

Lion Hirth

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Short Bio

Prof. Dr. Lion Hirth is Professor of Energy Policy at Hertie School, a Berlin-based public policy school, and founder and director of **Neon**, a boutique energy economics consulting firm. Trained as an economist, he is an expert in electricity markets, power systems, and energy policy. His academic articles are published in top energy economics and engineering journals, have won several awards, and are among the most cited in the field. Lion was a member of Germany's gas commission and has advised clients across the private and public sectors, including the German government, the International Energy Agency, the European Commission, transmission system operators, utilities, and commodity trading houses. Being a thought leader in public policy debates, he has shaped the discussion on matters such as energy crisis response, bidding zone split, and renewables support policies. With a social media following of more than 70k, NZZ ranks Lion among Germany's most influential economists. Before acquiring a Ph.D., he spent five years with Vattenfall, a utility.

Positions

- 2017 – present **Professor at Hertie School**
Professor of Energy Policy at Hertie School, a public policy school, teaching classes on energy economics, electricity markets, power market modeling, climate change, and economic growth
- 2014 – present **Director of Neon**
Founder and director of Neon Neue Energieökonomik GmbH, a Berlin-based boutique consulting firm for energy economics, advising international clients from the public and private sector to design and navigate power systems and markets
- 2014 – 2016 **Post-doc researcher at MCC**
Post-doctoral researcher at Mercator Research-Institute for Global Commons and Climate Change, a think tank for climate economics
- 2009 – 2014 **Analyst at Vattenfall**
Market analyst at Vattenfall Group Strategy, assessing renewable energy policy, long-term electricity prices and balancing energy

Education

- 2012 – 2014 **Economics (Ph.D.), Technical University of Berlin**
“The Economics of Wind and Solar Variability” (*summa cum laude*), supervised by Ottmar Edenhofer
- 2004 – 2009 **Economics (Diploma), University of Tübingen**
Final grade 1.1 on a scale from 1.0 to 5.0, best degree in economics
- 2005 – 2010 **Political Science (Magister Artium), University of Tübingen**
Final grade “excellent”
- 2001 – 2009 **Study abroad and research visits**
UMass (USA), U Católica (Chile), John Abbot College (Canada), PIK (Germany)
- 1994 – 2004 **Willi-Graf-Gymnasium, Munich**
Final grade 1.2 on a scale from 1.0 to 6.0

Teaching

- 2017 – present Master-level courses at Hertie School
- 2014 – present Executive training seminars
- 2006 – 2018 TU Berlin, HTW, Deutsche Schülerakademie

Honors

- 2024 ELNET Young Leader
- 2022 Member of the Gas Commission of the German government
- 2021 TenneT Future Market Design sounding board
- 2020, '21, '22 Top 40 under 40, Das Capital
- 2018 Excellence in Teaching Award, Hertie School
- 2017 – 2018 Fellow Freies Wissen, Wikimedia Deutschland
- 2017 Open Science Award of Schleswig-Holstein for OPSD
- 2015 Best paper award, INREC conference Essen
- 2014 Best working paper award, International Association for Energy Economics
- 2013 Selected paper, Solar Integration Workshop London
- 2013 Best paper award and Best poster award, IEWT conference Vienna
- 2011 Best degree in economics, University of Tübingen
- 2005 – 2010 Scholarship, Studienstiftung des Deutschen Volkes
- 2007 – 2009 Scholarships, Hertie-Stiftung, DAAD, University of Massachusetts

Service to the Community

Founder, director of *Strommarkttreffen*, a 5000+ member network for professionals in energy

Co-founder of the *Openmod Initiative*, a network for open-source energy modeling

Peer review for *Energy Economics*, *The Energy Journal*, *IEEE Transactions on Power Systems*, *IEEE Transactions on Renewable Energy*, *Energy Policy*, *EEEE*, *Research Council of Norway*

Research Interest

Electricity market design: wholesale markets, investment incentives, financial markets and hedging, balancing energy, flexibility

The economics of renewables: market value of wind and solar energy, renewables system integration, (whole) system costs

Network pricing: redispatch and congestion management, locational incentives, zonal and nodal pricing, cross-border trade and market coupling

Energy policy instruments: support schemes, carbon pricing

Energy modeling: numerical power market and energy system modeling, open-source software and open data in energy

Research Grants

START. Project funded by BMBF and headed by Potsdam Institute of Climate Impact Research (Hertie share EUR 42k). Within the large and diverse START project, we empirically researched locational investment signals in electricity systems. 2017-20

MODELX-Polins. Project funded by BMWi and headed by the University of Duisburg-Essen (Hertie share EUR 82k). In this model comparison exercise, we tested and validated various energy system models with respect to policy instruments such as carbon pricing. 2019-21

