Master's Thesis Supervision Plan
Academic Year 2024-2025
MIA/MPP/MDS

1. Supervisor information

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2. Supervision Profile

General Academic Field: *How would you summarise your academic background?*

The closer your research topic aligns to my own research interest, the more detailed and more helpful my advice will be. If your topic is only remotely to my own expertise, I will only be able to support you in very general forms.

I am an energy economist, and I primarily work quantitatively. I have detailed knowledge of energy policy and regulation in Europe, but not beyond. Please have a look at my publications, my course offerings and my Twitter feed to get a better idea of what I do. In particular, I am familiar with the following areas:

- Electricity markets, including topics such as electricity market design, energy-only markets, balancing systems, the European integration of electricity markets, prosumers and behind-the-meter storage
- Commodity markets, in particular power and gas markets
- Power grids, in particular nodal pricing, re-dispatch, locational markets for flexibility and locational investment incentives
- The economics of renewable energy, such as the market value of wind and solar energy, system integration, and impacts on electricity markets and prices
- Energy policy, in particular carbon pricing, support schemes for renewable energy, auction design for renewables, revenue and price caps, and to a lesser degree heating and transport policies
- Electricity system modeling, in particular numerical power market modeling such as EMMA

Main Research Areas: *On what research areas are you especially keen to supervise students?*

Below you find a list of ideas for master thesis topics. Some are pretty specific and well thought-through, others are mere fields or topics that I find interesting.

Proposed Topics

Price elasticity of energy demand. How responsive are energy consumers to prices changes? What is the price elasticity of demand? A thesis could be a review of all sectors or focus on a fuel (gasoline, natural gas, electricity) and/or a sector (transport, industry, buildings). It could be a literature review or a new econometric estimate of demand elasticity.

Capacity mechanisms in Europe. Review of the design, implementation and performance of capacity remuneration mechanisms in various European countries.

Capacity credits. With a numerical model, calculate capacity credits of single production and storage technologies, or de-rating factors in capacity mechanisms. Discuss how the complementarity of renewables and storage can(not) be reflected in capacity credits as well as implications for capacity remuneration mechanisms.

Balancing energy prices. A review and descriptive statistical assessment of prices for balancing services (reservation and activation) across European countries. How have prices developed over longer periods, how have they been affected by the 2022 crisis, and how well correlated are they across countries?

The impact of batteries on balancing. Review of battery expansion in Germany plus a few additional European countries. Empirical analysis of balancing reserve prices in DE. Discussion of possible effects of reserve prices with a focus on the impact of the expansion of batteries on capacity prices. (literature review + data analysis).

Demand response in power models. What are the various demand response options available in power systems? How are these options represented in numerical power system models? What are the comparative benefits and disadvantages of the different approaches?

Estimating emissions intensity of power systems. Emissions intensity of electricity generation is needed for estimating impact of all forms of demand side interventions, electric vehicles, life-time emission calculations, storage, etc. How can such numbers be derived, and what are pros and cons? What are practical implications of marginal vs. average emissions intensity and short-term vs. long-term emissions intensity?

Contracts for differences. European policy-makers would like to expand the role of CfDs, but many different contract designs are used. Review of proposed and existing CfD designs and a discussion of their implications on incentives and risk.

The "downstream" side of CfDs. Long-term contracts between governments and power generators, such as contracts for differences, need to be passed on to consumers in some way: Costs need to be recovered and/or proceeds distributed. Which options exist and what are implications on consumer risk, tax burden, industrial policy, energy savings incentives, and demand-side flexibility?

Power purchasing agreements. Review of the European market for PPAs and interviews with industrial uptakers to understand the potential and limitations of PPAs.

The value of the solar PV learning curve. Germany has spent about EUR 250bn in solar PV deployment. The main benefit, it is sometimes argued, lies in reduction of future costs due to learning-by-doing, a phenomenon often represented as a learning curve. What is the economic value of this learning and which actors/countries/generations are the one benefitting? (theory & quantifications)

Smart meter and retail pricing review. Review of the status quo of electronic meter globally; overview of purpose (electricity theft vs. price-elastic demand); review of corresponding retail pricing (time-of-use pricing, dynamic pricing, invariant prices, etc.). (literature review)

Dynamic retail tariffs. How prevalent are variable tariffs across Europe and across different consumer segments? What are the policy, regulatory, economic and technological drivers behind these? (literature review & interviews)

Hedged retail tariffs. How can dynamic retail tariffs be combined with price hedging? Are the proposals by Severin Borenstein and Frank Wolak applicable to Europe? How would such tariffs be structure and how could temperature-related consumption shocks be accounted for?

