Addressing climate resilience through research and industry partnerships

Laura Fischer, Lead, Physical Climate Data and Guidance

EPRI Energy and Climate Research Seminar
May 9, 2025

CLIMATE READi

RESILIENCE AND ADAPTATION INITIATIVE

Register for the May 22 Webcast

Learn more at www.epri.com/readi

EPRI Climate Resilience and Adaptation Initiative (READi)

- **COMPREHENSIVE:** Develop a *Common Framework* addressing the entirety of the power system, planning through operations
- **CONSISTENT:** Provide an informed approach to climate risk assessment and strategic resilience planning that can be replicated
- **COLLABORATIVE:** Drive stakeholder alignment on adaptation strategies for efficient and effective investment

Final Product: A Common Framework

- Climate data assessment and application guidance
- Vulnerability assessment
- Risk mitigation investment
- Hardening technologies
- Adaptation strategies
- Research priorities

The Goals of Climate READi

Establish a Network

Create Consistent Assessment Approach

Provide Foundation for Continued Development

The Goals of Climate READi

Establish a Network

40+ Member Companies and 100+ CRAG Participants

Bridging the gap between the scientific community and power system practitioners

Collaborators ALREADY advancing efforts in alignment

The Goals of Climate READi

Establish a Network

Create Consistent Assessment Approach

42 Member Companies and 100+ CRAG Participants

Bridging the gap between the scientific community and power system practitioners

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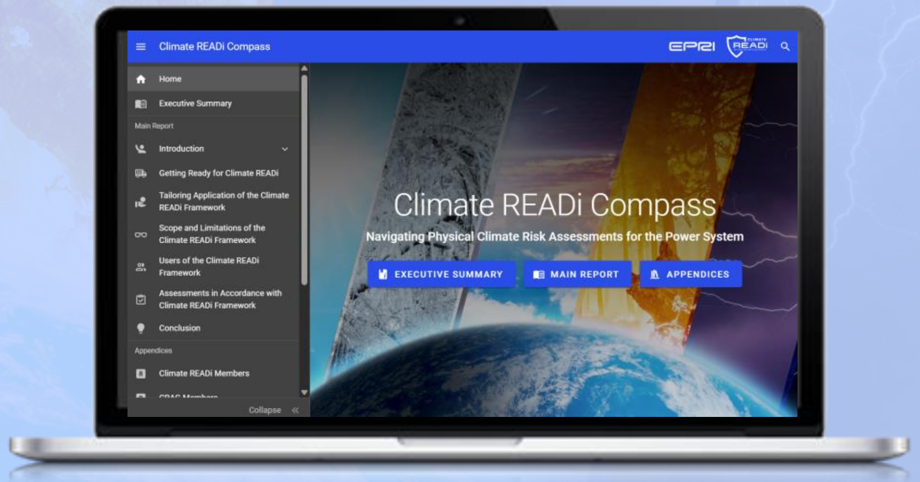
THE Framework

Access Compass here!

Climate READi Compass: Navigating Physical Climate Risk Assessments for the Power System



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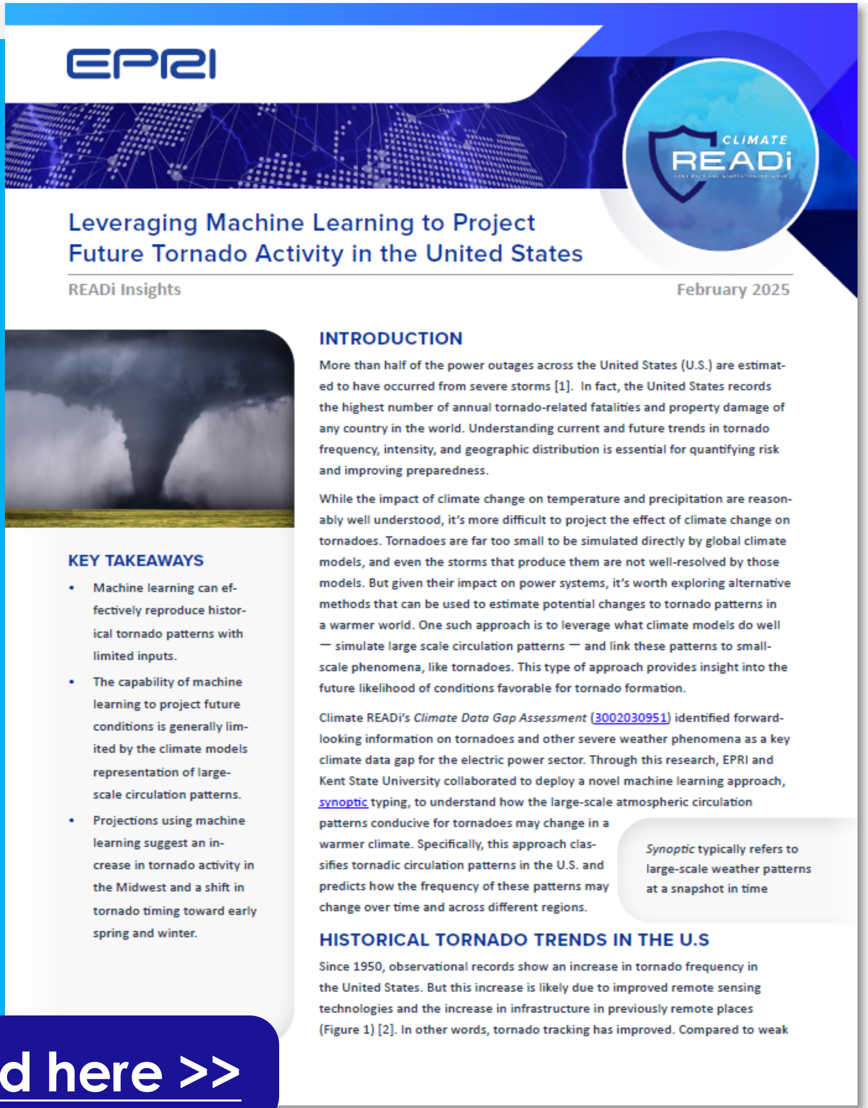
READi Continuing Research Opportunities

