option for DOE to consider is to enable states and Tribes – themselves or via a subgrant – to obtain this type of modeling tool and to use the data for the planning processes to enhance their grid infrastructure resilience.

Because the *compound nature* of climate change-related physical perils and the *dynamic nature* of associated impacts significantly affect the ability of a community to be sufficiently resilient to increasing climate change-related pressures from interdependent social, physical, and economic factors, modeling tools that support the capabilities listed above are critical to the success of the DOE Program.

Thus, data sets that are more dynamic and more forward-looking in nature are preferable, such as data from integrated assessment models (IAMs) for the dynamic aspect, and data from global climate models (GCMs) to define current and future characteristics of climate-related physical perils. GCM and IAM data are readily available from a variety of public repositories.

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[6] Three of the 15 largest U.S. power providers use Jupiter's services for resilience planning; utilities, real estate, pharmaceutical, and many other companies across critical infrastructure sectors use Jupiter to comply with disclosure and other regulatory requirements. The U.S. Air Force, U.S. Army, the Federal Emergency Management Agency (FEMA), the U.S. Department of Housing and Urban Development (HUD), and public sector customers in Florida and New York use Jupiter's services to support risk assessments and resilience investments.

[7] Bipartisan Infrastructure Law (also known as the *Infrastructure Investment and Jobs Act (IIJA)*), (Public Law 117-58), 117th Congress, November 15, 2021, available at: https://www.congress.gov/117/plaws/publ58/PLAW-117publ58.pdf; and SOPO.

[8] DOE, "Bipartisan Infrastructure Law Section 40101(d) Formula Grants to States and Indian Tribes for Preventing Outages and Enhancing the Resilience of the Electric Grid (Grid Resilience Grants)," webinar presentation, May 5, 2022, available at: https://www.energy.gov/sites/default/files/2022-05/Grid-Resilience%2040101d%20Webinar%20Final%20%28web%29.pdf.

Specifically, if DOE were to choose to use such data, then GCM data would best be taken from the Coupled Model Intercomparison Project-6 (CMIP6), Eyring et al. 2016 suite,[9] which formed the basis for the most recent IPCC Sixth Assessment Reports. IAM data might be less standardized than the suite of CMIP-6 data, but sources for obtaining such data are suggested.[10]

However, in their most basic formats, IAM and GCM data are not suitable for decision-making scenarios. Instead, a dynamic modeling tool would enable a planner, e.g., to examine whether, or the extent to which, the implementation of a certain adaptation strategy would modify conditions to remain within (or below) certain thresholds (e.g., temperatures, flood levels). Such data could identify a community's critical needs and benefits of programs aimed at addressing these needs. Therefore, data derived from dynamic modeling tools could be extremely helpful to states, communities, and Tribes, as they undertake steps to reduce "the likelihood and consequences of disruptive events to the electricity grid" in a manner that "generate[s] the greatest community benefit."[11] In other words, with the ability to more accurately predict and assess projected climate-induced perils and their impacts, states, communities, and Tribes would be better able to plan, prepare for, and adapt to them.

As part of the integrated ClimateScore™ suite, Jupiter's HeatScore™ can help assess critical electric infrastructure vulnerability to elevated temperatures, humidity, and multi-day heat events (as well as to cold events). Typical metrics include the number of days above a critical temperature and over specified time frames. In addition, factors such as urban heat island effects are incorporated into overall metrics. HeatScore™ methods and data also can be used to analyze short- and long-range heat indexes at weather time scales (0-7 days) for emergency management and at climate time scales (0-60 years) for urban infrastructure planning purposes, as in this figure.
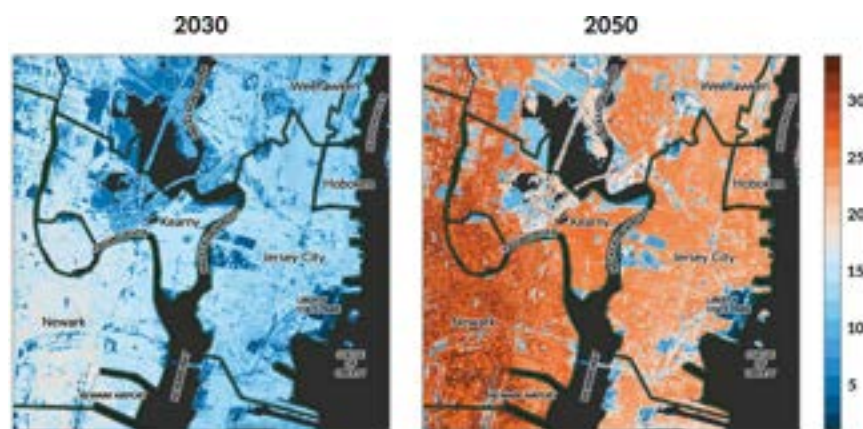
A HeatScore™-generated image displaying the number of days projected to be at or above 95°F in 2030 (left; i.e., 15-17 days or less) and in 2050 (right; i.e., more than 20-25 days) in western New Jersey.