SENTINEL. Project funded by the European Commission under the Horizon 2020 program headed by ETH Zürich (Hertie share EUR 312k). SENTINEL fosters the quality and transparency of energy system models through open modeling. 2019-22

ARIADNE. Kopernikus project funded by BMBF headed by Potsdam Institute of Climate Impact Research (Lion's share EUR 291k). Lion's team contributes by researching locational incentives in power markets. 2020-23

ML-Strom. Joint project by data scientists and energy experts to apply machine learning to electricity market research (Lion's share EUR 225k). 2022-25

ARIADNE II. BMBF- funded project headed by PIK (Lion's share EUR 371k). Lion's research concern long-term electricity contracts and risk mitigation. 2023-26

Publications

Lion has published 39 articles in peer-reviewed economics and engineering journals, including single-author papers in the leading field outlets *Energy Economics*, *The Energy Journal*, and *Applied Energy*. Google Scholar lists a total of 8400 citations, yielding an h-index of 37. Two of his papers are the most cited in recent times in major field journals, “Optimal Share” in *The Energy Journal* and “Market Value” in *Energy Economics*.

RePEc lists Lion among the top 5% energy economists; FAZ lists him among the top 30 German research economists and NZZ among the 40 most influential German economists. Lion’s publications have won several awards, including the best paper award of the International Association for Energy Economics.

Google Scholar · RePEc · ResearchGate · SSRN · ORCID · Scopus

Journal Articles (Peer-Reviewed)

39. **Cross-border cannibalization**, *Energy Economics*, 2025 (w/ Clemens Stiewe, Alice Lixuan Xu & Anselm Eicke). open access
38. **Profile contracts for electricity retail customers**, *Energy Policy*, 2024 (w/ Christian Winzer, Ramírez-Molina & Ingmar Schlecht). open access
37. **How aggregate electricity demand responds to hourly wholesale price fluctuations**, *Energy Economics*, 2024 (w/ Oliver Ruhnau & Tarun Khanna). open access
36. **Financial Contracts for Differences**, *Energy Policy*, 2024 (w/ Ingmar Schlecht & Christoph Maurer). open access
35. **Natural gas savings in Germany during the 2022 energy crisis**, *Nature Energy*, 2023 (w/ Oliver Ruhnau, Clemens Stiewe, Jarusch Muessel). pdf
34. **Cost-Potential Curves of Onshore Wind Energy: the Role of Disamenity Costs**, *Environmental and Resource Economics*, 2022 (w/ Oliver Ruhnau, Anselm Eicke, Raffaele Sgarlato & Tim Tröndle).
33. **Blue hydrogen and industrial base products**, *Journal of Cleaner Production*, 2022 (w/ Schalk Cloete, Oliver Ruhnau & Jan Hendrik Cloete). pdf
32. **Carbon pricing in a model-comparison experiment**, *Renewable & Sustainable Energy Reviews*, 2021 (w/ Oliver Ruhnau and others).
31. **Electricity balancing as a market equilibrium**, *Energy Economics*, 2021 (w/ Anselm Eicke & Oliver Ruhnau). pdf
30. **Reducing carbon emissions of households through monetary incentives and behavioral interventions: a meta-analysis**, *Nature Energy*, 2021 (w/ Tarun Khanna and others)
29. **Eyes on the Price: Which Power Generation Technologies Set the Market Price?**, *Economics of Energy & Environmental Policy*, 2021 (w/ Eike Blume-Werry, Thomas Faber, Claus Huber & Martin Everts) pdf
28. **On capital utilization in the hydrogen economy**, *International Journal of Hydrogen Energy*, 2021 (w/ Schalk Cloete & Oliver Ruhnau). pdf

