

Trevor Barnes

RESEARCH FELLOW | ENERGY SYSTEMS RESEARCHER

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Research Focus

I develop and apply system-level energy optimization models to help inform policy and business decisions. The results of my research include practical plans on how organizations should allocate spending to cost effectively meet emission targets. Specific research interests include near-term energy transitions, multi-sector energy analysis, sensitivity and uncertainty analysis, and open-research methodologies.

Education

PhD in Sustainable Energy Engineering

Simon Fraser University

Vancouver, BC

Jan 2021 - Sept 2026

BEng in Mechanical Engineering

British Columbia Institute of Technology

Vancouver, BC

September 2015 - May 2019

Experience

Research Fellow

University College London

London, UK

October 2026 – Present

- Energy systems researcher in the [Bartlett School of Environment, Energy and Resources](#)
- Develop a decision-support modelling framework for critical mineral supply chains
- Integrate supply, trade and demand modules into the model to capture market dynamics
- Evaluate the UK's industrial resilience within global lithium markets

Student Researcher

Google DeepMind

London, UK

March 2026 – August 2026

- Develop pipelines to generate datasets suitable to train AC OPF machine learning models on
- Use graph neural networks to solve and evaluate AC OPF problems
- Evaluate machine learning model performance against traditional solvers for AC OPF problems
- Create data translation libraries to manage AC OPF data

Research Assistant

Simon Fraser University

Vancouver, BC

Jan 2021 – Sept 2026

- Researcher in the [ΔE+ Research Group](#)
- Develop energy system optimization models to support effective energy policy decisions
- Contribute to open-source energy modelling tools and packages

Graduate Research Intern

Generac Power Systems

Vancouver, BC

April 2023 – April 2025

- Quantitatively study electrification initiatives at a system level
- Develop open-source tools for energy system analysis
- Evaluate the impact of multi-sector demand response programs
- Provide suggestions on near-term emission target solutions

Visiting Researcher

KTH Royal Institute of Technology

Stockholm, Sweden

Aug 2022 – Oct 2022

- Visited the [Department of Energy Technology](#) at KTH
- Collaborate with researchers working on energy system modelling research
- Contribute to work on sensitivity analysis and software development

Skills

Programming Python, Git, Linux, Snakemake, Mathematical Programming, High Performance Computing

Frameworks PyPSA, PandaPower, OSeMOSYS

Energy Modelling Multi-Sector Analysis, GeoSpatial Analysis, Sensitivity and Uncertainty Analysis, Computational Workflows

Soft Skills Technical Documentation and Communication, Research Process, Project Management, Open Science

Academic Contributions

JOURNAL ARTICLES

- Costs and Benefits of Transmission Investments in the United States under Different Policy Scenarios
Kamran Tehranchi, **Trevor Barnes**, Martha Frysztacki, Ines Azevedo
(Oct. 2026). 2026. DOI: [10.1088/1748-9326/aea586](https://doi.org/10.1088/1748-9326/aea586)
- [Under Revision] Unlocking Climate Finance Eligibility of Transmission Projects Using Energy Modelling
Jairo Quirós-Tortós, Jeeno George, Simone Osei-Owusu, **Trevor Barnes**, Will Blyth, Abhishek Shivakumar, Taco Niet
(2026). 2026. DOI: [10.5281/zenodo.21130109](https://doi.org/10.5281/zenodo.21130109)
- [Under Revision] Near-Term Emission Targets Need Immediate Attention in the USA
Trevor Barnes, Kamran Tehranchi, Bradley Reinholz, Malcolm Metcalfe, Taco Niet
(2026). 2026. DOI: [10.48550/arXiv.2607.01471](https://doi.org/10.48550/arXiv.2607.01471)
- Multi-Sector Demand Response for Cost Optimal Energy Transitions
Trevor Barnes, Kamran Tehranchi, Bradley Reinholz, Malcolm Metcalfe, Taco Niet
PLOS Climate (2026). 2026. DOI: [10.1371/journal.pclm.0000918](https://doi.org/10.1371/journal.pclm.0000918)
- A Global Electricity Transmission Database for Energy System Modelling
Maarten Brinkerink, Gordon Sherman, Simone Osei-Owusu, Reema Mohanty, Aman Majid, **Trevor Barnes**, Taco Niet, Abhishek Shivakumar, Erin Mayfield
Data in Brief 54 (June 1, 2024) p. 110420. 2024. DOI: [10.1016/j.dib.2024.110420](https://doi.org/10.1016/j.dib.2024.110420)
- otoole: OSeMOSYS Tools for Energy Work
Trevor Barnes, William Usher
Journal of Open Source Software (May 3, 2023) p. 5511. 2023. DOI: <https://doi.org/10.21105/joss.05511>
- Global sensitivity analysis to enhance the transparency and rigour of energy system optimisation modelling
William Usher, **Trevor Barnes**, Nandi Moksnes, Taco Niet
Open Research Europe 3 (Feb. 13, 2023) p. 30. 2023. DOI: [10.12688/openreseurope.15461.1](https://doi.org/10.12688/openreseurope.15461.1)
- Applying the open-source climate, land, energy, and water systems (CLEWs) model to Canada
Kamaria Kuling, **Trevor Barnes**, Abhishek Shivakumar, Maarten Brinkerink, Taco Niet
Energy Strategy Reviews 44 (Nov. 1, 2022) p. 100929. 2022. DOI: [10.1016/j.esr.2022.100929](https://doi.org/10.1016/j.esr.2022.100929)
- OSeMOSYS Global, an Open-Source, Open Data Global Electricity System Model Generator
Trevor Barnes, Abhishek Shivakumar, Maarten Brinkerink, Taco Niet
Scientific Data 9.1 (Oct. 14, 2022) p. 623. 2022. DOI: [10.1038/s41597-022-01737-0](https://doi.org/10.1038/s41597-022-01737-0)
- The role of U.S.-Canada electricity trade in North American decarbonization pathways
Sina Motalebi, **Trevor Barnes**, Le Lu, Benjamin Leibowicz, Taco Niet
Energy Strategy Reviews 41 (May 1, 2022) p. 100827. 2022. DOI: [10.1016/j.esr.2022.100827](https://doi.org/10.1016/j.esr.2022.100827)

