Constance Crozier

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Research Interests

FUTURE POWER SYSTEMS   GRID OPTIMIZATION   MACHINE LEARNING   HUMAN-IN-THE-LOOP

Education

2016-2020   **D.Phil** in Engineering Science, ***University of Oxford***

    Thesis: The Impact of Domestic Electric Vehicle Charging on Electricity Networks

    Advisor: Professor Malcolm McCulloch

2012-2016   **M.Eng** in Engineering Science (First Class), ***University of Oxford***

    Thesis: Bayesian Non-Parametrics for the War in Afghanistan

    Advisor: Professor Michael Osborne

Academic Positions

2020-pres   **Postdoctoral Associate**, *University of Colorado Boulder*

    Advisor: Professor Kyri Baker

    Topic: Developed winning code for the ARPA-E Grid Optimization competition

2019-2020   **Technical Energy Specialist**, *Department of Business, Energy & Industrial Strategy*

    Team Lead: Dr. Ian Llewellyn

    Topic: Research for policy makers regarding electric vehicles and energy storage

Prizes & Awards

2022   Rising Star in EECS, *UT Austin* (Selective workshop for underrepresented genders in academia)

2021   Outstanding Postdoc Award, *CU Boulder* (University-wide award, two given annually)

2021   ARPA-E Grid Optimization Competition Challenge 2 Prize Winner (**$140,000** prize)

2020   Winner of UK Power Networks Charge Challenge (Data science competition, solo entrant)

2020	High Performance Award, *UK Department for Business, Energy & Industrial Strategy* (Department-wide award, decided by review panel)
2017	Best Presentation at Manchester Energy and Electrical Power Systems Workshop
2016-2019	EPSRC Industrial Case Award (Match funding award from research council and industry)
2015	Gibbs Prize for Best Part B Project, *University of Oxford* (Best research project out of 150 students)
2014	Overall Winner at Intern Hackathon, *Metaswitch Networks* (Around 40 interns in teams of 3)
2014-2016	Academic Scholarship, *University of Oxford* (Awarded for high performance in exams)

Grants

FUNDED ($450K TOTAL)

2022-2024 · **Fast and robust strategies for large-scale mixed-integer SCOPF**
PI: Javad Mohammadi, Co-PIs: Kyri Baker, **Constance Crozier**
Budget: **$400,000**, Funding organization: *ARPA-E*.

2021-2022 · **Predicting Binding Constraints using Physics-Informed Deep Learning**
PI: Kyri Baker, Co-PI: **Constance Crozier**
Budget: **$23,090**, Funding organisation: *Solea*.

2021-2022 · **Efficacy and equity of demand response programs across socioeconimic groups**
PI: Kyri Baker, Co-PI: Barry Mather, Collaborator: **Constance Crozier**
Budget: **$25,000**, Funding organisation: *Renewable and Sustainable Energy Initiative*.

2021-2022 · **Electric vehicle adoption and associated impacts on infrastructure and society**
PI: Kyri Baker, Co-PIs: Cristina Torres-Machi, Amy Javernick-Will, **Constance Crozier**
Budget: **$8,500**, Funding organisation: *RISE Seed Grant - University of Colorado, Boulder*.

Publications

Ordered reverse chronologically, my author position is highlighted in **bold**, mentored students/postdocs denoted by underline.

Open access versions are posted at: `https://constancecrozier.github.io/pubs/`, also check out my google scholar.

JOURNAL ARTICLES - PUBLISHED

[j.13] **C. Crozier**, K. Baker, The effect of renewable electricity generation on the value of cross-border interconnection, *Applied Energy*, 2022.

[j.12] A. Pigott, **C. Crozier**, K. Baker, Z. Nagy, GridLearn: multiagent reinforcement learning for grid-aware building energy management, *Electric Power Systems Research*, 2022.

[j.11] **C. Crozier**, K. Baker, B. Toomey, Feasible region-based heuristics for optimal transmission switching, *Sustainable Energy, Grids and Networks*, 2022.

[j.10] **C. Crozier**, C. Quarton, N. Mansor, D. Pagnano, I. Llewellyn, Modeling of the ability of a mixed renewable generation electricity system with storage to meet consumer demand, *Electricity*, 2022.

[j.9] K. Collett, S. Hirmer, H. Dalkmann, **C. Crozier**, Y. Mulugetta, M. McCulloch, Can electric vehicles be good for Sub-Saharan Africa?, *Energy Strategy Review*, 2021.