27. **Open Data for Electricity Modeling: Legal Aspects**, *Energy Strategy Reviews*, 2020. open access
26. **Heating with Wind**, *Energy Economics*, 2020 (w/ Oliver Ruhnau & Aaron Praktiknjo). pdf
25. **Locational investment signals in electricity markets**, *The Energy Journal*, 2020 (w/ Anselm Eicke & Tarun Khanna). pdf
24. **Reforming the electric power industry in developing economies: Evidence on efficiency and electricity access outcomes**, *Energy Policy*, 2020 (w/ Andrea Dertinger). pdf
23. **Flexible power and hydrogen production: Finding synergy between CCS and variable renewables**, *Energy*, 2020 (w/ Schalk Cloete). open access
22. **Technology-neutral auctions for renewable energy: EU law vs. reality in Member States**, *Journal for European Environmental & Planning Law*, 2019 (w/ Lars Jerrentrup, Bastian Lotz & Silvana Tiedemann). pdf
21. **Time series of heat demand and heat pump efficiency for energy system modeling**, *Nature Scientific Data*, 2019. (w/ Oliver Ruhnau & Aaron Praktiknjo). open access
20. **Short-Term Electricity Trading for System Balancing**, *Renewable & Sustainable Energy Reviews*, 2019 (w/ Christopher Koch). pdf
19. **Open Power System Data - Frictionless data for electricity system modelling**, *Applied Energy*, 2019 (w/ Frauke Wiese, Ingmar Schlecht, Juliane Reimann, Clemens Gerbaulet, Martin Jahn, Jonathan Mühlenpfordt, Friedrich Kunz, Wolf-Peter Schill & Casimir Lorenz). pdf
18. **The ENTSO-E Transparency Platform. An assessment of Europe's most ambitious electricity data platform**, *Applied Energy*, 2018 (w/ Jonathan Mühlenpfordt & Marisa Bulkeley). open access
17. **Opening the black box of energy modelling: strategies and lessons learned**, *Energy Strategy Reviews*, 2018 (w/ Stefan Pfenninger, Ingmar Schlecht, Eva Schmid, Frauke Wiese, Tom Brown, Chris Davis, Matthew Gidden, Heidi Heinrichs & Clara Heuberger). open access
16. **What caused the drop of European electricity prices? A factor decomposition analysis**, *The Energy Journal*, 2018. open access
15. **The importance of open data and software: is energy research lagging behind?**, *Energy Policy*, 2017 (w/ Stefan Pfenninger, Joseph DeCarolis, Sylvain Quoilin & Iain Staffell). open access
14. **The benefits of flexibility: The value of wind energy with hydropower**, *Applied Energy*, 2016. pdf
13. **The role of capital costs for decarbonizing the power sector**, *Environmental Research Letters*, 2016 (w/ Jan Steckel). pdf
12. **System-friendly Wind Power**, *Energy Economics*, 2016 (w/ Simon Müller). pdf | Best paper award INREC
11. **Why Wind is not Coal: On the Economics of Electricity Generation**, *The Energy Journal*, 2016 (w/ Falko Ueckerdt & Ottmar Edenhofer). pdf
10. **Carpe diem: A novel approach to select representative days for long-term power system models with high shares of renewable energy sources**, *Energy*, 2016 (w/ Paul Nahmmacher, Eva Schmid & Brigitte Knopf). open access

9. **Balancing Power and Variable Renewables: Three Links**, *Renewable & Sustainable Energy Reviews*, 2015 (w/ Inka Ziegenhagen). pdf
8. **Integration Costs Revisited – An economic framework of wind and solar variability**, *Renewable Energy*, 2015 (w/ Falko Ueckerdt & Ottmar Edenhofer). pdf | Best paper award IAEE | Best poster award IEWT | Best paper award IEWT
7. **The Optimal Share of Variable Renewables: How the Variability of Wind and Solar Power affects their Welfare-optimal Deployment**, *The Energy Journal*, 2015. pdf | review
6. **The Market Value of Solar Power: Is Photovoltaics Cost-Competitive?**, *IET Renewable Power Generation*, 2015. pdf | Selected paper Solar Integration Workshop
5. **The Market Value of Variable Renewables: The effect of solar wind power variability on their relative price**, *Energy Economics*, 2013. pdf
4. **Redistribution Effects of Energy and Climate Policy: The electricity market**, *Energy Policy*, 2013 (w/ Falko Ueckerdt). pdf
3. **On the Economics of Renewable Energy Sources**, *Energy Economics*, 2013 (w/ Ottmar Edenhofer, Brigitte Knopf, Michael Pahle, Steffen Schloemer, Eva Schmid & Falko Ueckerdt). pdf
2. **System LCOE: What are the costs of variable renewables?**, *Energy*, 2013 (w/ Falko Ueckerdt, Gunnar Luderer & Ottmar Edenhofer). pdf
1. **Carbon lock-out: Advancing renewable energy policy in Europe**, *Energies*, 2012 (w/ Paul Lehmann, Felix Creutzig, Melf-Hinrich Ehlers, Nele Friedrichsen, Clemens Heuson & Robert Pietzcker). open access

Working Papers / Preprints

- Redispatch Markets in Zonal Electricity Markets, 2020 (w/ Ingmar Schlecht)
- Markets for Local Flexibility in Distribution Networks, 2019 (w/ Julia Radecke & Joseph Hefele)
- Congestion Management: From Physics to Regulatory Instruments, 2018 (w/ Samuel Glismann)
- The Market Value of Wind and Solar Power: An Analytical Approach, 2016 (w/ Alexander Radebach)
- Minimal Thermal Generation in Power Systems, 2015
- How much electricity do we consume? 2014 (w/ Maximilian Schumacher)

Dissertation

- The Economics of Wind and Solar Variability, TU Berlin, 2014.

