

IEGOR RIEPIN

PERSONAL INFORMATION

Background: 
Email: iegor.riepin@tu-berlin.de
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I am a research scientist with expertise in energy economics, energy policy, operations research, and related programmable matter. I am particularly interested in mathematical models, their applications to real world problems, their limitations, and the role in decision making.

It is these interests that bring me to my current role as a postdoc researcher at the [Energy Systems group](#) @ TU Berlin. The overarching goal of our work is to find cost-effective opportunities for climate neutrality.

Aside from my research, I enjoy astrophotography, reading about space exploration, related discoveries and just good sci-fi books. I truly believe in the value of open science, and I try to contribute by sharing my code, data and teaching materials.

EDUCATION

PhD in energy economics (2015-2022)

University: Brandenburg Technical University C-S, Germany

PhD advisors: Prof. Felix Müsgens and Prof. Luis Baringo

My cumulative thesis is titled "*Modeling challenges of modern energy markets: studies on uncertainty, complexity, and constant change*" and is published in [open access](#).

Grade: Summa cum laude (1.0)

Master degree in Power Engineering (2012-2014)

University: Brandenburg Technical University C-S, Germany

Honours degree based on the overall performance (1.2)

Bachelor degree in Heat Power Engineering (2008-2012)

University: ZSEA, Ukraine

Honours degree based on the overall performance (4.98/5)

WORK EXPERIENCES

2022 March → Postdoctoral researcher | Energy system modeler @ [ENSYS](#)

We use methods from operations research and mathematical optimisation researching the most cost-effective pathways to reduce greenhouse gas emissions in energy systems. Our group also maintains the [PyPSA ecosystem](#) - an open-source python environment for state-of-the-art energy system modelling. Currently, I lead the modelling work for the 24/7 Carbon-Free Energy by 2030 project, which is a research collaboration with Google. Details are at the project page 247cfe.github.io/ This research is open and reproducible: github.com/PyPSA/247-cfe

2021 September → 2022 February Research fellow | Energy Systems Modelling lead @ [Chair of Energy Economics](#) at BTU C-S

I was leading a team of researchers working on modelling of energy markets, acquisition and implementation of third-party research projects with energy industry and government stakeholders. My job in leading the team included managing ongoing research activities, modelling workflow and making sure we do the right things.

2014 November → 2021 August Research fellow @ [Chair of Energy Economics](#) at BTU C-S

I have carried out research on energy economics and energy systems modeling. The topics included infrastructure investments, decisions under uncertainty, robust planning of energy systems, risk-aversion, sector coupling and energy auctions. In this period, my PhD supervisor and I developed an “Energy systems modelling” study course at BTU C-S. The class focuses on the intersection of energy economics, operations research and systems modelling. The course gets usually very warm feedback from students. Apart from that, I was teaching “Power System Economics 101/102” classes.

ACADEMIC RESEARCH VISITS

August 2023 → September 2023 I had a research visit to a [Scalable Systems Laboratory](#) headed by Prof. Victor Zavala at University of Wisconsin-Madison, USA. My work there focused on optimization problems for space-time load shifting by data centers.

September 2019 → October 2019 I had a research stay in a [Sustainable Energy Systems Integration & Transitions Group](#) headed by Prof. Madeleine McPherson at UVIC, Victoria BC, Canada. My work there focused on robust optimization algorithms applied to electricity system expansion problems. Victoria BC is simply a fantastic place.

THIRD-PARTY PROJECTS

2022 March → @TUB – 24/7 Carbon-Free Energy Procurement. Funding: Google. Project webpage: 247cfe.github.io/ Background: [Google sustainability](#).

2021 → 2022 @BTU – TransHyDE (System analysis of transport solutions for green hydrogen). Funding: BMBF (Federal Ministry of Education and Research). Cooperation: >30 partners. Project webpage: wasserstoff-leitprojekte.de.

2017 @BTU – Design of auctions for market premia for onshore wind generation: theoretical and experimental testing. Cooperation: CERGE-EI. [Summary](#).

2016 @BTU – Strategy 2020: modelling of forward prices for natural gas in European gas markets. Funding: industry partner. Cooperation: r2b energy consulting GmbH.

2014 → 2016 @BTU – Fundamental gas market analysis in a context of the German energy transition process. Funding: gas trading utility. Cooperation: r2b energy consulting GmbH. [Summary](#)

PEER-REVIEWED JOURNAL ARTICLES

In review: [On the means, costs, and system-level impacts of 24/7 carbon-free energy procurement](#)

Riepin, I., Brown, T.

Working paper: <https://zenodo.org/records/10407831>

Code: <https://github.com/Irieo/247-procurement-paper>

In review: **Temporal regulation of renewable supply for electrolytic hydrogen**
Zeyen, E., Riepin, I., Brown, T.

Working paper: <https://zenodo.org/records/8324521>

Code: <https://zenodo.org/record/7457441>

Energy Economics (2023): **Risk aversion and flexibility options in electricity markets**

Möbius, T., Riepin, I., Müsgens, F., van der Weijde A. H.

