

Position: PhD student/research assistant

Institution: North Carolina State University, College of Natural Resources, Department of Forestry and Environmental Resources

Start date: Fall 2022 (exact date is flexible)

Adviser: Jordan Kern (<https://kern.wordpress.ncsu.edu>)

Description: The Kern group at NC State is looking for a PhD student/ research assistant to conduct innovative research on hydrometeorological risks in energy systems, including bulk electric power systems and natural gas networks. This research will be directly supported by an NSF CAREER award, but is likely to involve significant interactions and collaboration with other ongoing projects, including the U.S. DOE funded Integrated Multisector, Multiscale Modeling (IM3) project (<https://im3.pnnl.gov/>).

Responsibilities: Primary research tasks for the PhD student will involve development of a national scale mechanistic model of the U.S. natural gas market, which will be coupled with nodal models of major U.S. electric power interconnections for joint simulation under hydrometeorological uncertainty and extremes. Of particular interest is exploring the potential for continental scale teleconnections like the North American Winter Dipole (e.g. extreme cold weather in the Eastern U.S. and drought/heat waves in the Western U.S.) to have cascading impacts across electrically disconnected parts of the U.S. grid via natural gas shortages. Planned research will also incorporate uncertainty in future climate states and energy system configurations (i.e. decarbonization).

Requirements: An undergraduate or graduate degree in engineering, statistics, operations research, and/or earth systems science is required. Applicants must have substantial experience in computer programming (e.g., Matlab, Python, R, C++, etc.) and statistics. Experience in power systems analysis, hydrology/meteorology, time series analysis/modeling, probability, simulation/optimization are encouraged. We're looking for people that will be kind, respectful group members while contributing their own unique perspectives and strengths to the team. Students from underrepresented groups (women, minorities) are especially encouraged to apply. Compensation: 4 years of stipend support are available at the base rate of \$31,500 per year, with additional funds guaranteed for travel, computational resources.

More about the group: Our research is broadly focused, bridging electric power systems and water resource systems analysis, environmental science, and finance/economics. We use computational modeling, operations research, and a wide range of analytical and statistical tools to build 'systems' level models of infrastructure (especially bulk electric power systems/markets) that can provide assessments of associated physical, environmental and financial risk to decision makers. Our group has a strong interest in power systems' exposure to uncertainty in

meteorological and hydrologic processes and associated extreme events (e.g., hydrological droughts, extremely windy periods), which can alternatively create extreme levels of scarcity or overabundance of renewable energy on the grid. Much of our work is ultimately aimed at supporting real-world decision-making regarding management of/ investment in natural resources and critical infrastructure, and we frequently interact with and collaborate with real stakeholders (e.g. electric power utilities, water managers). We aim to provide students with modeling and analytical skills and sector-specific knowledge, as well as a professional network spanning academia, government, and the private sector, which collectively could be leveraged to pursue a range of post-graduate employment opportunities.

To Apply: If interested, please send an email to Jordan Kern (jkern@ncsu.edu) with a letter of introduction, CV, and statement of research interests.