Commissioned Reports

- Intelligentes Laden, *Kurzgutachten für Rabot Energy*, 2025
- Weiterentwicklung der individuellen Netzentgelte, *Kurzgutachten für TenneT TSO*, 2024
- Mehrwert dezentraler Flexibilität, *Kurzgutachten für ZVEI*, 2024

Cross-border forward markets, *Report for German TSOs*, 2024

Systemstützendes Bilanzkreismanagement, *Kurzgutachten*, 2023

Electricity market reform, *Report for European Parliament*, 2023

Stromtarife für Preissicherheit und Flexibilität, *Kurzgutachten für LichtBlick*, 2023

Zeitvariable Netzentgelte, *Kurzgutachten für LichtBlick*, 2023

Windstrom Nutzen statt Abregeln, *Kurzgutachten für Agora Energiewende*, 2022

Öffentliche Ladeinfrastruktur, *Kurzgutachten für Agora Energiewende*, 2022

Dispatch Hubs, *Report for Elia Group*, 2021

Handel auf Basis des Regelleistungs-Abrufs, *Kurzgutachten*, 2021

Evaluierungsbericht der Ausschreibungen für erneuerbare Energien, *Bericht für das Bundesministeriums für Wirtschaft und Energie*, 2019

Kosten- oder Marktbasier? Zukünftige Redispatch-Beschaffung in Deutschland, *Bericht für das Bundesministeriums für Wirtschaft und Energie*, 2019

Cost- or market-based? Future redispatch procurement in Germany, *Report for the German Federal Ministry for Economic Affairs and Energy*, 2019

Open Data for Electricity Modeling, *Report for the German Federal Ministry for Economic Affairs and Energy*, 2018

Zusammenspiel von Markt und Netz im Stromsystem, *Bericht für das Bundesministeriums für Wirtschaft und Energie*, 2018

Nodale und zonale Strompreissysteme im Vergleich, *Bericht für das Bundesministeriums für Wirtschaft und Energie*, 2018

Study on the quality of electricity market data, *Report for the European Commission*, 2018

Electricity Market Design and RE Deployment, *Report for IEA-RETD*, 2016

The Integration Costs of Wind and Solar Power, *Report for Agora Energiewende*, 2015

Op-eds and Interviews

Lokale Preise, Op-ed ifo Schnelldienst, 2025

Die Energiewende günstiger machen, Op-ed FAZ, 2025

Achtung, Stromüberschuss!, Op-ed Tagesspiegel Background, 2024

Der deutsche Strommarkt braucht lokale Preise, Op-ed FAZ, 2024

Hans-Werner Sinns Klimaskepsis im Realitätscheck, Op-ed FAZ, 2023

Protecting electricity consumers from (more) price shocks, Op-ed Euractive, 2023

Six flaws in the EU Electricity Emergency Tool and how to fix them, Op-ed Euractive, 2022

Putin hat sein Erpressungspotenzial praktisch erschöpft, Interview with NZZ, 2022

The Iberian electricity market intervention does not work for Europe, Op-Ed VoXEU/CEPR, 2022

The Greek market design proposal would be the end of electricity markets as we know them, Op-ed Euractive, 2022

Energiemarkt der Zukunft, Interview with Lage der Nation, 2022

Why Spanish-Portuguese proposal to intervene in wholesale energy markets is problematic, Op-ed Euractive, 2022

Wie wir richtig viel Gas sparen, Op-ed Spiegel Online, 2022

Wie Europa auf Putins Gaslieferstopp reagieren kann, Op-ed Handelsblatt, 2022

Putin hat Europa finanziell ausgepresst wie eine Zitrone, Interview with Tagesspiegel, 2022

Alternative Gaslieferanten haben wir quasi ausgeschöpft, Interview with Cicero Online, 2022

Panel discussion „Zur Diskussion“, Deutschlandfunk, 2022

Teaching

Course	Term	Evaluation
Energy Economics Power systems and markets	2024 Fall	95
	2024 Spring	93
	2023 Spring	93
	2022 Fall	90
	2022 Spring	95
	2021 Spring	94
	2020 Spring	90
	2019 Fall	95
	2018 Fall	95
Renewable Energy Policies Renewables support schemes, auctions, and governance	2022 Fall	95
	2021 Fall	90
	2019 Fall	94
	2018 Fall	94
	2017 Fall	91
Electricity Market Design Electricity markets, trading and regulation	2024 Fall	98
	2024 Spring	95.5
	2023 Spring	90
	2022 Spring	95
Electricity System Modeling Excel- and GAMS-based numerical modeling	2022 Fall	90
	2020 Fall	90
	2019 Spring	91
	2018 Spring	90
Emissions Pricing (with Christian Flachsland)	2024 Spring	

