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Research Interests

- Impacts of weather and climate change on electric power systems
- Solar photovoltaic designs for cold climates
- Regional-scale, community-engaged research on energy transitions
- Interdisciplinary research on electrification and decarbonization



Links of Interest



[Great Lakes Energy Group](#)



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Research Synopsis



What are the impacts of weather and climate change on electric power systems?

The Great Lakes Energy Group lab works to improve electric power system models to reflect the increasing sensitivity of power systems to weather and climate. Our work includes using grid-scale models to study the balance of supply and demand under extreme conditions and improving how generation assets are represented in grid-scale models. For example we are working to understand how grid-scale models represent the reductions in natural gas combined cycle capacities under high ambient temperatures.

How can solar photovoltaic systems be optimized for cold and snowy climates?

As the share of solar photovoltaic (PV) in power systems increases globally, PV is growing in northern and snowy climates too. A major thrust of our work is to understand how single-axis PV systems can be optimally designed for snowy climates to reduce snow losses and to estimate the impacts of snow on large-scale power system balancing. We leverage the Michigan Solar Regional Test Center on Michigan Tech's campus to test system operations in snowy conditions and to improve models for solar power generation under snow.

Regional-scale, community-engaged research on energy transitions

The Great Lakes Energy Group is focused on regional aspects of energy transitions. We seek to address issues that are overlooked in national-scale studies including snow, remote power systems, and the criticality of heating services in northern rural climates. Through a grant from the Alfred P. Sloan Foundation, we are taking a deep-dive into electric heat pump performance in rural communities to better understand the readiness of rural housing for heat pumps, and structuring our work through a community advisory board and engagement in three individual rural, northern communities across Wisconsin, Minnesota, and Michigan. We are committed to elevating voices that are traditionally underrepresented including Indigenous communities through this work.

Interdisciplinary research on electrification and decarbonization

Energy transitions are complex, and research in this mechanical engineering team is often done in partnership within interdisciplinary teams that include social scientists, policy experts, and electrical engineers. We are interested in both the social and technical dimensions of energy transitions and so we value the input of a diverse team.

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For more information



Tech Forward Initiative on Sustainability and Resilience at MTU



Publications