

Curriculum Vitae: Lion Hirth

Prof. Dr. Lion Hirth
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Short bio

Prof. Dr. Lion Hirth is founder and director of Neon, a boutique energy economics consulting firm; assistant professor at Hertie School of Governance, a Berlin-based public policy school; and research fellow at MCC, a climate think tank. He is an energy economist and expert in wind and solar energy, power market modeling, and electricity market design. Lion has advised clients from the private and public sector, including the International Energy Agency (Paris), the European Commission (Brussels), the Department for Energy and Climate Change (London), Agora Energiewende (Berlin), and Svensk Energi (Stockholm). He also regularly supports the German Federal Ministry for Economic Affairs and Energy. Lion is the founder of Strommarkttreffen, a 4000-member network of energy professionals in science, policy and industry. He has developed and maintains the open source power market model EMMA and coordinates the open energy data platform OPSD. Previously, Lion spent five years with the Swedish utility Vattenfall. Lion holds a Ph.D. and a Diploma in economics, and a Magister Artium in political science. His academic articles are published in the top energy economics and engineering journals, have won several awards and are among the most cited in the field.

Positions

- 2014 – present **Director of Neon**
Neon Neue Energieökonomik GmbH is a Berlin-based boutique consulting firm for energy economics. Lion is founder and director of Neon. Recent projects include work on redispatch, open data, portfolio management, and nodal pricing.
- 2017 – present **Assistant professor at Hertie School**
Lion is Assistant Professor of Governance of Digitalization and Energy Policy at Hertie School of Governance, a Berlin-based public policy school. He teaches classes on energy economics, power market modeling, climate change, and economic growth.
- 2014 – 2016 **Post-doc researcher at MCC**
The Mercator Research-Institute for Global Commons and Climate Change is a think tank for climate economics. Until today, Lion remains associated as research fellow.
- 2009 – 2014 **Market Analyst at Vattenfall**
At Vattenfall's Group Strategy, Lion worked on renewable energy policy analysis, long-term electricity price modeling, and monitoring of balancing power markets.

Education

- 2012 – 2014 **Economics (Ph.D.), Technical University of Berlin**
The dissertation “The Economics of Wind and Solar Variability” (*summa cum laude*) was supervised by Ottmar Edenhofer.
- 2004 – 2009 **Economics (Diploma), University of Tübingen**
Final grade: 1.1 (corresponds to A+), best degree in economics
- 2005 – 2010 **Political Science (Magister Artium), University of Tübingen**
Final grade: “excellent” (A+)
- 2006 – 2009 **Study abroad and research visits**
University of Massachusetts (USA), Universidad Católica (Chile), John Abbot College (Canada), Potsdam Institute for Climate Impact Research (Germany)
- 1994 – 2004 **Willi-Graf-Gymnasium, Munich**
Final grade: 1.2 (A+)

Teaching

- 2017 – present Master-level lectures and seminars at Hertie School
- 2014 – present Executive training seminars in power markets and energy economics
- 2014 – 2018 Master-level courses at TU Berlin on climate economics and climate policy
- 2013 – 2014 Master-level courses at HTW Berlin on electricity economics
- 2009 – 2012 Summer schools for Deutsche Schülerakademie

Honors

- 2018 Excellence in Teaching Award, Hertie School
- 2017 - 2018 Fellow Freies Wissen, Wikimedia Deutschland
- 2017 Open Science Award of Schleswig-Holstein for OPSD project
- 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

Initiatives

- 2009 – today Founder of Strommarkttreffen, a network for professionals in energy
- 2014 – today Founder of the Openmod Initiative, a network for open-source energy modeling

Research interest

- The economics of wind and solar energy
- Electricity market design
- System integration of renewables
- Energy policy
- Balancing
- Electricity grids and locational incentives
- Electricity system modeling
- Open-source software and open data

Publications

Lion has published 19 articles in economics and engineering journals, including single-author papers in the leading field outlets *Energy Economics*, *The Energy Journal*, and *Applied Energy*. His Market Value paper is the most cited article in *Energy Economics* in recent years (see ranking) and the Optimal Share paper the most cited in *The Energy Journal* (see ranking). RePEc lists Lion among the top 10% energy economists and among the top 10 of all economists of the cohort 2014. Lion's publications have won several awards, including the best paper award of the International Association for Energy Economics. See [Google scholar page](#) for citation details. Click on the title for link to the journal. Click on "pdf" for a free-access pre-publication version or email me. Download all papers (zip).