Carbon taxes and emissions trading schemes	2023 Spring	92
	2021 Spring	94
	2019 Fall	93
	2018 Fall	95
Economic Growth and Climate Change	2024 Spring	
The theory and empirics of sustainable long-term growth	2023 Spring	90
	2022 Spring	87
	2019 Spring	87
	2018 Spring	95
	2017 Spring	89

Supervision

PhD Tarun Khanna (completed, now Assistant Professor)
 Anselm Eicke (completed)
 Oliver Ruhnau (completed, now Assistant Professor)
 Raffaele Sgarlato (completed)
 Silvana Tiedemann
 Clemens Stiewe
 Alice Lixuan Xu
 Jorge Sanchez

Master 50+ students since 2017

Consulting Projects

Non-clearing (Utility). Rapid expansion of renewables, combined with insufficient market integration, is increasing the likelihood of supply exceeding demand—even at very low prices. In these cases, the day-ahead market would not clear. Our project develops a model to predict the probability of such events. Ongoing.

Training (Flex Power). xxx. Ongoing.

Training (FZ Jülich). xxx. Ongoing.

Local signals (BMWK). To efficiently integrate the growing number of flexible consumers into the system, local signals are essential. In this project, we are supporting the German government in the development and evaluation of instruments for local signals. Ongoing.

Progress report solar (BMWK). Along with our partner ZSW, we write the current edition of the regular progress report on solar energy. We are tasked with assessing the impact of dynamic tariffs and dynamic grid fees on small-scale solar. Ongoing.

Electricity strategy (BMWK). Support of Germany's economics ministry in developing and implementing the overall strategy in transforming and decarbonizing the country's electricity supply. Ongoing.

Electricity grid (BMWK). This large project, lead by Consentec, supports the German government in a range of questions related to network expansion planning. We provide advice on grid financing, including cross-border cost sharing and reforms of network charges. Ongoing.

Demand-side flexibility (BMWK). Everyone lives demand-side flexibility, but it hasn't taken off yet. A crucial reason are various regulatory hurdles, from the (lack of) smart meters to peak demand network charges. We support Germany's DOE in this domain. Ongoing.

Renewables support scheme (BMWK). Germany needs to reform its support scheme by 1 Jan 2027. A particular concern are undistorted dispatch incentives for wind and solar energy. Along with our partners Guidehouse and Consentec, we provide assessment and advice on various proposed reforms. Ongoing.

Settlement price (utility). Several European countries move towards more liberal imbalance settlement rules and introduce a symmetric imbalance settlement price. Against this background, we supported a utility updating its trading and investment strategies. 2024-25.

Scheduling process (TSOs). Market parties have to submit a schedule to their connecting TSO, forecasting generation and consumption. However, they often have an incentives to submit a biased forecast. For the German TSOs, we evaluate options to improve schedule accuracy, building on lessons learned from other countries. 2024-25.

Strategic advisory (project developer). For a European wind, solar and battery developer, we provide strategic advice, focusing on capture rates, regulatory change and market design. 2024.

Solar price effect (BSW). Imagine a year without solar energy. With reduced supply, wholesale prices would be much higher than they actually are. For trade association BSW, we empirically quantify this solar price effect. 2024.

Excess electricity (BMWK). The fast expansion of solar energy comes at a price: because many investments small-scale and subject to a feed-in-tariff, they keep generation even if supply exceeds demand. In this project, we forecast the probability of excess electricity situations for coming years and support the German government addressing the problem. Ongoing.

Smart charging (Rabot). Dynamic tariffs allow owners of EVs to benefit financially from charging their cars when it is cheapest. Time-of-use grid fees, intraday optimization, and bidirectional charging leverage such optimization. For Rabot Energy, a smart charging pioneer, we quantify the financials for a range of typical German drivers. 2024-25.

Injection charges (TenneT). Countries such as the Netherlands are discussing introducing injection charges as a mean to distribute offshore grid connection costs more fairly. With our partner Consentec, we provide an economic assessment such injection charges. 2024-25.

EU electricity market design (BMWK). European legislation shapes electricity markets, and more change is coming. This project provides continuous support and advice for Germany's energy ministry in upcoming EU electricity market negotiations in a variety of topics ranging from support schemes to grid fees and capacity mechanisms. Ongoing.

Consultation (industrial company). After the German government publishing an electricity market white paper ("Strommarkt der Zukunft"), we provided support in drafting a stakeholder consultation response. 2024.