DOI: doi.org/10.1016/j.eneco.2023.106767

Working paper: <https://arxiv.org/abs/2110.04088>

Code: <https://github.com/BTU-EnerEcon/RiskAv>

Applied Energy (2022): **Adaptive robust optimization for European strategic gas infrastructure planning**

Riepin, I., Schmidt, M., Baringo, L., Müsgens, F.,

DOI: doi.org/10.1016/j.apenergy.2022.119686

Code: <https://github.com/Irieo/ARO-GasInfrastructure>

Working paper: www.optimization-online.org/DB_HTML/2021/10/8654.html

Energy Policy (2022): **Policy choices and outcomes for the global competitive procurement of offshore wind**

Jansen, M., Beiter, P., Riepin, I., Müsgens, F. Juarez Guajardo-Fajardo, V., Staffell, I., Bulder, B., Kitzing, L.

DOI: [10.1016/j.enpol.2022.113000](https://doi.org/10.1016/j.enpol.2022.113000)

Data: <https://zenodo.org/record/6524754>

Working paper: <https://arxiv.org/abs/2202.12548>

Applied Energy (2021): **Modelling uncertainty in coupled electricity and gas systems—Is it worth the effort?**

Riepin, I., Möbius, T., Müsgens, F.

DOI: [10.1016/j.apenergy.2020.116363](https://doi.org/10.1016/j.apenergy.2020.116363)

Code: <https://github.com/Irieo/IntEG>

Working paper: <https://arxiv.org/abs/2008.07221>

Nature Energy (2020): **Offshore wind competitiveness in mature markets without subsidy**

Jansen, M., Staffell, I., Kitzing, L., Quoilin, S., Wiggelinkhuizen, E., Bulder, B., Riepin, I., Müsgens, F.

DOI: <https://www.nature.com/articles/s41560-020-0661-2>

Code: <https://zenodo.org/record/3906565>

Supplementary data: <https://zenodo.org/record/3906325>

Nature Energy News & Views: [Leaving the competition in its wake](#)

Media coverage: [125 news stories](#)

Energy Journal (2019): **Seasonal flexibility in the European natural gas market**

Riepin, I., Müsgens, F.

URL: <http://www.iaee.org/en/publications/ejarticle.aspx?id=3779>

Code: <https://github.com/Irieo/SeasonalFlex>

Cambridge Working Papers Series:

DOI: doi.org/10.17863/CAM.43923 | [Abstract](#) | [Non-Technical Summary](#)

CONFERENCE PAPERS

IEEE EEM (2022): **Modeling of Extreme Weather Events—Towards Resilient Transmission Expansion Planning**
 Bernecker, M., Riepin, I., Müsgens, F.
 DOI: [10.1109/EEM54602.2022.9921145](https://doi.org/10.1109/EEM54602.2022.9921145)

IEEE EEM (2020): **Regret analysis of investment decisions under uncertainty in an integrated energy system**
 Möbius, T., Riepin, I.
 DOI: [10.1109/EEM49802.2020.9221935](https://doi.org/10.1109/EEM49802.2020.9221935)

IEEE EEM (2018): **Integrated electricity and gas market modeling—effects of gas demand uncertainty.**
 Riepin, I., Möbius, T., Müsgens, F.
 DOI: [10.1109/EEM.2018.8469790](https://doi.org/10.1109/EEM.2018.8469790)

IEEE EEM (2018): **Is offshore already competitive? Analyzing German offshore wind auctions.**
 Müsgens, F., Riepin, I.
 DOI: [10.1109/EEM.2018.8469851](https://doi.org/10.1109/EEM.2018.8469851) | [Preprint](#) | [Video](#)

IEEE EEM (2016): **Modelling of world LNG market development: focus on US investments and supplies.**
 Montenegro, R., Riepin, I., Hauser, P.
 DOI: [10.1109/EEM.2016.7521361](https://doi.org/10.1109/EEM.2016.7521361)

ZSEA (2011): **Usage of solar energy for heating service and domestic water heating.** Riepin, I. VII all-Ukrainian scientific conference. Vol. 2, pp. 78 - 83.

ZSEA (2011): **Ukrainian market prospects in the field of alternative energy sources.** Riepin, I. The annual conference for graduate students. pp. 186 - 192.

OTHER PUBLICATIONS

Project study (2023): **The value of space-time load-shifting flexibility for 24/7 carbon-free electricity procurement**
 Riepin, I. and Brown, T.
 DOI: <https://zenodo.org/records/8185850>

Project study (2022): **System-level impacts of 24/7 carbon-free electricity procurement in Europe**
 Riepin, I. and Brown, T.
 DOI: <https://zenodo.org/record/7180098>

SSRN paper (2021): **Grok it and use it: Teaching energy systems modeling**
 Riepin, I., Sgarciu, S., Bernecker, M., Möbius, T., Müsgens, F.
 DOI: <https://dx.doi.org/10.2139/ssrn.4320978>

Working paper (2015): **A note on climate policy negotiations at the threshold of COP-21 in Paris**
 Müsgens, F., Poudineh, R., Riepin, I.
 A [note](#) by Oxford Institute for Energy Studies & BTU CS

SCIENCE EXPLAINERS
& MEDIA APPEARANCES

I am not a media person, but occasionally I happen to be in the media to talk about my research in a way that is understandable and interesting to a broader audience.

