NREL
Transforming ENERGY

Leading Practices in Managing Climate Risk to the Energy Sector

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Quad Infrastructure Coordination Group
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3,915
Workforce, including
223 postdoctoral researchers
155 graduate students
93 undergraduate students

World-class
facilities, renowned technology experts

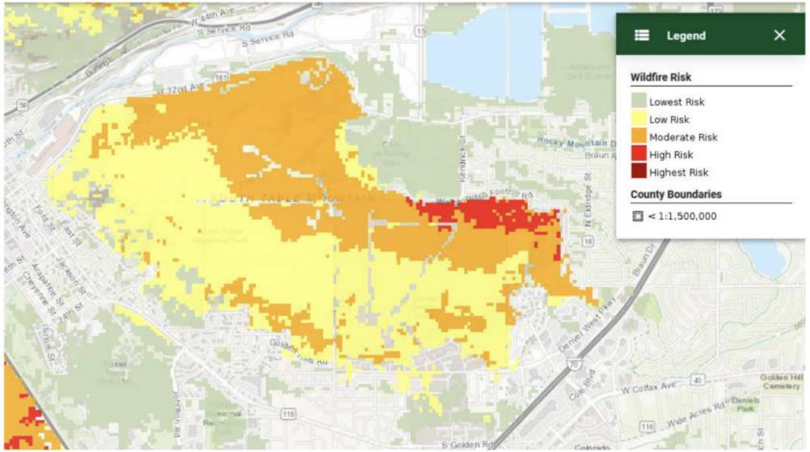
More than 1,100
Partnerships
with industry, academia, and government

Campus
4 campuses operating as living laboratories

- Renewable energy
- Sustainable transportation & fuels
- Buildings & industry
- Energy systems integration
- Supply chain resilience
- Techno-economic modeling
- Materials research
- System resilience

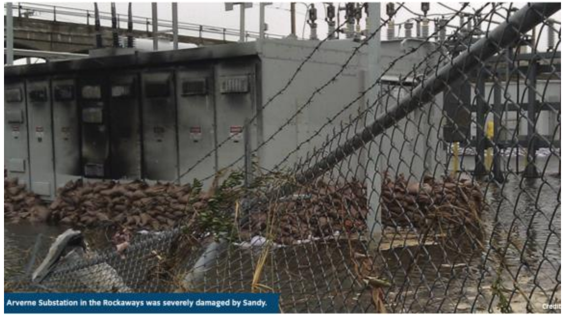
Impetus for utilities to initiate climate risk planning:

- Major event exposure
- Investor disclosures
- Regulatory oversight
- Planning for changing conditions.



Source: Rice 2022

Source: NASA Earth Observatory image by Joshua Stevens, using Landsat data from the U.S. Geological Survey and MODIS data from NASA EOSDIS/LANCE and GIBS/Worldview



Source: SIRR 2013, p 113. Photo credit: LIPA, https://www.nyc.gov/assets/sirr/downloads/pdf/Ch_6_Utilities_FINAL_singles.pdf

Source: Technical Sergeant Bill Kimble
https://nara.getarchive.net/media/evidence-of-the-f-5-tornado-was-apparent-entering-the-city-limits-of-oklahoma-58688c

Key Challenges

Planning

Integrating complex changes in severe weather into grid planning

Risk

Understanding physical climate risk and uncertainty

Fragility

Anticipating how grid assets and systems are vulnerable to hazards

Localization

Overlaying local climate risk and grid attributes

Community

Formulating an equitable resilience model

Photo by Dennis Schroeder, NREL 58020

Best Practice 1

Strong technical leadership

- Planning for climate resilience depends on the integration of complex and sometimes incompatible datasets that operate at different geographical and chronological scales.
- Both engineering and climate expertise are essential.
- Strong technical leadership involves sustained executive support for long-range (30-year-plus) scenario development despite pressing short-term constraints.
- Resources are available from the Institute of Electrical and Electronics Engineers and from the Electric Power Research Institute Climate READi initiative to support professional development.