First-authored articles in peer-reviewed journals

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](#)

What caused the drop of European electricity prices? A factor decomposition analysis, *The Energy Journal*, 2018. [open access](#)

The role of capital costs for decarbonizing the power sector, *Environmental Research Letters*, 2016 (w/ Jan Steckel). [pdf](#)

The benefits of flexibility: The value of wind energy with hydropower, *Applied Energy*, 2016. [pdf](#)

System-friendly Wind Power, *Energy Economics*, 2016 (w/ Simon Müller). [pdf](#) | Best paper award INREC

Why Wind is not Coal: On the Economics of Electricity Generation, *The Energy Journal*, 2016 (w/ Falko Ueckerdt & Ottmar Edenhofer). [pdf](#)

Balancing Power and Variable Renewables: Three Links, *Renewable & Sustainable Energy Reviews*, 2015 (w/ Inka Ziegenhagen). [pdf](#)

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

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](#)

The Market Value of Solar Power: Is Photovoltaics Cost-Competitive?, *IET Renewable Power Generation*, 2015. pdf | Selected paper Solar Integration Workshop

The Market Value of Variable Renewables: The effect of solar wind power variability on their relative price, *Energy Economics*, 2013. pdf

Redistribution Effects of Energy and Climate Policy: The electricity market, *Energy Policy*, 2013 (w/ Falko Ueckerdt). pdf

Co-authored articles in peer-reviewed journals

Technology-neutral auctions for renewable energy: EU law vs. reality in Member States, *Journal for European Environmental & Planning Law*, 2019 (w/ Lrs Jerrentrup, Bastian Lotz & Silvana Tiedemann).

Short-Term Electricity Trading for System Balancing - An Empirical Analysis of the Role of Intraday Trading in Balancing Germany's Electricity System, *Renewable & Sustainable Energy Reviews*, 2019 (w/ Christopher Koch)

Open Power System Data - Frictionless data for electricity system modelling, *Applied Energy*, 2018 (w/ Frauke Wiese, Ingmar Schlecht, Juliane Reimann, Clemens Gerbaulet, Martin Jahn, Jonathan Mühlendorff, Friedrich Kunz, Wolf-Peter Schill & Casimir Lorenz)

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

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

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).

On the Economics of Renewable Energy Sources, *Energy Economics*, 2013 (w/ Ottmar Edenhofer, Brigitte Knopf, Michael Pahle, Steffen Schloemer, Eva Schmid & Falko Ueckerdt). pdf

System LCOE: What are the costs of variable renewables?, *Energy*, 2013 (w/ Falko Ueckerdt, Gunnar Luderer & Ottmar Edenhofer). pdf

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 paper / under review

Market-Based Redispatch in Zonal Electricity Markets, *IAEE Working Paper* (w/ Ingmar Schlecht).

Short-Term Electricity Trading for System Balancing, *IAEE Working Paper* (w/ Christopher Koch).

Congestion Management: From Physics to Regulatory Instruments, *EconStor* (w/ Samuel Glismann).

Technology-neutral auctions for renewable energy: EU law vs. reality in Member States, *under review* (w/ Lars Jerrentrup, Bastian Lotz & Silvana Tiedemann)

Eyes on the price: Which power generation technologies set the market price?, *under review* (w/ Eike Blume-Werry, Thomas Faber, Claus Huber & Martin Everts)

The Market Value of Wind and Solar Power: an Analytical Approach, *IAEE Working Paper*, 2016 (w/ Alexander Radebach).

Minimal Thermal Generation in Power Systems, *IAEE Working Paper*, 2015.

How much electricity do we consume? A guide to German and European electricity consumption and generation data, *FEEM Working Paper*, 2014 (w/ Maximilian Schumacher).

Dissertation

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

Other publications

The importance of open data and software for energy research and policy advise, *SETIS Magazine*, 2016 (w/ Stefan Pfenninger, Joseph DeCarolis, Sylvain Quoilin & Iain Staffell).

Übertragungsnetzbetreiber erwarten massiven Wertverlust für Solarstrom, *Phasenprüfer*, 7 January 2016 (with Jakob Schlandt)

Jenseits des Sündenbocks Erneuerbare: Was hat den Verfall des Börsenstrompreises wirklich verursacht? , *Phasenprüfer*, 13 August 2015 (with Christoph Weber).

Das Ende der Grundlast, *Phasenprüfer*, 26 May 2015.

Solarstrom - an der Börse immer weniger wert, *pv magazine*, 23 April 2015.

Die Ökonomie der Energiewende, *Phasenprüfer*, 9 March 2015.