Establishment of long-term research program at EPRI

Climate READi has supported multiple collaborations with universities and other research organizations.



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CLIMATE READi

Leveraging Machine Learning to Project Future Tornado Activity in the United States

READi Insights — February 2025

INTRODUCTION

More than half of the power outages across the United States (U.S.) are estimated to have occurred from severe storms [1]. In fact, the United States records the highest number of annual tornado-related fatalities and property damage of any country in the world. Understanding current and future trends in tornado frequency, intensity, and geographic distribution is essential for quantifying risk and improving preparedness.

While the impact of climate change on temperature and precipitation are reasonably well understood, it's more difficult to project the effect of climate change on tornadoes. Tornadoes are far too small to be simulated directly by global climate models, and even the storms that produce them are not well-resolved by those models. But given their impact on power systems, it's worth exploring alternative methods that can be used to estimate potential changes to tornado patterns in a warmer world. One such approach is to leverage what climate models do well — simulate large scale circulation patterns — and link these patterns to small-scale phenomena, like tornadoes. This type of approach provides insight into the future likelihood of conditions favorable for tornado formation.

Climate READi's *Climate Data Gap Assessment* (3002030951) identified forward-looking information on tornadoes and other severe weather phenomena as a key climate data gap for the electric power sector. Through this research, EPRI and Kent State University collaborated to deploy a novel machine learning approach, synoptic typing, to understand how the large-scale atmospheric circulation patterns conducive for tornadoes may change in a warmer climate. Specifically, this approach classifies tornadic circulation patterns in the U.S. and predicts how the frequency of these patterns may change over time and across different regions.

Synoptic typically refers to large-scale weather patterns at a snapshot in time

KEY TAKEAWAYS

- Machine learning can effectively reproduce historical tornado patterns with limited inputs.
- The capability of machine learning to project future conditions is generally limited by the climate models' representation of large-scale circulation patterns.
- Projections using machine learning suggest an increase in tornado activity in the Midwest and a shift in tornado timing toward early spring and winter.

HISTORICAL TORNADO TRENDS IN THE U.S

Since 1950, observational records show an increase in tornado frequency in the United States. But this increase is likely due to improved remote sensing technologies and the increase in infrastructure in previously remote places (Figure 1) [2]. In other words, tornado tracking has improved. Compared to weak

Download here >>

1 **Kent State University**
Leveraging machine learning to project future tornado activity in the United States

2 **University of Reading**
Assessment of climate model-derived energy datasets during dunkelflaute events

3 **CIGRE**
Evaluate requirements for HV T&D equipment operating under abnormal weather conditions