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[9] Eyring, V., S. Bony, G. A. Meehl, C. A. Senior, B. Stevens, R. J. Stouffer, and K. E. Taylor, 2016: Overview of the Coupled Model Intercomparison Project Phase 6 (CMIP6) experimental design and organization, *Geosci. Model Dev.*, 9, 1937–1958, https://doi.org/10.5194/gmd-9-1937-2016. E.g., a CMIP6 data repository also is available at: https://esgf-node.llnl.gov/projects/cmip6/.
[10] One public repository of IAM model and data is available at: https://github.com/anthofflab/mimi-page-2009.jl and documented in Anthoff, D. et al. Mimi-PAGE-2009.jl v1.0.0 (Version v1.0.0). *Zenodo* (2018) is available at: https://doi.org/10.5281/zenodo.1322831.
[11] SOPO.

This type of analysis helps a state, community, Tribe, or utility better understand and quantify the impacts of extreme heat events, such as providing decision makers with better forecasts of peak capacity and demand for different networks and critical equipment, e.g., transformers, across predominantly urban service areas, where surface temperatures vary significantly. In turn, these forecasts facilitate more accurate and improved planning efforts, better load management, and greater situational awareness across a state, community, or utility service area.

Following is a flood risk evolution using the Jupiter FloodScore™ product that illustrates the type of flood-related risk analyses that Jupiter's platform can produce and specific ways in which these tools and data can be used that might be helpful as DOE proceeds with the next steps in the process to implement this Formula Grant Program, and/or as states and Tribes apply for grants and technical assistance through this Program to enhance their resilience and that of their critical electric system infrastructure.
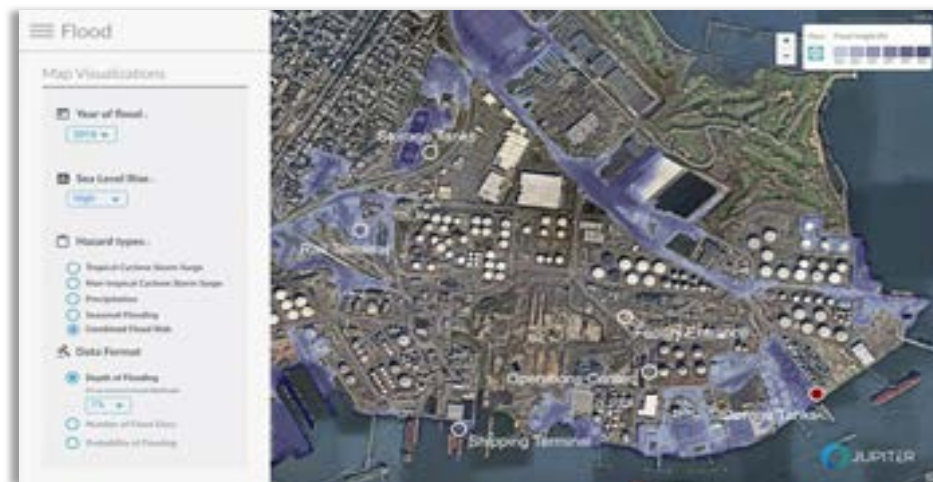
The 2019 1-in-100-year flood exposure of a natural gas hub providing critical support to a major US city.
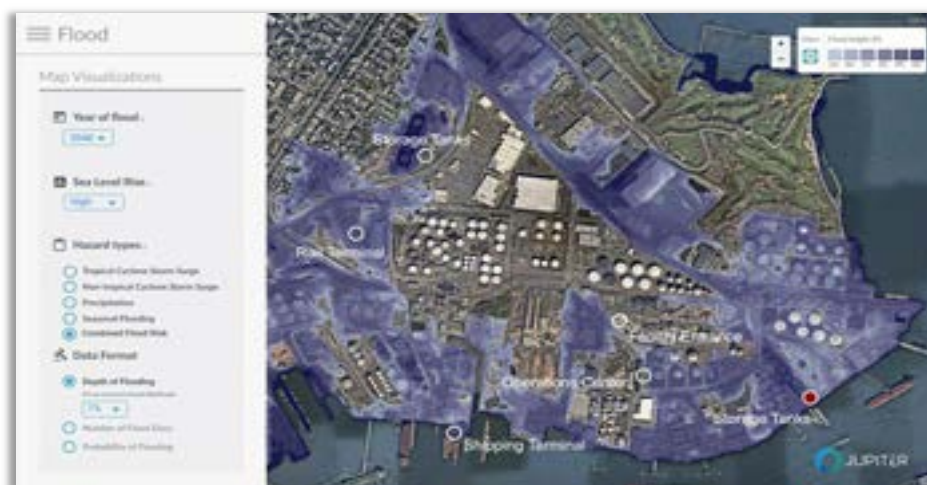