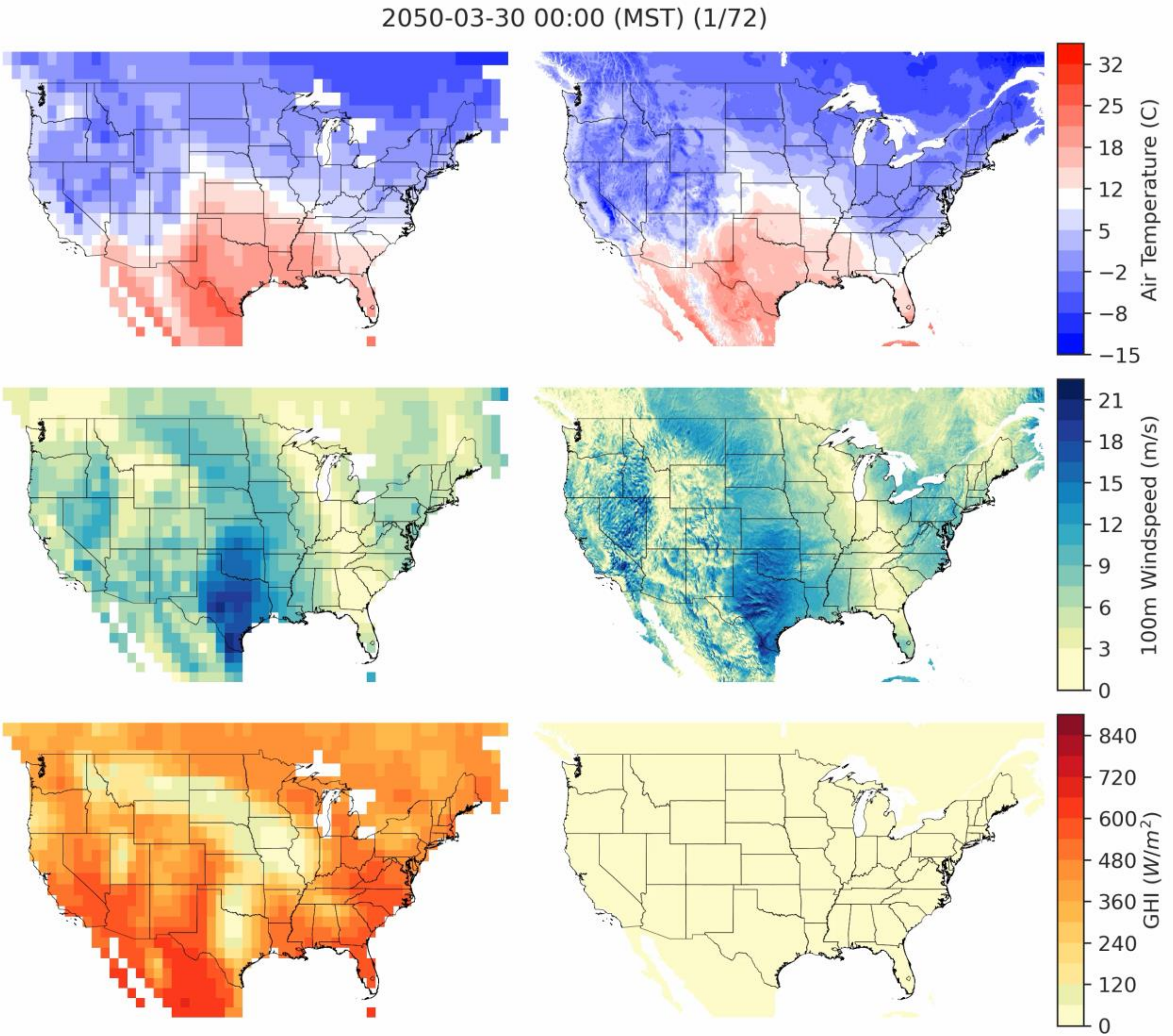
Best Practice 2

Model-informed scenarios

Climate risk planning involves choices about future emissions scenarios.

