VANDERBILT UNIVERSITY School of Engineering

DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING

Seminar

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12:10 pm – 1:10 pm

FGH 211

"EXTREME WEATHER DRIVERS DURING POWER OUTAGES & EQUITY CONSIDERATIONS FOR FUTURE GRID EXPANSION PLANNING IN THE UNITED STATES"

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ABSTRACT

Electric grid power outages often co-occur during extreme weather events such as high winds or low temperatures. The power system's susceptibility to outages and the variance in time for service restoration are highly dependent on where the outage is occurring and type of weather event. However, coupled analysis of power outages and weather events are oftentimes focused on the type of weather event and often overlook rigorous analysis of the underlying characteristics of the weather events themselves and the potential compound weather events. To address this gap, we performed an integrated assessment that explicitly couples power outage data with extreme weather data. To do so, county-level power outages and weather data for the United States for the period 2014-2019 are fused to create a composite time series panel. Exploratory data analysis is performed to address the following questions: 1) What types of weather events co-occur with power outages? 2) How do the weather variable signatures differ across weather events and outages? Our results will aid in our understanding of key characteristics during historical power outages and the resilience of power systems to multiple natural hazards.

Energy affordability and social vulnerability are often incorporated into research and environmental decision-making tools as they relate to environmental injustice. Climate projections have been utilized to understand environmental vulnerability or infrastructure risks. Metrics for the joint consideration of social injustice and climate risks are often presented as a singular measure, which can inhibit nuanced understanding of the underlying inequities. To address this gap, we performed a comparative analysis of future climate projections, sociodemographic attributes, and energy justice variables. To do so, we combine data climate projection data from the North American Regional Climate Change Assessment Program, socio-economic data from the United States Census Bureau, and several energy-related datasets from 2014-2018. This enables us to address the following questions: 1) How do temperature-related climate metrics change over the next few decades? 2) Do communities with the highest present day energy burden coincide with the greatest changes in projected climate risk? This analysis helps our understanding of the nuanced social and spatial differences of inequality, energy injustices, and future climate risks.

BIOGRAPHY

Dr. Nicole D. Jackson is a Senior Member of the Technical Staff in the Climate Change Security Center at Sandia National Laboratories, where she was also a postdoctoral appointee. She received her B.S. and Ph.D. degrees in civil engineering as well as an M.S. degree in materials science and engineering from the University of Illinois at Urbana-Champaign, and an M.S. degree in engineering mechanics from Virginia Tech. Her expertise centers on using climate and weather data to quantify exposure and impacts from extreme weather on critical infrastructure performance and resilience. Nicole's current research portfolio includes projects across multiple spatial and temporal scales with a focus on solar, hydropower, and the grid at large. In 2022, she was selected to be an early career fellow of the Society for Industrial and Applied Mathematics.