[j.8] **C. Crozier**, T. Morstyn, M. McCulloch, Capturing diversity in electric vehicle charging behaviour for network capacity estimation, *Transportation Research Part D: Transport and Environment*, 2021.

[j.7] **C. Crozier**, T. Morstyn, M. McCulloch, The opportunity for smart charging to mitigate the impact of EVs on the GB transmission and distribution systems, *Applied Energy*, 2020

[j.6] **C. Crozier**, M. Deakin, T. Morstyn, M. McCulloch, Co-ordinated electric vehicle charging to reduce losses without network impedance information, *IET Smart Grid*, 2020.

[j.5] T. Morstyn, **C. Crozier**, M. Deakin, M. McCulloch, Electric vehicle smart charging with battery voltage awareness using second-order cone programming, *IEEE Transactions on Transport Electrification*, 2020.

[j.4] **C. Crozier**, M. Deakin, T. Morstyn, M. McCulloch, The case for bi-directional charging of electric vehicles in low voltage distribution networks, *Applied Energy*, 2020

[j.3] K. Collett, M. Byamukama, **C. Crozier**, M. McCulloch, Energy and transport in Africa and South Asia, *Energy and Economic Growth*, 2020.

[j.2] **C. Crozier**, D. Apostolopoulou, M. McCulloch, Mitigating the impact of personal vehicle electrification: A power generation perspective, *Energy Policy*, 2018.

[j.1] J. Cao, **C. Crozier**, M. McCulloch, Optimal design and operation of a low carbon community based multi-energy systems considering EV integration, *IEEE Trans. of Sustainable Energy*, 2018.

JOURNAL ARTICLES - UNDER REVIEW

[j.14] **C. Crozier**, A. Pigott, K. Baker, Robust and Privacy Preserving Demand Response for TSO-DSO Coordination, *Submitted to: IEEE Transactions on Smart Grid.*

PEER REVIEWED CONFERENCE PAPERS

[c.12] C. Winner, J. Garland, **C. Crozier**, K. Baker, Carbon emissions resulting from different power flow models for dispatch, *IEEE PES General Meeting*, 2023.

[c.11] **C. Crozier**, K. Baker, Data-driven probabilistic constraint elimination for accelerated optimal power flow, *IEEE PES General Meeting*, 2022.

[c.10] **C. Crozier**, A. Pigott, K. Baker, Spatial arbitrage through bidirectional electric vehicle charging, *IEEE PES General Meeting*, 2022.

[c.9] M. Li, Y. Du, J. Mohammadi, **C. Crozier**, K. Baker Numerical comparisons of linear power flow approximations: optimality, feasibility, and computation time, *IEEE PES General Meeting*, 2022.

[c.8] A. Pigott, **C. Crozier**, K. Baker, Z. Nagy, GridLearn: multiagent reinforcement learning for grid-aware building energy management, *Power Systems Computation Conference*, 2022.

[c.7] **C. Crozier**, K. Baker, Y. Du, M. Li, J. Mohammadi, Data driven methods for contingency filtering in security constrained optimal power flow, *International Conference on Probabilistic Methods Applied to Power Systems*, 2022.

[c.6] **C. Crozier**, K. Baker, Optimal sizing of an energy storage portfolio considering multiple time-scales, *IEEE PES General Meeting*, 2021.

[c.5] M. Deakin, **C. Crozier**, T. Morstyn, D. Apostolopoulou, M. McCulloch, Stochastic hosting capacity in distribution networks, *IEEE PES General Meeting*, 2019.

[c.4] **C. Crozier**, M. Deakin, T. Morstyn, M. McCulloch, Incorporating charger efficiency into electric vehicle charging optimization, *Innovation in Smart Grid Technologies (ISGT) Europe*, 2019.

[c.3] L. Han, T. Morstyn, **C. Crozier**, M. McCulloch, Improving the scalability of a prosumer cooperative game with k-means clustering, *IEEE PowerTech*, 2019.

[c.2] **C. Crozier**, D. Apostolopoulou, M. McCulloch, Clustering of usage profiles for electric vehicle behaviour analysis, *Innovation in Smart Grid Technologies (ISGT) Europe*, 2018.

[c.1] **C. Crozier**, D. Apostolopoulou, M. McCulloch, Numerical analysis of national travel data to assess the impact of UK fleet electrification, *Power Systems Computation Conference*, 2018.