Planners can also draw upon downscale models for higher resolution, such as NREL's generative AI Sup3rCC model.

A strong partnership with climate scientists can improve model interpretation.



Best Practice 3

Managing interdependent infrastructures

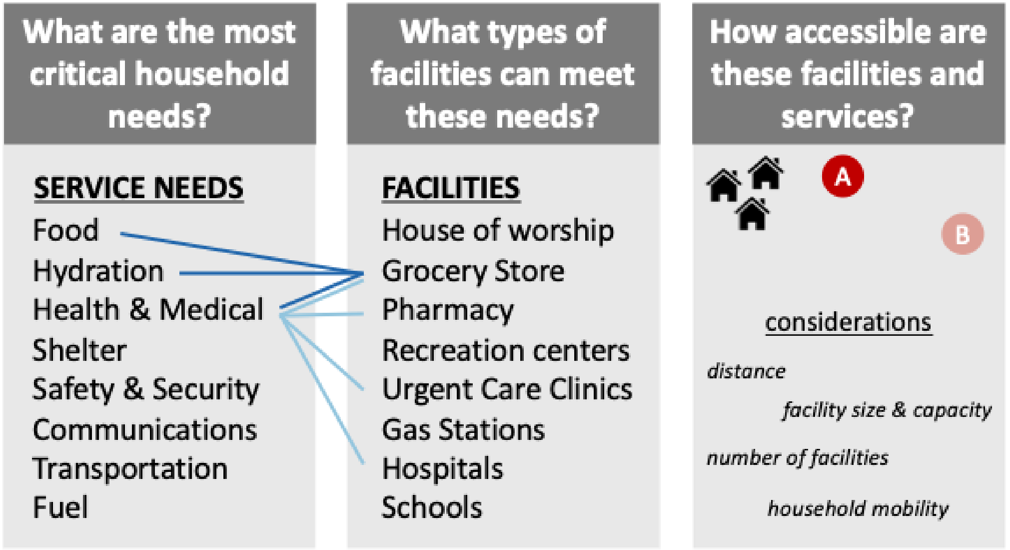
- Energy interacts with other infrastructures.
  - Power system generation often depends on fuel source access.
  - In turn, water infrastructure and many other critical systems depend on power.
- Tracing this interdependence allows planners to better prioritize investments to achieve resilient system performance under constraints.
- Consider transportation, water, public safety, and food distribution as key examples.

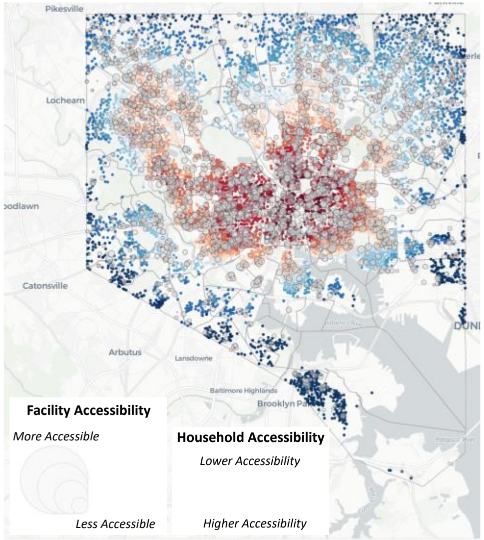
Best Practice 4

Prioritizing resilience investments

Planning for community resilience means:

- Considering what community members—especially particularly vulnerable community members—need during disruption events
- Working to ensure that facilities that provide these needs are accessible during disruption events.





Thank you

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References

- Rice, Carol. 2022. *National Renewable Energy Laboratory Wildland Fire Management Plan (August 2022–August 2025): February–August 2022*. Golden, CO: National Renewable Energy Laboratory. NREL/SR-1900-83565. https://www.nrel.gov/docs/fy22osti/83565.pdf.