Curriculum Vitae
Nicholas D. Laws, Ph.D.

February 27, 2025

Contents

Professional Experience

- Director of Modeling and Analytics, IdeaSmiths LLC, 2024–present

- Senior Power Systems Optimization Engineer, Camus Energy, 2022–present

- Research Engineer, National Renewable Energy Laboratory, 2017–2022

- Graduate Research Assistant, Webber Energy Group, UT Austin, 2018–2023

- Graduate Research Assistant, Thayer School of Engineering, Dartmouth College, 2014-2016

- Mountain, Climbing, and Ski Guide, Aspen Alpine Guides, 2013-2014

- Mountain Guide, International Mountain Guides, 2011-2014

- Commodity Buyer, Valley Lumber, 2007-2011

- Construction Manager, Eldorado Climbing Walls, 2006-2007

Education

- Ph.D. Mechanical Engineering, The University of Texas at Austin, 2023

- M.S. Engineering Sciences, Thayer School of Engineering Dartmouth College, 2016

- B.S. Aerospace Engineering, Boston University, 2005

Peer-Reviewed Journal Articles

8. **Laws, Nicholas D**, Chen, Dongmei, and Webber, Michael J. "Valuing distributed energy resources for non-wires alternatives". In: *Electric Power Systems Research* 234 (2024)

7. **Laws, Nicholas D** and Hanasusanto, Grani A. "Linearizing bilinear products of shadow prices and dispatch variables in bilevel problems for optimal power system planning and operations". In: *IEEE Transactions on Power Systems* 38.1 (2022)

6. Mishra, Sakshi, Pohl, Josiah, **Laws, Nicholas D**, Cutler, Dylan, Kwasnik, Ted, Becker, William, Zolan, Alex, Anderson, Kate, Olis, Dan, and Elgqvist, Emma. "Computational framework for behind-the-meter DER techno-economic modeling and optimization: REopt Lite". In: *Energy Systems* (2021). URL: https://arxiv.org/pdf/2008.05873

5. McLaren, Joyce, **Laws, Nicholas D**, Anderson, Kate, DiOrio, Nicholas, and Miller, Hannah. "Solar-plus-storage economics: What works where, and why?" In: *The Electricity Journal* 32.1 (2019). URL: https://www.sciencedirect.com/science/article/am/pii/S1040619018302744

4. **Laws, Nicholas D**, Anderson, Kate, DiOrio, Nicholas A, Li, Xiangkun, and McLaren, Joyce. "Impacts of valuing resilience on cost-optimal PV and storage systems for commercial buildings". In: *Renewable energy* 127 (2018). URL: https://www.sciencedirect.com/science/article/am/pii/S0960148118305305

3. Anderson, Kate, **Laws, Nicholas D**, Marr, Spencer, Lisell, Lars, Jimenez, Tony, Case, Tria, Li, Xiangkun, Lohmann, Dag, and Cutler, Dylan. "Quantifying and monetizing renewable energy resiliency". In: *Sustainability* 10.4 (2018). URL: https://www.mdpi.com/2071-1050/10/4/933/pdf

2. **Laws, Nicholas D**, Epps, Brenden P, Peterson, Steven O, Laser, Mark S, and Wanjiru, G Kamau. "On the utility death spiral and the impact of utility rate structures on the adoption of residential solar photovoltaics and energy storage". In: *Applied energy* 185 (2017). URL: https://www.sciencedirect.com/science/article/pii/S0306261916315732

1. **Laws, Nicholas D** and Epps, Brenden P. "Hydrokinetic energy conversion: Technology, research, and outlook". In: *Renewable and Sustainable Energy Reviews* 57 (2016). URL: https://www.sciencedirect.com/science/article/pii/S1364032115015725

Peer-Reviewed Conference Proceedings

3. Gasper, Paul, **Laws, Nicholas D**, Rathod, Bhavesh, Olis, Dan, Smith, Kandler, and Thakkar, Foram. "Optimization of Energy Storage System Economics and Controls by Incorporating Battery Degradation

Costs in REopt". In: *243rd Electrochemical Society Meeting.* Boston, MA, 2023

2. Mirletz, Brian T and **Laws, Nicholas D**. "Impacts of Dispatch Strategies and Forecast Errors on the Economics of Behind-the-Meter PV-Battery Systems". In: *2023 IEEE 50th Photovoltaic Specialists Conference (PVSC).* IEEE. 2023

1. **Laws, Nicholas D**, Epps, Brenden, Medina, Albert, and Ol, Michael V. "Singularity methods for modeling airfoil flows with dynamic stall and fast flap deflections". In: *55th AIAA Aerospace Sciences Meeting.* 2017. URL: https://arc.aiaa.org/doi/abs/10.2514/6.2017-0095

Non-Refereed Conference Papers and Presentations

1. **Laws, Nicholas D**. When Solar Plus Storage Make Sense. Technical report. Presented to National Association of Energy Service Companies, Milwaukee, WI. National Renewable Energy Lab.(NREL), Golden, CO (United States), June 2018. URL: https://www.osti.gov/servlets/purl/1458716