Wholesale market participation of electricity demand. How can (flexible) electricity demand participate in European wholesale electricity markets (day-ahead & intraday)? What are the country differences? What are the pros and cons of the different currently implemented options? How should regulation be developed further? (literature review & interviews)

Economic value of subsidized loans for renewable energy. Estimate the (global) economic value of below-interest rate loans issues to renewable energy project developers by state-owned banks such as EIB, EBRD, KfW and World Bank. (methodological review & quantification)

Storage vs. transmission. How does the location of storage effect the need for transmission infrastructure? How do the market design and other regulatory incentives affect this outcome? (Literature review and time series analysis)

Future dispatchable capacity mix. What is the role of different dispatchable (almost) carbon-free technologies (nuclear, hydrogen, carbon capture and storage) in future electricity systems with (more or less) variable renewable energy sources? An adaptation of the screening curve model to future technologies, including a sensitivity analysis on uncertain input parameters (literature review & screening curve model)

Balancing market in the Netherlands. How do balancing responsible parties (BRPs) respond to changes in the imbalance price? Applying the instrumental variable approach presented in Eicke, Ruhnau and Hirth (2021) on the Dutch power market. How much larger is the price responsiveness in this market compared to Germany? (econometrics)

Predicting network congestion. In electricity systems, it is often relevant to predict the occurrence of line overload (grid congestion) a few hours or days before they occur. In this work, econometric methods are used to predict congestion based on variables such as wind and solar generation, imports and exports of electricity, load levels, among other regressors. Prediction could be made at the national level (redispatch volumes), individual lines, regional curtailment of renewables, or redispatch of individual power plants. (econometrics)

Redispatch and curtailment in Germany. Analyse redispatch and curtailment data in Germany to learn more when and why the feed in of renewable energy sources is reduced. In which hours does redispatch occur? How significant is the welfare loss?

Revenue cap. Capping power generators' revenues was one of the major EU responses to the 2022 energy crisis. This thesis is an ex-post evaluation of the policy: how it was implemented in (a few) European countries and what the outcome was in terms of market effects and public revenues.

Co-location of wind and solar. It is well understood that the benefits of co-locating wind, solar and/or storage assets behind the same grid connection (sometimes called a "hybrid power plant") point are very limited. Yet, if the grid connection is expensive or takes a long time to complete, using an existing connection could yield net benefits. This is true in particular if the cost are small,

because the energy wasted due to the too small connection is of low economic value if it is wasted during times of zero prices and/or grid curtailment. This is a deeply empirical question that requires assessing past wind and solar generation patterns as well as wholesale price and grid congestion time series.

Locational signals from grid fees. Some European countries differentiate transmission and/or distribution grid fees by location, e.g. charging higher fees in regions where electricity is scarce. Review of the way such differentiation is done and implemented. How do European countries use such tariffs and what are the results?

Network tariff as optimal taxes. A theoretical discussion optimal tax theory (Ramsey taxation) applied to electricity network charges. Through the lens of optimal taxes, how should tariffs be structured? Who should pay them, should they be differentiated regionally or over time, and what type of tariff should be applied (per energy, per peak load, per capacity)?

Time-variant grid fees. In many, but not all, European countries transmission and/or distribution grid fees vary over time, e.g. as time-of-day tariffs. Review of the design and implementation of such time-variant grid fees, as well as an assessment of the performance, problems and outcomes.

Methods Expertise: *What type of research methods can you advise on?*

Character of a master thesis
A master thesis is a piece of research. It should broadly resemble an academic article: it should be focused on a quite narrow topic, be novel and make a contribution, and apply rigorous academic methods. A master thesis is not a business plan, a consulting report, a policy brief, or an opinion piece.

Practice partners and group work
I strongly encourage students to work with practice partners. To find a practice partner, a good option is the HEEN mentoring program, which matches Hertie students with alumni and non-alumni professionals in the field of energy and environment. Program participants are free to choose the exact scope and intensity of the mentoring envisioned for the development of the master thesis.
I also encourage students to work in pairs. Group proposals will generally be given priority over individual proposals.