Invited Talks

Mar 2023   UC Davis "Power sector decarbonization with human-in-the-loop"

Mar 2023   Duke University "Power sector decarbonization with human-in-the-loop"

Mar 2023   Cornell University "Power sector decarbonization with human-in-the-loop"

Mar 2023   Cornell Tech "Power sector decarbonization with human-in-the-loop"

Feb 2023   Carnegie Mellon University "Power sector decarbonization with human-in-the-loop"

Feb 2023   Georgia Tech "Power sector decarbonization with human-in-the-loop"

Jan 2023   Rice University "Power sector decarbonization with human-in-the-loop"

Dec 2022   Texas A&M University "Power sector decarbonization with human-in-the-loop"

Oct 2022   INFORMS "Robust pricing for residential demand response with human-in-the-loop"

Mar 2022   Imperial College London "Large scale low carbon electricity networks with human-in-the-loop"

Mar 2022   Boston University "Large scale low carbon electricity networks with human-in-the-loop"

Feb 2022   MIT "Large scale low carbon electricity networks with human-in-the-loop"

Feb 2022   Temple University "Large scale low carbon electricity networks with human-in-the-loop"

Jan 2022   University of Oxford "Developing scalable algorithms for ARPA-E grid optimization competition"

Dec 2021   Newcastle University "Developing scalable algorithms for ARPA-E grid optimization competition"

Oct 2021   INFORMS "Approximations and heuristics for fast security constrained optimal power flow"

Oct 2021   ARPA-E Grid Optimization Competition Outreach Event "Approximations and heuristics for fast security constrained optimal power flow"

Oct 2017   Oxford Institute for Energy Studies Workshop on Electric Vehicles and Public Policy "The impacts of electric mobility on the power grid"

Sep 2017   Warwick Manufacturing Group Catapult Energy Storage Conference "The impacts of electric mobility on the power grid"

Mentored Students

2022	Calla Winner, *Undergraduate Research Assistant, University of Colorado Boulder*
2020-2022	Aisling Pigott, *PhD Student, University of Colorado Boulder*
2021-2022	John Montagu, *Masters Student, University of Colorado Boulder*
2020-2021	Meiyi Li, *PhD Student, Carnegie Mellon University*
2020-2021	Yuhan Du, *Masters Student, Carnegie Mellon University*
2019	Lyn Yeoh, *Undergraduate Research Assistant, University of Oxford*

Teaching Experience

2021	Guest Lecturer, University of Colorado Boulder, *Grid Connected Systems*
2020	Project Assessor, Carnegie Mellon University, *Energy Transport and Storage*
2017-2019	Stipendiary Lecturer, Christ Church (Oxford), *Electrical Engineering and Mathematics*
	» Delivered weekly tutorials to 1st and 2nd years on mathematics and control systems topics
2018-2019	Stipendiary Lecturer, Mansfield College (Oxford), *Electrical and Information Engineering*
	» Delivered weekly tutorials to 1st and 2nd years on various electrical engineering topics
2017-2018	Teacher, Department of Engineering Science, University of Oxford, *Signal and Image Analysis*
	» Taught 24 student class, including setting practice exam and assisting with practical exercise
2016-2017	Lab Demonstrator, Department of Engineering Science, University of Oxford *Microcontrollers*
	» Helped run a five day laboratory where students designed microcontroller-based projects.

Industry Experience

2018-pres	Consultant Research Scientist, *Various*
	» Developed and integrated power flow physics into energy trading algorithm
	» Built cost optimization for smart hot water tanks to respond to LMPs
2018	Data Scientist Intern - Route planning for autonomous vehicles, *Five AI*
2015	Control Engineering Intern - Automated submarine operations, *Rolls-Royce Nuclear*

Professional Service

2022	Session Chair, *International Conference on Probabilistic Methods Applied to Power Systems*
2021	Session Chair, *INFORMS Annual Meeting*
2017-pres	Reviewer, *IEEE TSG, TPWRS, TTE, PESGM, PES Letters*

Outreach & Engagement

2020-pres	Created scientific animations for Twitter that have attracted over 600,000 views.
2020-pres	Write and manage a personal science communication blog, which has had over 40,000 views.
2019	Filmed video series showing an undergraduate engineering interview with over 75,000 views.
2019	Helped create a series of challenges designed to help students teach themselves to code in Python.
2018	Ran an engineering workshop for school leavers as part of Christ Church Horizons program.
2015-2016	Access and academic affairs officer at Christ Church – co-ordinated outreach and the open day.

Coding Languages

Expert: Python, MATLAB
Advanced: C++, SQL, Javascript
Proficient: C, Julia