Wind, Sonne und Regelleistung, *energiewirtschaftliche tagesfragen*, 2013 (with Inka Ziegenhagen). pdf | Mandarin

The Decreasing Market Value of Variable Renewables: Integration Options and Deadlocks, in: Detlef Stolten & Viktor Scherer (eds.): *Transition to Renewable Energy Systems: Energy Process Engineering*, Wiley, 2013 (with Falko Ueckerdt). pdf

Press coverage

Europe risks costly mistake with redispatch markets, *Montel News*, 2018.

Wind and Solar Power Advance, but Carbon Refuses to Retreat, *New York Times*, 2017.

Vattenkraft förbättrar vindkraftens lönsamhet, *Second Opinion*, 2016 (Swedish).

3 Ways Wind and Solar Can Continue To Grow In a 21st-Century Grid, *Rocky Mountain Institute Outlet*, 2015.

Renewable energy sector runs the risk of overpowering market, *Financial Times*, 2015. pdf

No business case for lots of wind and solar, *Energy Transition*, 2015.

Strom aus Erneuerbaren kannibalisiert sich selbst, *Handelsblatt*, 2015 (German).

A Look at Wind and Solar, Part 2: Is There An Upper Limit To Variable Renewables?, *TheEnergyCollective*, 2015.

The Optimal Share of Intermittent Renewables, *TheEnergyCollective*, 2014.

Doe windenergie niet af als kostenpost van miljarden euro's, *NRC*, 2014 (Dutch).

Google scholar | RePEc | ResearchGate | SSRN

Peer review

Lion has peer-reviewed manuscripts for the major energy economics journals, including:

Energy Economics
The Energy Journal
IEEE Transactions on Power Systems
IEEE Transactions on Renewable Energy
Energy Policy
Economics of Energy and Environmental Policy

Research grants

START. Project funded by BMBF and headed by Potsdam Institute of Climate Impact Research (Hertie share EUR 42,000). Within the large and diverse START project, we empirically research locational investment signals in electricity systems.

MODELX-Polins. Project funded by BMWi and headed by University of Duisburg-Essen (Hertie share EUR 82,000). In this model comparison exercise, we will test and validate various energy system models with respect to policy instruments such as carbon pricing.

SENTINEL. Project funded by the European Commission under the Horizon 2020 program headed by ETH Zürich (Hertie share EUR 312,000). SENTINEL will focus on open source model development for the integrated European energy sector.

Consulting projects

The following list summarizes consulting projects conducted by Neon. An overview of projects that Lion conducted in previous positions as well as letters of reference from clients are available on request.

Redispatch (BMWi). Assessment of alternative options to source redispatch resources, including redispatch markets and local markets for flexibility. The client is Germany's Federal Ministry of Economic Affairs and Energy, Berlin. Neon serves as project coordinator for a consortium of Consentec, Connect Energy Economics, Fraunhofer ISI, Ecofys, and SUER and is responsible for two work packages. 2017-20.

Open source modeling (BMWi). Study on open source energy system modeling and open data in the energy sector for BMWi. Neon leads a consortium of DIW Berlin, TU Berlin and ETH Zurich. 2018-20.

Electricity supply contract (European industrial company). Evaluation of a long-term electricity supply contract for a large-scale energy-intensive industrial consumer in the context of a court case. 2018.

TSO data quality (European Commission). Assessment of data quality provided by European transmission system operators for DG Energy, Brussels. 2017. An article based on this study appeared in *Applied Energy*. [More](#)

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

Nodal pricing (BMW). Consulting on locational price signals in wholesale markets. Along with Consentec, Neon was responsible to organize a series of workshop and write a project report. 2016-17.

Market value of wind power (European utility). Evaluation of design options and operation strategies to improve the economics of wind power under market conditions. 2016-17.

Wind value in the Nordic region (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](#)

EU electricity market design (BMW). Policy advise on wholesale market and balancing market design in the development of the Clean Energy for all Europeans package. Neon was member of a consortium with Connect, Consentec, and others. 2016-18.

Reasons for the 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. [More](#)

The benefits of hydropower flexibility (European utility). Model-based assessment of capture rates for a European utility. Neon provided a model-based assessment of the market value of wind energy and hydroelectricity. 2016.

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

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 report is published in *Energy Economics*. [More](#)

Integration costs (Agora Energiewende). Qualitative study for Agora Energiewende. Neon advised Agora and helped implement workshops in Berlin and Paris. 2015. [More](#)

Model development (European utility). 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.

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

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. [More](#)

Ad-hoc consulting. Neon regularly advises financial institutions and investment banks on renewable energy and power markets.