The 2040 1-in-100-year flood exposure of the same natural gas hub. As 2040 is well within the useful life of a range of critical infrastructure assets, several will experience more than two feet of flooding during a 1-in-100-year storm.
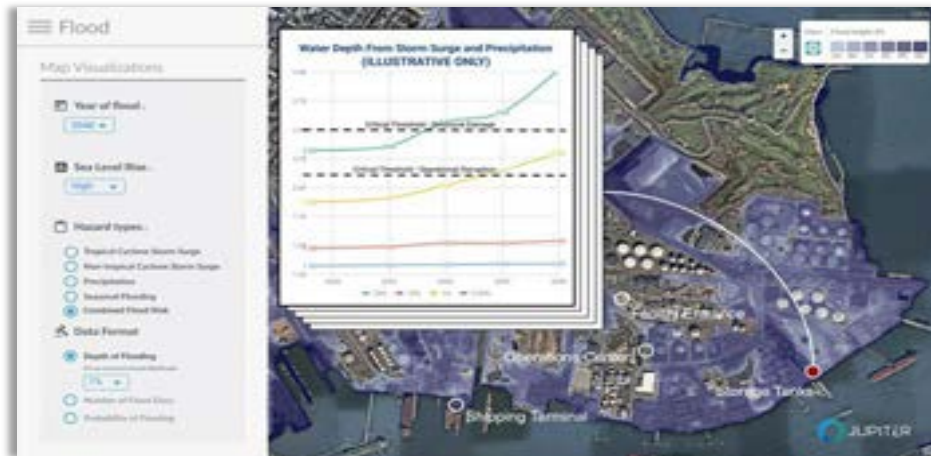
Jupiter analytics highlight when climate impacts at a single facility asset are expected to exceed risk tolerance, factoring in mission importance, and the costs and benefits of resilience investments across public and private stakeholder entities and affected populations, including taxpayers.

Conclusion

When decision makers and planners have access to extremely accurate weather and climate risk prediction capabilities, they are better able to make informed short- and long-term planning and operational decisions that drive superior risk management, risk disclosure, and investments that enhance infrastructure asset resilience. As such, the DOE Program objectives are well positioned to aid states, communities, and Tribes achieve such critical infrastructure resilience with respect to projected extreme events. However, success will depend on analytics and metrics that account for the compound and dynamic nature of impacts from physical perils, which, in turn, must come from appropriate data, tools, and systems.

WIRED Magazine wrote: "[i]f you run a business, or maintain a city, or plan power plants or highways or bridges, you'd like to know how bad things are, and how bad they're going to get."[12] Therefore, the type of tool that incorporates climate-related perils and impacts with social, physical, and economic factors and disseminates easily-digestible data to public decision makers and those in critical infrastructure sectors is essential. Jupiter appreciates the opportunity to submit these comments and stands ready to be a resource at any time. For further information, please do not hesitate to contact me at: rich.sorkin@jupiterintel.com.

Sincerely,

Rich Sorkin
CEO
Jupiter Intelligence

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[12] Rogers, Adam, "Companies Can Predict Climate Catastrophes for You – as a Service," *WIRED Magazine,* April 29, 2019.