Advancing climate resilience through research and industry partnerships

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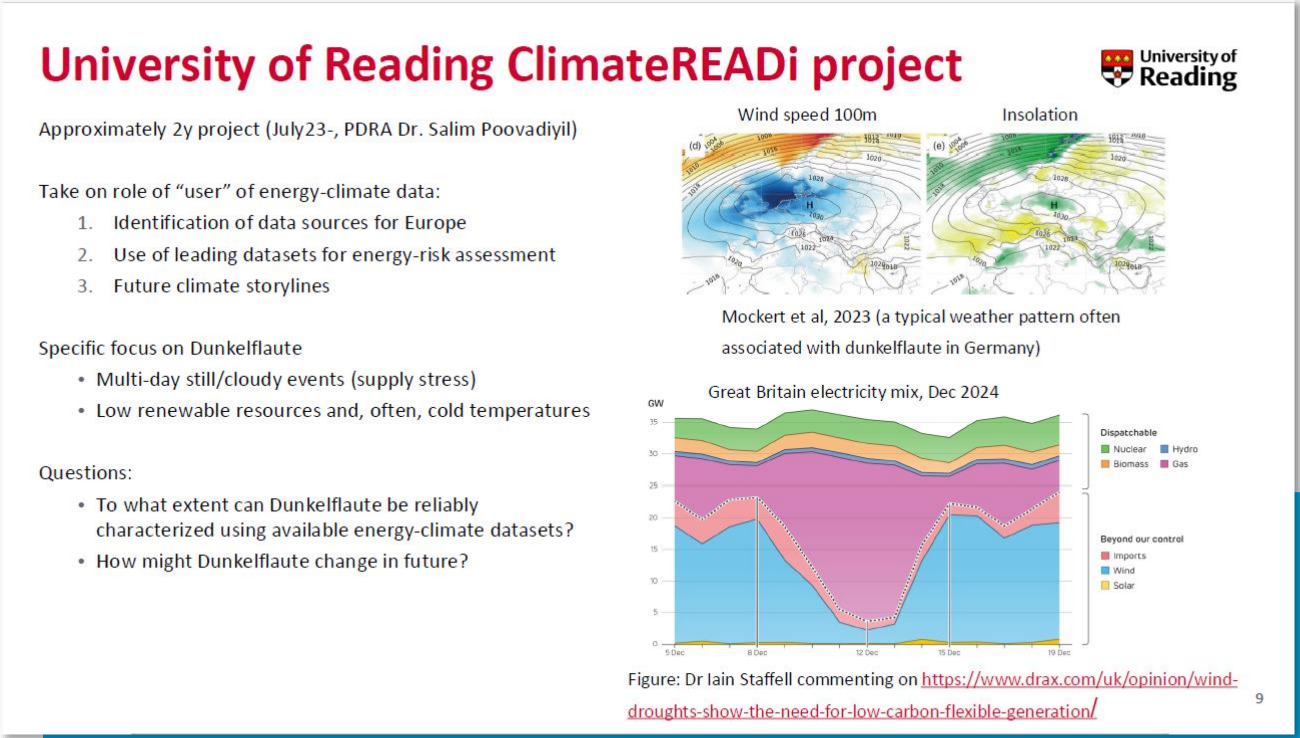

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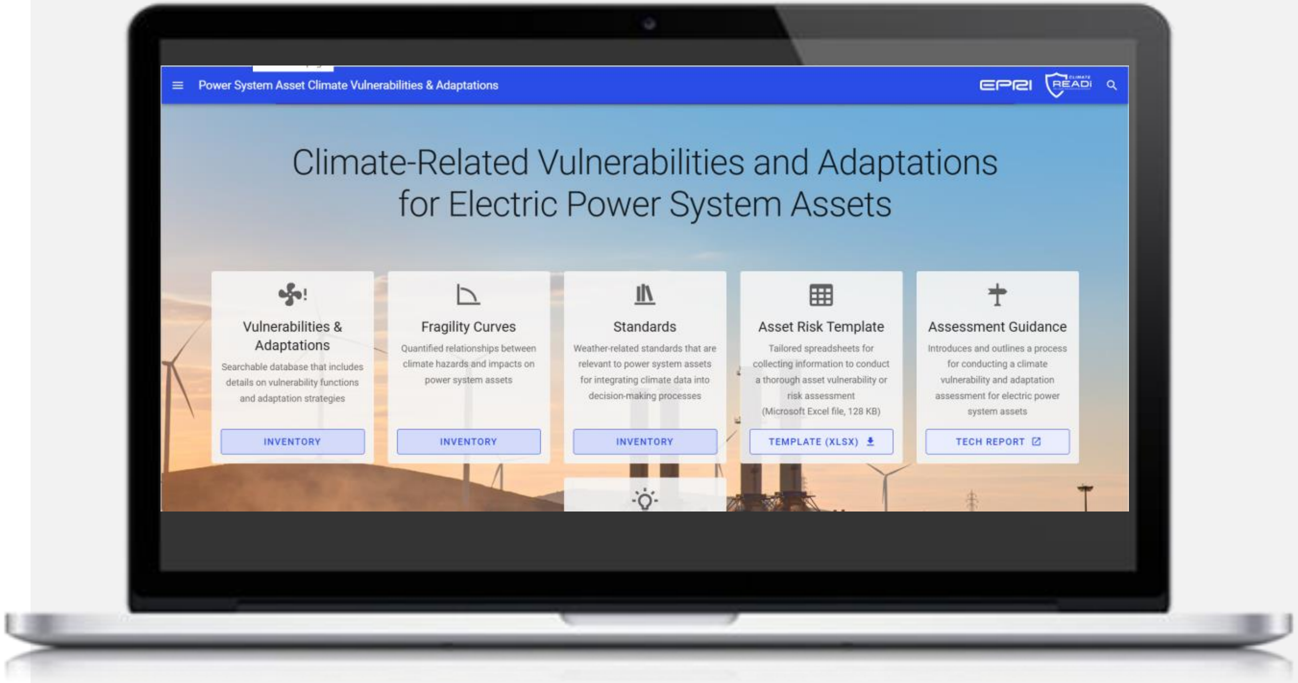

Access the Asset Climate Vulnerability and Adaptation Database

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