Power market trainings and workshops. Neon trained staff at BMW, IRENA, BMEL, RP Global, ERRA, Vattenfall, JRC, EHA, 50 Hertz, GIZ, IASS Potsdam, UFZ, Swedenergy, Innogy, Clean Air Task Force, IG Windkraft, Hochschule Reutlingen, Axpo, Renac, Europe Beyond Coal, Agora Energiewende in topics such as power markets, energy economics, energy policy, and electricity market modeling. [More](#)

Teaching

Slides and evaluation results are available on request.

- 2019 **Electricity Economics.** Hertie School, Master-level. Power systems, electricity markets, merit order model, scarcity pricing, market value of renewables, electricity grids.
- Renewable Energy Policies.** Hertie School, Master-level. Support schemes for renewable energy, auction design, risk and finance, net metering and prosumers.
- Emissions Pricing.** Hertie School, Master-level (w/ Christian Flachsland). Taxes vs. quantities, EU Emission Trading Scheme, global cap and trade systems.
- Economic Growth & Climate Change.** Hertie School, Master-level. Empirics of growth, Solow and Ramsey model, economics of ideas, poverty and inequality, climate change, sustainability.
- Electricity System Modeling.** Hertie School, Master-level. Power market modeling based on Excel and GAMS.
- 2018 **Electricity Systems & Markets.** Hertie School, Master-level. Power systems, electricity markets, merit order model, scarcity pricing, market value of renewables, electricity grids.
- Renewable Energy Policies.** Hertie School, Master-level. Support schemes for renewable energy, auction design, risk and finance, net metering and prosumers.
- Emissions Pricing.** Hertie School, Master-level (w/ Christian Flachsland). Taxes vs. quantities, EU Emission Trading Scheme, global cap and trade systems.
- Economic Growth & Climate Change.** Hertie School, Master-level. Empirics of growth, Solow and Ramsey model, economics of ideas, poverty and inequality, climate change, sustainability.
- Electricity Economics & Modeling.** Hertie School, Master-level. Power market modeling based on Excel and GAMS.
- Electricity Economics & Modeling.** TU Berlin, Master-level. Power market modeling based on Excel and GAMS.
- Power Markets & Energy Economics.** Neon, professional training seminar. Power systems, electricity markets, merit order model, scarcity pricing, market value of renewables, electricity grids.
- Electricity system modeling.** Neon, professional training seminar. Power market modeling based on Excel and GAMS.
- 2017 **Electricity Economics & Technology.** Hertie School, Master-level. Power systems, electricity markets, merit order model, scarcity pricing, market value of renewables, electricity grids.
- Renewable Energy Policies.** Hertie School, Master-level. Support schemes for renewable energy, auction design, risk and finance, net metering and prosumers.
- Sustainable Energy & Climate Change.** Hertie School, executive Master (w/ Claudia Kemfert).
- Economic Growth & Climate Change.** Hertie School, Master-level. Empirics of growth, Solow and Ramsey model, economics of ideas, poverty and inequality, climate change, sustainability.
- Power market modeling.** Neon, professional training seminar. Power market modeling based on Excel and GAMS.
- 2016 **The Economics of Climate Change.** TU Berlin, Master-level (w/ Ottmar Edenhofer). Climate physics, cost-benefit analysis of climate change, welfare theory, discounting.

- 2015 **The Economics of Climate Policy.** TU Berlin, Master-level (w/ Edenhofer). Market failures, internalization instruments, carbon pricing, international negotiations and game theory.
The Economics of Climate Change. TU Berlin, Master-level (w/ Edenhofer). Climate physics, cost-benefit analysis of climate change, welfare theory, discounting.
- 2014 **Climate Change, Land Use & Infrastructure.** TU Berlin, Master-level (w/ Edenhofer). Land use and bioenergy, urban economics, land rent taxation.
Electricity Economics. HTW Berlin, Master-level (w/ Andreas Raab).
- '07-'13 **Electricity Economics.** HTW Berlin, Master-level (w/ Raab).
The Economics of Everything. Summer school "Deutsche Schülerakademie". Two weeks full-time undergraduate-level course (w/ Marie-Therese von Schickfus).
Electricity. Summer school "Deutsche Schülerakademie". Two weeks full-time undergraduate-level course (w/ Jonas Peters)
Energy Revolution. Summer school "JGW Nachhaltigkeitsakademie". Ten days full-time undergraduate-level course (w/ Valentin Schwamberger).
Global Warming. Summer school "JGW Nachhaltigkeitsakademie". Ten days full-time undergraduate-level course (w/ Schwamberger).
Public Finance, Macroeconomics I, Macroeconomics II. Teaching assistant at University of Tübingen and Technical University of Berlin.