Supervision Style: *What is distinctive about your approach to supervision?*

Process: We will meet in six sessions during the supervision process. Each session represents a milestone for which you will be asked to provide certain assignments (see below). The supervision takes place during the colloquium sessions.
Structured proposal: For the first session, you are asked to bring a structured thesis proposal (template provided). You will keep on working on this document throughout the process, step by step transforming it into a structured summary of your thesis, which you will submit along with your thesis.
Readings: All readings need to be read before the respective session.
Drafts: I will read and comment on the material requested for the colloquium sessions. I never read drafts; when I read your thesis, I am reading it to grade it.
Attendance: For each session, you are expected to be present, prepared, and to actively participate; this includes contributing thoughtful and constructive feedback to your fellow classmates' work. You are expected to attend all sessions and cannot miss more than one of the sessions.

Assignment submission: You will be asked to prepare written material (texts, slides). *All material must be submitted 36 hours ahead of the sessions* (early morning of the day before) via Moodle. Late submissions will lead to grade deductions and will not be read. Merge all material into a single DOCX file and provide your last name in the file name, e.g. "Hirth – Lit Review.docx".
Changing topic: You are expected to refine, sharpen and focus your research topic. However, you are not supposed to change topic. After the second colloquium session, no change of topic will be accepted. Any change of topics is at your own risk.

Examples of Previously Supervised Thesis Topics: (*if applicable*)

Please find examples here

Recommended General Readings: (*if applicable*)

No general readings, please find specific ones in the respective session.

Plagiarism:

Plagiarism is an infringement of § 11 Good Academic Conduct, 2a: "Infringements of the standards of good academic conduct include for instance to use wordings, ideas or other intellectual work of others in an academic work without clearly indicating the author. The obligation to indicate the authorship of others shall apply irrespective of whether or not the sources used are protected by copyright" (See: Exam Rules, § 11 Good Academic Conduct for more information). It is vital to keep track of your sources and to cite all material properly. The Library will offer a session available to all students on resource management and proper citation.

Additional notes on plagiarism [optional!]

3. Master's Thesis Colloquium

Overview:

Session	Session Title	Date (*approx.*)
1	Initial Proposal	Late November / Very early December
2	Revised proposal	Early February (earliest possible in Spring term)
3	Outline and Literature Review	Late February (2-3 weeks later)
4	Methodology	Mid-March (2-3 weeks later)
5	Preliminary findings	Early April (2-3 weeks later)
6	Final Presentation	Mid-April (2 weeks prior to submission)

Sessions:

Session 1: Initial Proposal	
Aim	Present and discuss your initial thesis proposal. At this point you should be clear about your topic and your (initial) research question. You should be able to present your motivation and a first overview of the existing literature.
Assignment (e.g. thesis proposal)	To be submitted 36h ahead • Structured thesis proposal (1 page, template provided, DOCX file)

	• Presentation slides (2-4 slides, PPTX/PDF file)
	• Read one of the "Exemplary Master Thesis" provided and summarize your impressions, learnings and take-aways (1 page, DOCX file)
	To be delivered in class
	• Presentation of your proposal
Readings	Introductory readings (While some of these are written to inform PhD thesis development, similar basic issues play out with a Master Thesis.) • Hirth & Eicke 2021: Master thesis guideline • Van Evera, Stephen 1997: Guide to Methods for Students of Political Science, Ithaca, NY: Cornell University Press, "Chapter 4: Helpful Hints for Writing a Political Science Dissertation", p.97-113.
During the session	Input by advisor and class discussion (30 min) • Timeline and colloquium setup • What makes a good master thesis? • The iterative process of doing research • Types of research Student presentations (90 min) • 4 min presentation by student • 3 min questions and feedback

Session 2: Revised proposal	
Aim	Discuss the progress you have made, in particular: How has your proposal evolved, and why? What is your methodology, why do you prefer it over alternatives? How do you define and operationalize your key concepts? Which challenges have you identified?
Assignment	To be submitted 36h ahead (one single DOCX file + slides). See example. • Updated structured proposal (1 page), highlight any significant changes • Time plan (Gantt chart) • Update: summarize progress made, changes to your research plan, next steps, remaining challenges (½ page max) • List of issues: what you would like to discuss with me (½ page max) • Presentation slides (2-4 slides, PPTX/PDF file) To be delivered in class • Presentation of progress and changes
Readings	Van Evera, Stephen 1997: Guide to Methods for Students of Political Science, Ithaca, NY: Cornell University Press, "Chapter 1 – Hypotheses, Laws, and Theories – A User's Guide", p.7-27.

