

Curriculum Vitae: Oliver Ruhnau

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Short bio

I am an Assistant Professor of Energy Market Design at the University of Cologne, a Research Scientist at the affiliated Institute of Energy Economics (EWI), and Founder and Director of the consultancy *tournesol energy*. My research interests lie in energy economics and energy market design, in the context of the sustainable transition of energy systems. I have (co-)developed several numerical energy market models and applied statistical methods for causal inference. Previously, I was a doctoral and postdoctoral researcher at the Hertie School in Berlin.

Positions

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| 2023 – present | Assistant professor of energy market design at the University of Cologne
Faculty of Management, Economics and Social Sciences |
| 2023 – present | Research scientist at the Institute of Energy Economics (EWI) at the University of Cologne
Acquisition and implementation of research projects |
| 2023 – present | Founder and director of tournesol energy
Consultancy and software on energy systems and markets |
| 2019 – 2023 | Research associate and postdoctoral researcher at the Hertie School
Centre for Sustainability |
| 2017 – 2019 | Data scientist at Digital Energy Solutions by BMW and Viessmann
Tasks: modeling and analysis of integrated energy systems and markets |

Education

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| 2019 – 2022 | Doctoral program in governance at the Hertie School
“Economics of flexible electricity demand” (summa cum laude)
Supervisors: Lion Hirth, Christoph Weber, Ottmar Edenhofer |
| 2011 – 2017 | Bachelor and master of science at RWTH Aachen
Engineering and economics (<i>Wirtschaftsingenieurwesen</i>) |

Initiatives

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| 2022 – present | Co-director of Strommarkttreffen
Network for energy professionals in academia, policy, industry, and nonprofits |
| 2020 – 2021 | Founding member of the d\carb – Future Economy Forum
Organizing public events on the transition toward a sustainable economy |

Teaching

2023 – present	At the University of Cologne Energy Markets and Regulation Energy Market Modeling Energy Market Design Energy and Environmental Economics
2024	At the Florence School of Regulation Loyola Autumn Research School (LARS)
2022 – 2023	At the Hertie School Net-Zero Energy Systems
2022	At the German Academic Scholarship Foundation (Studienstiftung) Net-Zero Energy Systems (w/ Maren Preuß)
2020	At TU Berlin Electricity Economics and Modeling (w/ Anselm Eicke)

Supervision

2023 – present	At the University of Cologne Dissertations: 7x first advisor, 13x second advisor, 9x referee Master's theses: 6x first advisor, 1x second advisor
2020 – 2023	At the Hertie School Master's theses: 8x second advisor

Funding

2025	Research collaboration with the German transmission system operator TenneT
2025	Research initiative with the Society for the Promotion of EWI e.V. Title " Integrated Electricity Market Design " (w/ Philipp Kienscherf and Philip Schnaars)
2024	Consulting project for the German Environment Agency (UBA) Evaluation of energy savings in 2022–2023 (w/ Fabian Arnold and Merit Dressler)
2022	Research project for the Federal Ministry of Education and Research (BMBF) Title "Machine Learning for Electricity Market Research" (w/ Lion Hirth and Lynn Kaack)
2020 – 2021	Stipend from the German Economy Foundation (Stiftung der Wirtschaft)
2013 – 2017	Stipend from the German Academic Scholarship Foundation (Studienstiftung)

Honors

2025	Junior Teaching Award of the WiSo Faculty at the University of Cologne
2021	2nd-Best Student Paper Award of the International Association for Energy Economics
2017 & 2019	Finalist at awards from the German Association for Energy Economics

Research interests

Energy economics, energy policy, electricity markets (wholesale, capacity, retail, balancing), market design, tariff design, market regulation, carbon pricing

Integrated energy systems, wind and solar energy, energy storage, flexible electricity demand, sector coupling, electrification, electric vehicles, electric heat pumps, hydrogen, net-zero energy systems

Numerical and empirical methods, energy market modeling, linear optimization, partial equilibrium models, causal inference, instrumental variables

Publications

[Google Scholar](#)