Capacity mechanism (BMWK). After a political decision to introduce a capacity market, this two-year project develops such a market for Germany's BMWK. The overall project is coordinated by Consentec, we lead the work on hedging obligations. Ongoing.

Dynamic FIT (50Hertz). Germany now has 60+ GW of solar capacity under the feed-in-tariff. Those generators won't stop producing, even if oversupply sends wholesale price in negative territory. For TSO 50Hertz, we develop a reformed feed-in-tariff that incentives producers to turn off in situations of oversupply. 2024.

Grid fees (Industrial company). Network charges make up an ever-increasing share of industrial electricity bills, jeopardizing electrification investments. We provide forecasts of TSO grid fees until 2040, including projections of capacity and energy charges. 2024.

§19(2) StromNEV (TenneT). For decades, Germany's system of rebates for grid fees for heavy industry has prevented industrial demand-side response. Finally, a reform window has opened. In this project, we identify the numerous problems of the current rebates and propose a range of reform options. 2024. Report (DE | EN)

Wind competitiveness (RE project developer). The cannibalization effect threatens to make wind energy a victim of its own success. For a large onshore developer, we assess future factors that support wind competitiveness and provide input for a new business strategy. 2024.

Imbalance settlement price (Swissgrid). Concerned about large system imbalances, Switzerland has decided to reform its imbalance settlement price. We provide quantitative assessment of proposed pricing system and develop a new pricing regime. Our proposal is derived from first principles and informed by the real-world experience of other countries. 2024.

Support schemes (BMWK). Germany needs to update its renewables support scheme for wind and solar energy to comply with EU law. A particular concern is to reduce dispatch distortions. We provide assessment and advice on a range of options ranging from incremental reforms to fixed-for-floating swaps. 2024.

Network charges (Chancellery). Rising network charges are an increasing concern for policy makers, driven by concern about industrial competitiveness. For Germany's chancellery, we assessed current and future development of grid costs and network charges. 2024.

Grid fees (Industrial company). Forecast of German TSO network charges on an annual basis until 2040 based on projections of investment, cost of capital, ancillary services, electricity prices, and electricity demand. 2024.

Ancillary services (Battery project developer). Battery project eye ancillary services as sources of revenues. Those include upcoming markets such as reactive power and synthetic inertia. We provided an assessment of ancillary services markets and ad-hoc input to business case development for a European battery project developer. 2024.

Offshore tender (RE project developer). Offshore wind tenders now often include non-price criteria. We reviewed the tender documents for a European offshore project and provided input regarding system integration. 2024.

REMIT (Utility). Lion served as an expert witness on behalf of a European utility in a REMIT-related market manipulation lawsuit concerning balancing markets. 2024.

Value of flexibility (ZVEI). Small-scaled demand-side flexibility resources such as EVs, heat pumps, and solar batteries are widely acknowledged as core ingredients of future energy systems, but scale-up is sluggish in practice. In this report, we estimated the economic value for markets and grids based on a numerical Python model. 2023-24. Report (DE | EN)

Cross-border forward markets (TSOs). European TSOs issue long-term transmission rights. ACER had proposed numerous changes, including the establishment of a virtual hub. In this report for the German TSOs, we develop an analytical framework to assess cross-border forward markets and assess these proposals. 2023-24. Report

Real-time price (Elia). Belgium TSO Elia works on reforming its imbalance settlement price in the context of PICASSO. As part of a review committee, we provide input and assessments and support external communication. 2023-24.

Passive balancing (multi client). Market parties bet on the imbalance settlement price, thereby helping to balance the system. This study commissioned by a group of market parties explains the mechanisms and addresses concerns about this kind of “passive balancing”. 2023. Report (DE | EN)

Industrial power prices (Agora Energiewende). 2023 saw an intensive political debate about introducing subsidized prices for heavy industry. For Agora Energiewende, we developed a feasible proposal of such a subsidy that maintains incentives for short-term flexibility and heading. 2023.

Network charges (Staatskanzlei Niedersachsen). Today, distribution grids are often expanded because of generators, yet costs are put on the shoulders of local consumers. This leads to the paradoxical situation that electricity prices for consumers tend to be highest where electricity generation is largest. In this project we developed briefing material on the status quo, the underlying reasons, and reform options. 2023.

Electricity market reform (European Parliament). Assessment of electricity market reform proposals such as CfDs, PPAs, price caps, and peak shaving. Joint project with Bruegel for ITRE committee. 2023. Report

Smart retail tariffs (LichtBlick). Proposal for a dynamic retail tariff that offers customers price insurance without stifling decentralized flexibility (report DE | EN) and dynamic grid fees (report DE | EN). 2023.

