Iegor Riepin

I am a postdoctoral researcher at the Energy Systems group @ TU Berlin.

My research focuses on energy economics, operations research, and energy-related programmable matter. The overarching goal is to find cost-effective opportunities for climate neutrality.

I find it enjoyable to answer challenging questions using mathematical models. I believe in open science, and I try to contribute by sharing my code, data and teaching materials.

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Work experience

2022.03 – present **Postdoctoral researcher | Energy system modeler**
Department of Energy Systems ENSYS @ TU Berlin
I spend most of my time writing and solving mathematical models in the energy field. Our group maintains the PyPSA ecosystem - an open-source python environment for state-of-the-art energy system modelling: https://pypsa.org/

Currently I work on the 24/7 Carbon-Free Energy by 2030 project by Google. In October 2022, we published a study on the system-level impacts of 24/7 CFE procurement. In July 2023, we published a study on the value of space-time load-shifting flexibility for data centers. The research work on this project is open and reproducible: https://github.com/PyPSA/247-cfe

2014.11 – 2022.02 **Research fellow | PhD student**
ESM group lead (2021.09 – 2022.02)
Brandenburg University of Technology (BTU CS), Germany
Chair of Energy Economics
I have carried out independent and third-party funded research in the fields of energy economics and energy systems modeling. The topics included infrastructure investments, decisions under uncertainty, risk-aversion, sector coupling and energy auctions.

2019.09 – 2019.10 **Visiting researcher**
University of Victoria, Canada | Institute for Integrated Energy Systems
My work was focused on robust optimization algorithms applied to

electricity system expansion problems.

2013.10 – 2014.09 **Student assistant**
Chair of Energy Economics, BTU CS

2013.09 – 2013.10 **Intern**
DIW Berlin, Institute for Economic Research, Germany
Department: Energy, Transportation, Environment

Academic background

2014.11 – 2022.06 **PhD (summa cum laude) in energy economics**
Supervision: Prof. Felix Müsgens | BTU CS
PhD thesis '*Modeling challenges of modern energy markets: studies on uncertainty, complexity, and constant change*' is published in open access.

2012 – 2014 **M.Sc. (Hon) in Power Engineering**
BTU CS, Germany | Final grade: 1.2 (/1)

2008 – 2012 **B.Sc. (Hon) in Heat Power Engineering**
ZSEA, Ukraine | Final grade: 4.98 (/5)

Third-party projects

2022.03 – present *@TUB:* **24/7 Carbon-Free Energy Procurement.** Funding: Google LLC. See **Operating on 24/7 Carbon Free Energy by 2030** webpage.

2021 (ongoing) *@BTU:* TransHyDE: **System analysis of transport solutions for green hydrogen.** Funding: BMBF (Federal Ministry of Education and Research) Cooperation: >30 partners | Project web page

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

1. 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 at arXiv (2021) | Code

2. *Working paper.* **Temporal regulation of renewable supply for electrolytic hydrogen**

Zeyen, E., Riepin, I., Brown, T.
Working paper DOI: https://zenodo.org/records/8324521 | Code

3. 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
Working paper at Optimization Online (2021)

4. 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 | Data
Working paper at arXiv (2022)

5. 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 | Code
Working paper at arXiv (2020): arxiv.org/abs/2008.07221

6. 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: 10.1038/s41560-020-0661-2 | Code | Supplementary data
Nature Energy News & Views | Media coverage: 118 news stories from 116 outlets

7. The Energy Journal (2022). **Seasonal flexibility in the European natural gas market**.
Riepin, I., Müsgens, F.
DOI: 10.5547/01956574.43.1.irie | Code
Cambridge Working Papers in Economics (2019)
DOI: 10.17863/CAM.43923 | Abstract | Non-Technical Summary | PDF

(Mostly peer-reviewed) Conference papers

8. 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

9. 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

10. 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 | preprint version | Video

11. IEEE EEM (2018). **Is offshore already competitive? Analyzing German offshore wind auctions.**
    Müsgens, F., Riepin, I.
    DOI: 10.1109/EEM.2018.8469851 | preprint version | Video

12. 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

13. 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.