Selected Technical Reports and White Papers

3. **Laws, Nicholas D**, Cutler, Dylan S, Dunham, Hallie, Johnson, Sam, Inman, Daniel, Granger, Nikita, Jones, Wayne, and Chalenski, David. Stochastic Price Generation for Evaluating Wholesale Electricity Market Bidding Strategies. Technical report. National Renewable Energy Laboratory (NREL), 2023. URL: https://www.nrel.gov/docs/fy23osti/82005.pdf

2. Murphy, Caitlin, Hotchkiss, Elizabeth L, Anderson, Katherine H, Barrows, Clayton P, Cohen, Stuart M, Dalvi, Sourabh, **Laws, Nicholas D**, Maguire, Jeffrey B, Stephen, Gordon W, and Wilson, Eric J. Adapting Existing Energy Planning, Simulation, and Operational Models for Resilience Analysis. Technical report. National Renewable Energy Lab.(NREL), Golden, CO (United States), 2020. URL: https://www.osti.gov/servlets/purl/1602705

1. McLaren, Joyce A, Mullendore, Seth, **Laws, Nicholas D**, and Anderson, Katherine H. Valuing the Resilience Provided by Solar and

Battery Energy Storage Systems. Technical report. National Renewable Energy Lab.(NREL), Golden, CO (United States), 2018

Selected Projects and Roles

Director of Modeling and Analytics – IdeaSmiths | 2024–present
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Senior Power Systems Optimization Engineer – Camus Energy | 2022–present
At Camus Energy Dr. Laws develops novel software to aid electric utilities in the energy transition, including:

- Automation of utility data into power flow models, including SCADA, AMI, and GIS.

- Novel graph methods to determine system connectivity of power distribution systems.

- Optimal power flow methods for dynamic operating envelopes to support flexible interconnection of new storage and generation assets.

- Optimal inverter based resource set points to support utility objectives

REopt Lead Developer – NREL | 2021-2022
Dr. Laws led the transition of REopt to an open-source Julia package and Python-based API to support a web tool (reopt.nrel.gov/tool) as well as make the REopt tool more accessible and customizable.

Co-optimizing distributed energy resources for system operator and customer objectives | 2020
Dr. Laws acted as Principal Investigator on a competitively awarded internal research and development grant at NREL on novel methods to determine optimal capacities and economic incentives for distributed energy resources from multiple perspectives.

Value of Resiliency Laboratory Directed R&D | 2018
Dr. Laws supported an NREL internally funded research and development project to determine methods for valuing the resiliency of energy storage and generation assets for all stakeholders, including asset owners, grid operators, and society.

National Scale Analysis of the Economics of Commercial Behind-The-Meter Solar Plus Storage | 2017

Dr. Laws' first project at NREL required adapting and scaling an in-house analysis tool that required an expert analyst weeks to months to curate many inputs and analyze the outputs into a tool that could be automated for tens-of-thousands of runs to support a national scale analysis of where in the United States behind-the-meter solar plus storage was economical for commercial building owners.

Skills

- Expert in Mathematical Programming including Optimization Under Uncertainty, Integer Programming, Optimal Control, Optimal Power Flow, and Bilevel optimization

- Familiar with many energy and ancillary service markets, power system regulatory bodies, and the deregulation of electric utilities.

- Familiar with a wide range power flow formulations, including relaxations and approximations for handling large optimization problems.

- Expert in Python, Julia, Docker, Git, test-driven development

- Experience with commercial and free solvers including Gurobi, CPLEX, Press, HiGHS, and Ipopt.

- Experience with many mathematical programming languages including JuMP, CVXPY, and Pyomo.

- Experience with full stack development, including Javascript, HTML, RESTful API, Kubernetes, PostgreSQL, Jenkins, multi-threaded task queues, AWS, and GCP.

- Contributor and author of several open source optimization packages (github.com/nlaws).

- Experience with OpenDSS for steady state power flow analysis including hosting capacity studies.

Biography

Dr. Nick Laws is the Director of Modeling and Analytics at IdeaSmiths. He is also the Senior Power Systems Optimization Engineer at Camus Energy, where he researches and develops methods and software to aid electric utilities in the energy transition. Prior to Camus Energy, Dr. Laws led the development of a flagship decision support tool at the National Renewable Energy Laboratory (NREL), called REopt. REopt is a techno-economic optimization tool for determining distributed energy resource (DER) capacities and dispatch strategies to meet economic, resilience, and emission reduction goals. Dr. Laws is the sole-author of the 2022 "Centralized Control of DER with Price Signals" NREL software record, developed to control diverse DER with minimal information exchange. Dr. Laws also served as Principal Investigator on the 2020 NREL Seed Laboratory Directed R&D project "Co-optimizing DER for system operator and customer objectives". Dr. Laws is passionate about preserving wild spaces for future generations and enjoying wilderness with family and friends.