During the session	Input by advisor and class discussion (30 min)
	• Literature search and review
	Student discussion (90 min)
	• 4 min presentation by student
	• 3 min questions and feedback

Session 3: Outline and Literature Review	
Aim	Present a literature review. At this point you should have a comprehensive overview of the scholarly literature in your field. You should be able to present a structured summary of the existing literature, identify gaps in the literature, and specify of your own contribution.
Assignment	To be submitted 36h ahead (one single DOCX file). Example submission is available on Moodle.
	• Updated structured proposal and updated Gantt chart, highlight any significant changes
	• Thesis outline (table of contents), detailed to the second level (i.e., subsections) with approx. word count per section (1 page)
	• Introduction: a condensed version of what will become the Introduction of your thesis. Please your topic in the wider academic and policy debate and motivate your research. (1 page)
	• Literature Review: a condensed version of what will become the Literature Review section of your thesis. (1-2 pages)
	• Update: summarize progress made, changes to your research plan, next steps, remaining challenges (½ page max)
	• List of issues: what you would like to discuss with me (½ page max)
Readings	• Hirth & Eicke 2021: Master thesis guideline, section Literature Review
	• USC The Literature Review
	• Watch on YouTube: Zotero
During the session	One-to-one session between student and supervisor (15 min). Slots will be communicated ahead of time. I will give feedback on the material you submitted and we will go through your issue list.

Session 4: Methodology	
Aim	Present draft thesis outline and discuss challenges; present and describe the methodology applied. At this stage you should have done a significant share of your research and have developed a coherent structure. You should have applied your methodology and be clear about remaining challenges that you need to overcome.
Assignment (e.g. thesis proposal)	To be submitted 36h ahead (one single DOCX file)
	• Structured summary (1 page, template provided – different from the structured proposal) and updated Gantt chart

	• Methodology: a condensed version of what will become the Methodology section of your thesis (structure + bullet points, 2 pages max)
	• Update: summarize progress made, changes to your research plan, next steps, remaining challenges (½ page max)
	• List of issues: what you would like to discuss with me (½ page max)
Readings	• Hirth (2020): Master thesis guideline
	• Oxbridge (2019): Writing the methodology section
	• Nirmaldasan (2008): The average sentence length
During the session	One-to-one session between student and supervisor (15 min). Slots will be communicated ahead of time. I will give feedback on the material you submitted and we will go through your issue list.

Session 5: Preliminary findings	
Aim	Present preliminary results. At this point you should have done the bulk of your research. You should be able to show your results, explain your findings, and share your conclusions.
Assignment	To be submitted 36h ahead (one single DOCX file)
	• Updated structured summary and updated Gantt chart, highlight any significant changes
	• A list of three to five key findings – not more, not less (1 page)
	• Three alternative titles and subtitles
	• Update: summarize progress made, changes to your research plan, next steps, remaining challenges (½ page max)
	• List of issues: what you would like to discuss with me (½ page max)
Readings	-
During the session	One-to-one session between student and supervisor (15 min). Slots will be communicated ahead of time. I will give feedback on the material you submitted and we will go through your issue list.

Session 6: Final Presentation	
Aim	Present draft thesis. At this point your thesis should be virtually finalized and only require minor refinement. This is the last possibility to receive feedback.
Assignment	To be delivered in class
	• Presentation of master thesis, 5-8 slides
	• To be submitted after the final submission of the thesis
	• Final structured summary (1 page, PDF)
Readings	• Rougier, Droettboom, Bourne - 2014 - Ten Simple Rules for Better Figures
	• Novartis - Graphics Principles Cheat Sheet
During the session	Student presentations (150 min)
	• 7 min presentation of draft thesis

| | • 4 min discussion and feedback |
| | • All students are required to attend the entire session |