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

Science explainers, media, project reports

15. Environment Variables podcast (November 2023): The Week in Green Software: Modeling Carbon Aware Software.
    Podcast link

16. Project study (2023). **The value of space-time load-shifting flexibility for 24/7 carbon-free electricity procurement**
    Riepin, I. and Brown, T.
    Zenodo

17. Project study (2022). **System-level impacts of 24/7 carbon-free electricity procurement in Europe.**
    Riepin, I. and Brown, T.
    Zenodo

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

19. CarbonBrief (2020). **The era of 'negative-subsidy' offshore wind power has almost arrived**
    Riepin, I., Jansen, M., Staffell, I., Müsgens, F.
    Guest post

20. e|m|w.trends (2020). **Offshore-Windenergie - subventionsfrei?**
    Müsgens, F. and Riepin, I.
    Guest post

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

Some public talks

1. **On space-time load-shifting flexibility for 24/7 carbon-free electricity procurement**
PDF @ Eurelectric 24/7 Carbon Free Energy (CFE) Hub meeting, October 2023
2. **Technical Research Fueling NextGen Actions**
Youtube @ Linux Foundation Energy summit, panel discussion, Paris
3. **Navigating to a greener Europe with 24/7 hourly clean electricity procurement**
PDF | Code @ Enerday, Dresden 2023
4. **24/7 A new paradigm for power procurement?**
PDF | Code @ European Climate and Energy Modelling Platform 2022
5. **European Natural Gas Infrastructure Expansion Planning: An Adaptive Robust Optimization Approach**
PDF | Code @ EWI Cologne & BTU CS Research seminars 2021
PDF | Code @ European Conference on Operational Research, Athens, 2021
6. **The costs of ignoring uncertainty and the value of perfect information: a toy model**.
PDF | Code @ Doctoral seminar, BTU CS, 2019
7. **Robust optimization of electricity system expansion**.
PDF | Code @ University of Victoria, Canada, 2019
8. **Economic impacts of uncertainty in integrated electricity and gas markets.**
PDF @ 30th European Conference on Operational Research, Dublin, Ireland, 2019
9. **Integrated electricity and gas market modelling – effects of gas demand uncertainty.**
PDF @ EEM2018 Conference, Lodz, Poland, 2018
PDF @ PhD seminar Cottbus-Leipzig-Dresden, 2018
10. **Integration of electricity and gas market models.**
PDF @ Energy modelling seminar, IER, Universität Stuttgart, 2018
11. **Application of non-linear and complementarity problems for natural gas market modelling.**
PDF @ Research seminar with chair of Mathematical Economics, BTU CS, 2017
PDF @ Internal research seminar, BTU CS, 2016
12. **Natural Gas Storages in Competition with Alternative Flexibility Sources.**
PDF @ 39th IAEE International Conference, Bergen, Norway, 2016
PDF @ PhD seminar Cottbus-Leipzig-Dresden, 2016
13. **Prospects for Shale Gas Exploration in Europe: Ongoing Experience**.
PDF @ 38th IAEE International Conference, Antalya, Turkey, 2015

Teaching experience

2014 - present	Supervision of master's and bachelor's theses, and study projects in energy economics and all around modeling of energy systems.
WS17/18 WS18/19 WS19/20	**Energy Systems Modeling** (course development, selected lectures, tutorials, supervision of student projects) Lecture: Prof. Dr. Felix Müsgens | Course GitHub page
From WS14/15 until SS2018	**Power System Economics 1** (Winter terms | tutorials) **Power System Economics 2** (Summer terms | tutorials) Lecture: Prof. Dr. Felix Müsgens and Prof. Dr. Stefan Zundel

Scholarships & awards

2017 – 2019	Postgraduate scholarship, BTU CS (Promotionsstipendium des Landes Brandenburg, GradV)
2014	Rheinstahl foundation study scholarship (Master degree)
2013	STIBET study scholarship, DAAD (Master degree)
2010	Zaporizhia city administration scholarship (Bachelor degree)

Some technical skills and languages

Mathematical modeling & programming	**GAMS** (project-related use, research and teaching) **Python** (project-related use, research and hobby projects) **Git** (version control) **Snakemake** (scientific workflow management)
Languages	**English** (fluent) **German** (C1 certificate) **Ukrainian** (native fluent) **Russian** (native fluent)

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Berlin, November 2023