German electricity market (Utility). Along with PA Consulting, we provided a global energy company with strategic assessments of the German power market. 2023.

Revenue cap implementation (BNetzA). Germany's energy regulator is tasked with implementing the revenue cap on power generators. Along with Frontier Economics, we provided economic expertise. 2023.

Intraday / Balancing (TSO). Econometric identification of the link between intraday prices and balancing activation based on millions of individual transactions. We found a strong correlation, a possible sign for insider trading. 2022.

PKNS (BMWK). The "Platform climate-neutral power system" is Germany's principal stakeholder forum for electricity market design. With our partners Guidehouse and Consentec we provided scientific guidance. Neon lead the work package on locational signals, covering topics such as bidding zone split and dynamic grid fees. 2022-24. Website

Electricity market design (Utility). Analytics and assessments on the EU market design reform, focusing on offshore wind. Topics included CfD design and transmission access guarantees. 2022.

Imbalance settlement pricing (Elia). Support in developing a new imbalance settlement pricing scheme in Belgium in the context of PICASSO. 2022.

Future gas costs (E3G). Assessment of future costs of gas supply for Berlin-based think tank E3G. 2022. Report

Home battery storage (Sonnen). Simulations for optimizing home battery storage operations during the energy crisis. 2022.

PV support scheme design (Swissgrid). Support scheme for solar energy centered around generation adequacy. We proposed an optimized contract for differences. 2022.

Electricity market design (Agora Energiewende). Support of Germany's leading energy think tank on electricity market design, in particular regional dynamic network charges. 2022-23. Report (DE | EN)

Consumer centric market design (50Hertz / Elia). Study on better integration of flexible consumers into power markets, particularly device-specific metering, passive balancing, and ex-ante firm imbalance pricing. 2022.

Balancing markets (Utility). For a European storage investor, we provided an assessment of multiple European balancing markets and long-term balancing price forecasts. 2022.

Strommarkttreffen (Agora Energiewende). For many years, we organized and grew Strommarkttreffen, a professional network that links researchers with practitioners. Agora Energiewende supported us financially. 2016-21.

Gaming (TenneT). Game-theoretical assessment of local markets for flexibility, formally identifying optimal increase-decrease bidding strategies and mitigation measures. Joint work with Takon and ZEW. 2021-23. Working paper

Coal exit (BMWi). Germany's government committed to cancel carbon certificates along with its coal exit. In this project with Aurora, we provided estimates how many certificates to delete. 2021-23.

EU electricity market design (BMWi). Advice on wholesale markets, balancing, redispatch and bidding zone delimitation for Germany's Economics Ministry in the context of the Fit-for-55 negotiations. Neon headed several work packages in this large project coordinated by Consentec. 2021-23.

Future Energy Outlook (TransitionZero). We advised think tank TransitionZero in various aspects of setting up a global energy outlook, including recruitment and technical model development. 2021-22.

Charging infrastructure (Agora Verkehrswende). Partnering with Consentec, we assessed the market for public charging infrastructure and developed a proposal for a competitive market design. 2021.

Nodal pricing model (TSO). For a European TSO, we developed a load flow model of Europe. The model main purpose is to simulate locational marginal prices. 2021-22.

Intraday / balancing (multi client). For a group of German electricity trading houses, we assessed the German intraday electricity market. Using state-of-the-art econometrics, we found the activation of balancing reserves to be followed by price movements. 2021.

Open energy outlook (ECF). On behalf of the European Climate Foundation we developed a technical proposal for an transparent, rigorous global energy systems model. 2021.

Dispatch Hubs (Elia / 50Hertz). For TSOs Elia und 50Hertz we assess the incentives implied in multiple variants of their flexibility market proposals, in particular incentives for inc-dec gaming. 2020-22.

Redispatch for loads (BMWi). Outline of a market-based, i.e. voluntary, participation of electricity consumers in Germany's redispatch system based on capacity payments. Key design parameters such as contract duration and auction design are assessed with respect to incentive compatibility, economic efficiency, and incentives for gaming. Study for the Federal Ministry of Economic Affairs and Energy, Berlin. 2020.

Italy's PUN (BMWi). The Italian electricity market has six different bidding zones, but consumers pay a uniform *prezzio nazionale unico* (PUN). For Germany's Federal Ministry of Economic Affairs and Energy, we assessed the pro's and con's of such an arrangement. 2020.

System imbalances (Trading company). During three episodes in June 2019, Germany's power system was heavily out of balance. For a European trading house, we provided expertise and analysis on the reasons and regulatory implications. 2019-20.