Full peer-review

1. Moritz, M., Czock, B. H., **Ruhnau, O.**, 2025. [A heated debate – The future cost-efficiency of climate-neutral heating options under consideration of heterogeneity and uncertainty](#). *Energy Policy*.
2. Hirth, L., Khanna, T., **Ruhnau, O.**, 2024. [How aggregate electricity demand responds to hourly wholesale price fluctuations](#). *Energy Economics*. (presented at INREC 2021, ESEE Pisa 2022, EMEE 2022, IAEE 2023)
3. Casas Ferrús, M. N., **Ruhnau, O.**, Madlener, R., 2024. [Portfolio effects in green hydrogen production under temporal matching requirements](#). *Energy Strategy Reviews*.
4. **Ruhnau, O.**, Eicke, A., Sgarlato, R., Tröndle, T., Hirth, L., 2024. [Cost-potential curves of onshore wind energy: the role of disamenity costs](#). *Environmental and Resource Economics*. (presented at IAEE Webinar 2023, EGU 2023)
5. **Ruhnau, O.**, Schiele, J., 2023. [Flexible green hydrogen: The effect of relaxing simultaneity requirements on project design, economics, and power sector emissions](#). *Energy Policy*. (presented at the FSR Annual Sustainability Conference 2022)
6. Muessel, J., **Ruhnau, O.**, Madlener, R., 2023. [Accurate and scalable representation of electric vehicles in energy system models: A virtual storage-based aggregation approach](#). *iScience*. (presented at the Smart Energy Systems Conference 2023)
7. **Ruhnau, O.**, Stiewe, C., Muessel, J., Hirth, L., 2023. [Natural gas savings in Germany during the 2022 energy crisis](#). *Nature Energy*. (presented at FSR Insights 2023, ENERDAY 2023)
8. **Ruhnau, O.**, 2022. [How flexible electricity demand stabilizes wind and solar market values: The case of hydrogen electrolyzers](#). *Applied Energy*. (2nd-Best Student Paper at the IAEE 2021, presented at INREC 2020, IEW 2021, EAERE 2021, EMP-E 2021, BTU 2022)
9. **Ruhnau, O.**, Qvist, S., 2022. [Storage requirements in a 100% renewable electricity system: Extreme events and inter-annual variability](#). *Environmental Research Letters*. (presented at IEW 2022)
10. **Ruhnau, O.**, Bucksteeg, M., Ritter, D., et al., 2022. [Why electricity system models yield different results: Carbon pricing in a model-comparison experiment](#). *Renewable and Sustainable Energy Reviews*. (presented at ENERDAY 2021, OR 2021, IAEE Webinar 2022)
11. Cloete, S., **Ruhnau, O.**, Cloete, J.H., Hirth, L., 2022. [Blue hydrogen and industrial base products: The future of fossil fuel exporters in a net-zero world](#). *Journal of Cleaner Production*.
12. Pöstges, A., Bucksteeg, M., **Ruhnau, O.**, et al., 2022. [Phasing out coal: An impact analysis comparing five large-scale electricity market models](#). *Applied Energy*.
13. Bucksteeg, M., Wiedmann, M., Pöstges, A., **et al.**, 2022. [The transformation of integrated electricity and heat systems—Assessing mid-term policies using a model comparison approach](#). *Renewable and Sustainable Energy Reviews*.
14. Eicke, A., **Ruhnau, O.**, Hirth, L., 2021. [Electricity balancing as a market equilibrium: An instrument-based estimation of supply and demand for imbalance energy](#). *Energy Economics*.

15. Cloete, S., **Ruhnau, O.**, Hirth, L., 2021. [On capital utilization in the hydrogen economy: The quest to minimize idle capacity in renewables-rich energy systems](#). *International Journal of Hydrogen Energy*.
16. **Ruhnau, O.**, Hirth, L., Praktijnjo, A., 2020. [Heating with wind: Economics of heat pumps and variable renewables](#). *Energy Economics*. (presented at YEEES 2019, INREC 2019)
17. **Ruhnau, O.**, Hennig, P., Madlener, R., 2020. [Economic implications of forecasting electricity generation from variable renewable energy sources](#). *Renewable Energy*. (presented at OR 2015)
18. **Ruhnau, O.**, Hirth, L., Praktijnjo, A., 2019. [Time series of heat demand and heat pump efficiency for energy system modeling](#). *Scientific Data*.
19. **Ruhnau, O.**, Bannik, S., Otten, S., Praktijnjo, A., Robinius, M., 2019. [Direct or Indirect Electrification? A review of heat generation and road transport decarbonisation scenarios for Germany 2050](#). *Energy*.

Working papers & works in progress

20. **Ruhnau, O.**, Lehmann, P., 2025. [Green hydrogen support with overlapping climate policies](#). *Working paper*. (presented at NRSE 2024, IAEE 2025)
21. Emelianova, P., Hoffmann-Willers, P., **Ruhnau, O.**, 2025. [Redistribution through cross-border electricity trade: How to achieve Pareto improvement?](#) *Working paper*.
22. Lilienkamp, A., Namockel, N., **Ruhnau, O.**, 2025. [Flexibility in electricity wholesale markets and distribution grids: An integrated model and its application to electric vehicles in Germany](#). *Working paper*.
23. Vey, M., Namockel, N., **Ruhnau, O.**, 2025. [Green charged decision-making: How two-part remuneration, contract flexibility, and environmental nudging drive vehicle-to-grid participation](#). *Working paper*.
24. Tiedemann, S., Sanchez Canales, J., Schur, F., Sgarlato, R., Hirth, L., **Ruhnau, O.**, Peters, J., 2024. [Identifying elasticities in autocorrelated time series using causal graphs](#). *Revise & Resubmit from Econometrica*.
25. Farag, M., **Ruhnau, O.**, 2024. [Decomposing Return and Volatility Connectedness in Northwest European Gas Markets: Evidence from the R2 connectedness approach](#). *Revise & Resubmit from Energy Economics*.
26. Stiewe, C., **Ruhnau, O.**, Hirth, L., 2022. [European industry responds to high energy prices: The case of German ammonia production](#). *Working paper*.
27. **Ruhnau, O.**, Muessel, J., 2022. [Update and extension of the When2Heat dataset](#). *Working paper*.