CONFERENCES

- Evaluating the Effectivness of Multi-Sector Demand Response in Energy Planning Models
Trevor Barnes, Kamran Tehranchi, Bradley Reinholz, Malcolm Metcalfe, Taco Niet
International Energy Workshop (June 2025). 2025
- High Impact Options to Meet Near Term Emission Targets in the USA
Trevor Barnes, Kamran Tehranchi, Bradley Reinholz, Malcolm Metcalfe, Taco Niet
Sensitivity Analysis of Model Output (Apr. 2025). 2025
- PyPSA-USA Sector; An Open-Source Energy System Optimizaion Model of the USA
Trevor Barnes, Kamran Tehranchi, Taco Niet
Energy Modelling Hub Annual Forum (Dec. 2024). 2024
- Global Sensitivity Analysis in Energy System Modelling
Trevor Barnes, Will Usher
OpenMod Meets USA (Nov. 2023). 2023
- CLEWs Global: An open source, open data Climate, Land, Energy, and Water systems model generator
Kamaria Kuling, Yalda Saedi, **Trevor Barnes**, Ashok Sunder Rajan, Taco Niet
International Energy Workshop (June 1, 2023). 2023

WHITE PAPERS

- PyPSA-USA: A Flexible Open-Source Energy System Model and Optimization Tool for the United States
Kamran Tehranchi, **Trevor Barnes**, Martha Frysztacki, Ines Azevedo
(Dec. 2024). 2024. DOI: [10.2139/ssrn.5029120](https://doi.org/10.2139/ssrn.5029120)
- OSeMOSYS step - a python package for modelling energy systems under limited foresight and with decision trees
Hauke T. J. Henke, **Trevor Barnes**, Will Usher
(Oct. 2024). Zenodo, 2024. DOI: [10.5281/zenodo.13373404](https://doi.org/10.5281/zenodo.13373404)
- Cables to change the world
Aman Majid, Abhishek Shivakumar, Maarten Brinkerink, Thomas Kouroughli, Matt Gray, Isabella Suarez, **Trevor Barnes**, Handriyanti Diah Puspitarini
2023 URL: <https://www.transitionzero.org/insights/interconnector-report-feo>

Enabling Decarbonization with a Coordinated Gas-Electricity System

Trevor Barnes, Bradley Reinholz, Malcolm Metcalfe, Taco Niet

Zenodo (2022). 2022. DOI: [10.5281/zenodo.17009320](https://doi.org/10.5281/zenodo.17009320)

SOFTWARE DEVELOPMENT

PyPSA USA

A PyPSA Model of the USA

Core Developer, URL: <https://github.com/PyPSA/pypsa-usa>

otoole

OSeMOSYS Tools for Energy Work

Core Developer, URL: <https://github.com/OSeMOSYS/otoole>

OSeMSOYS Global

A global power system model generator for OSeMOSYS

Core Developer, URL: https://github.com/OSeMOSYS/osemosys_global

WORKSHOPS AND TALKS

4th Annual PyPSA User Meeting

Trevor Barnes

2026, [Video Link](#)

Macro Energy Society: Using the PyPSA-USA Model

Trevor Barnes, Kamran Tehranchi

2026, [Video Link](#)

Catalyst Cooperative: Open Energy Data for All

Trevor Barnes, Kamran Tehranchi

2025, [Video Link](#)

ECEMP Skills Workshop: Global Sensitivity Analysis

William Usher, **Trevor Barnes**

2022, [Video Link](#)

OTHER CONTRIBUTIONS

OSeMOSYS and FlexTool Trainer

2023, ICTP Joint Summer School on Modelling Tools for Sustainable Development

OSeMOSYS and FlexTool Trainer

2023, Energy Modelling Platform for Latin America and the Caribbean

OSeMOSYS Trainer

2021, Joint Summer School on Modelling Tools for Sustainable Development