Procurement of ancillary services (BMWi). Assessment of market-based procurement of non-frequency ancillary services such as inertia, black start capability and voltage support. The study for the Federal Ministry of Economic Affairs and Energy, Berlin, provides the analytical basis for Germany's implementation of this aspect of the EU Clean Energy Package. Neon supports the project coordinated by EF.Ruhr and serves as work package leader. 2019-21.

Future market design (Utility). Neon supported an internal strategy process to assess alternative scenarios of future European power market designs. 2019

Nodal pricing (Forum Energii). Workshops on nodal pricing in Poland for the think tank Forum Energii and transmission system operator PSE. 2018.

UK wind value (RE project developer). We assessed the capture price of UK onshore and offshore wind, identifying drivers and singling out differences to other European markets. 2018.

Electricity supply contract (Industrial company). Expert evaluation of a long-term electricity supply contract for a large-scale energy-intensive industrial consumer as part of a litigation case. 2018.

RE auction design (BMWi). Evaluation of Germany's renewable energy auctions and assessment of reform options on behalf of Germany's Federal Ministry of Economic Affairs and Energy, Berlin. Navigant served as project lead. Neon contributed analyses of system-friendly wind power and locational signals. 2018-20. [Report](#)

Open modeling (BMWi). Study on open source energy system modeling and open data in the energy sector for BMWi. Neon lead a consortium of DIW Berlin, TU Berlin and ETH Zurich. 2018-20. [OPSD | Report](#) | [Paper](#)

Market-based redispatch (BMWi). Comprehensive assessment of alternative options to source redispatch resources, including redispatch markets and local markets for flexibility. After concluding that market-based redispatch results in problematic gaming incentives, alternative locational incentives were assessed. The client was Germany's Federal Ministry of Economic Affairs and Energy, Berlin. Neon served as project coordinator for a consortium of Consentec, Connect Energy Economics, Fraunhofer ISI, Ecofys, and SUER and was responsible for two work packages. 2017-20. [Intermediate report \(DE\)](#) | [Final Report \(DE | EN\)](#)

Grid benefits of offshore wind (RE project developer). Neon delivered input to a policy paper, assessing the grid and system benefits of offshore wind, driver by high capacity factors.

EU electricity market design (BMWi). Policy advice on wholesale market and balancing market design in the context of the EC Clean Energy for all Europeans package. Neon was member of a consortium with Connect Energy Economics, Consentec, and others. 2016-19.

ENTSO-E Transparency Platform (European Commission). Quality assessment of the data provided by European Transmission System Operators for DG Energy, Brussels. 2017. An article based on this study appeared in *Applied Energy*. [Report](#) | [Article](#)

Wind value lift (RE project developer). Evaluation of design options and operation strategies to improve the economics of wind power under market conditions. 2016-17.

Trading benchmark (Trading company). Regulatory assessment and quantitative cost benchmarks for portfolio management costs of renewable energy for the trading department of a major European utility. 2017.

Nodal vs. zonal pricing (BMWi). Consulting on locational price signals in wholesale markets. Along with Consentec, Neon was responsible to organize a series of workshop and develop a project report. 2016-17. [Report \(DE\)](#)

Open Power System Data (BMWi). Construction of an online platform for European power system data. Neon coordinated a team of three research institutes. 2015-17. [Platform](#)

RE time series (Utility). Neon provided in-feed time series of wind and solar power from re-analysis models. 2016.

Electricity market design (IEA-RETD). Assessment of long-term wholesale and retail power market design under very high shares of variable renewables in cooperation with FTI CL Energy. 2015-16. [Report](#)

Benefits of hydro flexibility (Utility). Model-based assessment of capture prices for a European utility. Neon provided a model-based assessment of the market value of wind energy and hydroelectricity. 2016.

Price drop (Swedish Energy). Swedish wholesale power prices declined by two thirds from 2010 to 2015. Neon conducted a model-based assessment of the reasons for this price drop. 2016. [Report](#)

Wind value in the Nordics (Energiforsk). Model-based assessment of the market value of wind energy in the hydro-dominated power system of the Nordic region. Neon designed the study, developed the model, and wrote the report, which appeared in *Applied Energy*. 2016. [More](#)

Model development (Trading company). Neon supported the trading department of a major European utility in power market model development. 2015.

Whole system costs (DECC). Neon reviewed a report on whole system costs of wind and solar power for the UK Department of Energy and Climate Change, London. 2015. [Report](#)

RE integration cost (Agora Energiewende). Qualitative study for Agora Energiewende. Neon advised Agora and helped implement workshops in Berlin and Paris. 2015. [Report](#)

System-friendly wind and solar power (IEA). Model-based study for the International Energy Agency. Neon assessed the market and system benefits of low-wind speed wind turbines and east- and west-oriented PV. 2014-16. A summary is published in *Energy Economics*. [Paper](#)