- [The Week in Green Software: Modeling Carbon Aware Software Podcast](#) @ Environment Variables (November 2023)
- [On space-time load-shifting flexibility for 24/7 carbon-free electricity procurement](#)
[Panel discussion](#) @ Linux Foundation Energy summit Paris, June 2023
- [The era of 'negative-subsidy' offshore wind power has almost arrived](#)
[Guest post](#) @ CarbonBrief (2020)
- [Offshore-Windenergie - subventionsfrei?](#)
[Guest post](#) @ e|n|w.trends (2020)

PUBLIC TALKS AND
SCIENTIFIC OUTREACH

An up-to-date list of my talks can likely be on <https://iriepin.com/>

- [On space-time load-shifting flexibility for 24/7 carbon-free electricity procurement](#)
[Slides](#) @ Eurelectric 24/7 CFE Hub, October 2023
Code: <https://github.com/PyPSA/247-cfe/tree/v0.3>
- [System-level impacts of 24/7 carbon-free electricity procurement in Europe](#)
[Slides](#) @ EWI research seminars, November 2022
Code: <https://zenodo.org/record/7181236>
- [24/7 - A new paradigm for power procurement?](#)
[Slides](#) @ ENERDAY Conference, May 2023
[Slides](#) @ European Climate and Energy Modelling Platform, October 2022
Code: <https://github.com/PyPSA/247-cfe/tree/v0.2>
- [European Natural Gas Infrastructure Expansion Planning: An Adaptive Robust Optimization Approach](#)
[Slides](#) @ EWI Cologne & BTU CS Research seminars 2021
[Slides](#) @ European Conference on Operational Research, Athens, 2021
Code: <https://github.com/Irieo/ARO-GasInfrastructure>
- [On the costs of ignoring uncertainty and the value of perfect information: a toy model.](#)
[Slides](#) | [Code](#) @ Doctoral seminar, BTU CS, 2019
- [Robust optimization of electricity system expansion](#)
[Slides](#) | [Code](#) @ University of Victoria seminar, 2019
- [Economic impacts of uncertainty in integrated electricity and gas markets](#)
[Slides](#) @ 30th European Conference on Operational Research, Dublin, 2019
- [Integrated electricity and gas market modelling—effects of gas demand uncertainty](#)
[Slides](#) @ EEM2018 Conference, Lodz, 2018
[Slides](#) @ PhD seminar Cottbus-Leipzig-Dresden, 2018
- [Integration of electricity and gas market models](#)
[Slides](#) @ Energy modelling seminar, IER, Universität Stuttgart, 2018

	<ul style="list-style-type: none"> • Application of non-linear and complementarity problems for natural gas market modelling Slides @ Research seminar on mathematical economics, BTU CS, 2017 Slides @ Internal research seminar, BTU CS, 2016 • Natural Gas Storages in Competition with Alternative Flexibility Sources Slides @ 39th IAEE International Conference, Bergen, 2016 Slides @ PhD seminar Cottbus-Leipzig-Dresden, 2016 • Prospects for Shale Gas Exploration in Europe: Ongoing Experience Slides @ 38th IAEE International Conference, Antalya, 2015
TEACHING EXPERIENCE	<p>2014 → Supervision of graduate students on topics in energy economics and all around modeling of energy systems.</p> <p>2017 → 2020 “Energy Systems Modeling” (course development, selected lectures, tutorials, supervision of student projects) Lecture: Prof. Dr. Felix Müsgens Some materials are available at github.com/Irieo/ESM</p> <p>2014 → 2018 “Power System Economics 101” (Winter terms tutorials) and “Power System Economics 102” (Summer terms tutorials) Prof. Dr. Felix Müsgens and Prof. Dr. Stefan Zundel</p>
SCHOLARSHIPS & AWARDS	<p>I am grateful for the following scholarships and awards that supported me during my studies:</p> <ul style="list-style-type: none"> • <i>Promotionsstipendium des Landes Brandenburg, GradV</i>, Postgraduate scholarship 2017-2019 • <i>Rheinstahl foundation study scholarship</i>, Master degree 2014 • <i>STIBET study scholarship, DAAD</i>, Master degree 2013 • <i>Zaporizhia city administration scholarship</i>, Bachelor degree 2010
COMPUTER SKILLS	<p>Programming, scripting and markup languages Python and data science stack (daily), Git (daily), Snakemake (daily), \LaTeX(daily), GAMS (many years of project-related use, research and teaching).</p> <p>Languages My mother tongue is Ukrainian and Russian, but almost everything I do in private and in scientific work is in English. I also speak German when needed.</p>
FOLLOW THE STARS	<p>I do enjoy astrophotography and even have a small blog page about it. When I am done with science, I will be a space cowboy.</p>
FUN FACT	<p>My wonderful wife holds a PhD in Energy Economics and is also an energy modeller & consultant by profession. I wish one of us would have chosen to be a doctor.</p>

Berlin, December 2023