Jessica Nicholson

Relocating to North Carolina

(630) 843-1991 jjn3@illinois.edu https://www.linkedin.com/in/jessica-n-a58367103/
https://www.jessicanicholson.info/professional

Work Experience

Research Mechanical Engineer | U.S. Army Corps of Engineers (USACE-ERDC) | Feb 2022 - Present

- Developed energy modeling software (AMPeRRe) to calculate metrics for expected reliability, resilience, and fuel use of power systems, significantly improving the accuracy and effectiveness of power feasibility studies
- Created a multi-objective optimization algorithm to maximize power system performance and reliability
- Produced analytical results for medium voltage power distribution projects to support investment decisions
  - Example: 2.7 MW solar and 4 MWh battery yield optimal reliability and resilience at San Nicolas Island
- Led team members to expand AMPeRRe's modeling abilities to include hydropower, nuclear, and geothermal

Graduate Researcher | Energy Transport Research Lab (ETRL) | Jan 2024 - Present

- Computationally modeled mechanical and thermal systems within parabolic trough Concentrated Solar Power
- Designed a control system for CSP that modulates its power output using thermal energy storage
- Computed a 68% increase in a CSP system's power availability associated with adding latent thermal storage
- Integrated this model into a simulation toolbox to model the performance of CSP systems in microgrids

Systems Performance Engineer Co-op | Cummins Inc | Jun 2021 - Dec 2021

- Investigated engine component failures and implemented redesigns to solve identified root cause(s) of failure
- Generated projected annual cost savings of $112,575 from cumulative redesigns and quality-related changes

Education

University of Illinois at Urbana-Champaign (UIUC)

Master of Science in Mechanical Engineering | Jan 2024 - Dec 2025 | GPA: 3.63

- Relevant Courses: Introduction to Optimization, Dynamic Systems Reliability, Advanced Computer Control, Theory of Energy and Sustainable Engineering, Computational Fluid Mechanics

Bachelor of Science in Mechanical Engineering, Minor in Business | Aug 2018 - Dec 2022

- Relevant Courses: Energy Conversion Systems, Fluid Dynamics, Thermodynamics, Heat Transfer, Engineering Materials, Dynamics of Mechanical Systems, Industrial Control Systems, Mechanical Design

Funded Projects

Technical Lead | Integration of Digital Analysis Tools to Quantifiably Forecast Metrics for Power System Resilience | Environmental Security Technology Certification Program (ESTCP) | $2,600,000 | 2025 - 2028

- Formed a multi-metric computational analysis framework to quantify the resilience of planned power systems
- Collaborated with other teams to integrate their digital analysis capabilities with ours, ensuring automation of the resilience analysis framework to produce actionable results for installation power system decision-makers

Technical Lead for Resource Optimization | Microgrid Reliability and Resilience | Congressional Funding | $36,500,000 | 2023 - Present

- Contributed to the development of my team's Modeling, Simulation, and Visualization (MSV) toolbox, which comprehensively models power infrastructure for power resource, load, and electrical component planning
- Performed inspections and produced analytics for customers such as Camp Ripley and San Nicolas Island

Technical Contributor | Base Integration of High-Powered Vehicles | OECIF | $700,000 | 2025 - Present

- Developed a program to measure the load-matching capabilities of vehicles that contain spinning generation
- Modeled the integration of these high-powered vehicles into existing microgrids as supporting resources

Patents & Publications

Patents

- Nicholson, Jessica. (2025). Analysis of Microgrid Performance, Reliability, and Resilience Computational Model. U.S. Patent Application Number 19/397,218, filed November 21, 2025. Patent pending.

Publications

- **Fort Phantom Power System Analysis - Case Studies for Notional Power Resource Mixes and Energy Storage**. Nicholson, Jessica. Gross, Matthew. Anderson, Camryn. Bozada, Thomas. U.S. Army Engineer Research and Development Center | https://dx.doi.org/10.21079/11681/50039
- **Analysis of Microgrid Performance, Reliability, and Resilience (AMPeRRe) Computational Model**. Nicholson, Jessica. Gross, Matthew. Herring, Daniel. Bozada, Thomas. (2024). U.S. Army Engineer Research and Development Center | http://dx.doi.org/10.21079/11681/49485
- **Camp Ripley Microgrid Analysis - Incorporation of Solar and Energy Storage**. Nicholson, Jessica. Gross, Matthew. Anderson, Camryn. Bozada, Thomas. U.S. Army Engineer Research and Development Center | https://library.erdc.dren.mil/items/46b2008d-a697-4200-828e-85c1e18733ad (Restricted / CUI)
- **Computational Modeling of Dynamic Phase Change Materials in Thermal Energy Storage for Concentrated Solar Power.** Nicholson, Jessica. Garimella, Vivek. Miljkovic, Nenad. UIUC Energy Transport Research Lab | Under Review
- **Mission-Driven Scheduling of Electrical Resources in Microgrids with Uncertain Short-Term Demand.** Heglund, Jacob. Nicholson, Jessica. Anderson, Camryn. Gross, Matthew. Bozada, Thomas. Herring, Daniel. U.S. Army Engineer Research and Development Center | Under Review

Professional Affiliations

American Society of Mechanical Engineers | Jul 2025 - Present

- Developed a network of industry professionals, researchers, and experts to collaborate across organizations

Interagency Advanced Power Group | Renewable Energy Conversion Group | May 2023 - Present

- Participated in working group meetings as a USACE representative to shape the group's research efforts

Society of Women Engineers | Sep 2018 - Present

- Planned, coordinated, and led the organization's StepUP initiative, an interactive STEM program for students

Awards & Certifications

Computational Science and Engineering Certificate | Jan 2025 - Present

- Program that develops skills in problem-solving using computation as a tool for modeling complex problems

Laboratory for Energy and Power Solutions (LEAPS) Microgrid Training Certificate | Aug 2025

- Hands-on training in microgrid design, integration, safety, and maintenance at Arizona State University

ERDC Leadership Development Program | Jul 2024 - Jul 2025

- A set of courses focused on leadership skills that are critical to research and project management at USACE

Fred S. Bailey Scholarship | Jun 2021

- Award for students who demonstrate exceptional leadership, involvement, and a positive impact at UIUC

Skills & Abilities

Programs:

- Python, MATLAB & Simulink
- Product design & software (AutoCAD)
- Creo, Inventor, SolidWorks
- ANSYS & Fusion 360 Simulation
- Project management tools (MS Project)
- MS Office suite (Excel, PowerPoint)

Technical:

- Process & resource optimization
- Mechanical & thermal modeling
- Power grid design
- AI & machine learning
- Data management & analytics
- Failure root cause analysis

Professional:

- Project management
- Technical proposals
- Technical documentation
- Product development
- Leadership & mentorship
- Speaking & presentations