Conference proceedings, dissertation & book chapters

28. **Ruhnau, O.**, Lundström, L., Dürr, L., Hunecke, F., 2023. [Empirical weather dependency of heat pump load: Disentangling the effects of heat demand and efficiency](#). *19th International Conference on the European Electricity Market*.
29. Muessel, J., **Ruhnau, O.**, Madlener, R., 2023. [Simulating charging behavior of electric vehicles: Review and comparison with empirical data](#). *19th International Conference on the European Electricity Market*.
30. **Ruhnau, O.**, 2022. [The Economics of Flexible Electricity Demand](#). *Dissertation*.
31. Madlener, R., **Ruhnau, O.**, 2021. [Variable renewables and demand flexibility: Day-ahead versus intraday valuation](#). In: Sioshansi, F., Variable Generation, Flexible Demand. *Academic Press*.

Commissioned studies

32. Dressler, M., Lilienkamp, A., Keutz, J., Just, L., **Ruhnau, O.**, 2025. [Assessment of energy-constrained flexibilities in capacity mechanisms](#). *EWI Research Report*.
33. Czock, B., Dressler, M., Keutz, J., Restel, L., **Ruhnau, O.**, Schnaars, P., 2025. [Optimized grid connections for wind and PV: How overplanting can save grid expansion costs](#). *EWI Research Report*.
34. Braungardt, S., Hünecke, K., Loschke, C., **et al.**, 2025. [Ex-post evaluation of energy consumption reduction in 2022–2023](#). *Report for the German Environment Agency (UBA)*.

Software & data

35. Hirth, L., **Ruhnau, O.**, Sgarlato, R., 2021. [The European Electricity Market Model EMMA](#). *Open-source electricity market model, including input data*.

36. Ruhnau, O., 2019. [When2Heat Heating Profiles](#). Dataset at the Open Power System Data platform.

Commentaries

37. Hirth, L., Maurer, C., Ruhnau, O., et al., 2022. [Energy policy and energy industry options for Germany and Europe in view of Russia's attack on Ukraine](#). Open letter at Tagesspiegel Background Energie & Klima.

38. Osorio, S., Pahle, M., Ruhnau, O., 2022. [If buildings renovation fails, the EU ETS pricing mechanism must change](#). *energypost.eu*.

Review service

Academic journals: *Applied Energy*, *Data in Brief*, *Economica*, *Energy Economics*, *Energy Efficiency*, *The Energy Journal*, *Energy Policy*, *Energy Strategy Reviews*, *IET Renewable Power Generation*, *iScience*, *Joule*, *Nature Communications*, *Nature Communications Earth and Environment*, *Nature Energy*, *Resource and Energy Economics*

Grant proposals: [Climate Change AI Innovation Grants](#), [DFG Individual Research Grants](#), [DAAD Research Grants](#)

Policy Statements: [Hydrogen Analysis by the Copernicus Research Project Ariadne](#), [Hydrogen Statement by German Advisory Council on the Environment](#)

Selected media coverage

Written

Frankfurter Allgemeine Zeitung, 2025: [Eine Idee, die Milliarden sparen könnte](#)

Tagesspiegel, 2023: [Gasverbrauch ist in Deutschland 2022 stark zurückgegangen](#)

Financial Times, 2022: [Germany dims the light to cope with Russia gas supply crunch](#)

Spiegel, 2022: [Wer in Deutschland Gas spart – und wer nicht](#)

Zeit Online, 2022: [So schlimm könnte der Gasstopp werden](#)

Tagesspiegel Background Energie & Klima, 2022: [Studie belegt Spareffekt hoher Gaspreise](#)

Radio & podcast

BBC Radio, 2022: [World Business Report on July 8](#)

Terra-X – der Podcast (ZDF), 2022: [Wie gefährdet ist unser Stromnetz?](#)

Television

ARD, 2023: [Tagesschau am 5. Mai um 20:00](#)

Selected talks

Invited speaker & panelist

University of Lucerne, 2025: [8. Tagung zum Recht und Management der Energiewirtschaft](#)

TU Wien, 2025: [Internationale Energiewirtschaftsatung \(Closing Plenary Session\)](#)

Florence School of Regulation, 2023: [FSR Insights on Experience with Emergency Gas Measures](#)

Conferences

International Association of Energy Economics (IAEE), Annual Conference 2021, 2023, 2025, Webinar 2021, 2022, 2023

Smart Energy Systems (SES) Conference, Copenhagen 2021, 2023

European Energy Markets (EEM) Conference, Lappeenranta 2023

European Association of Environmental and Resource Economists (EAERE), Online 2021