

Energy Markets and Regulation

Prof. Dr. Oliver Ruhnau

University of Cologne

oliver.ruhnau@uni-koeln.de

Course contents

Energy is needed for almost every economic activity. At the same time, the energy sector is responsible for about 75% of global greenhouse gas emissions and fundamental changes are needed to mitigate climate change. These are two good reasons to study energy markets and their regulation, which have some interesting particularities, compared to other markets.

This course focuses on electricity markets, which play a central role in the energy sector already today and even more so in the future. We start with some technical background that is necessary to understand electricity markets. On that basis, we study:

- 1) Optimal dispatch and price setting in short-term electricity markets
- 2) Optimal long-term mix of electricity generation & storage technologies
- 3) Capacity mechanisms and renewable support schemes
- 4) The European electricity market model
- 5) Electricity consumers
- 6) Grid stability and balancing markets
- 7) Electricity transmission and locational pricing

This course will provide you with fundamental knowledge on energy markets and regulation. It will relate to real-world case studies, recent academic papers, and current developments in the context of the ongoing energy transition. In addition to conventional lectures and exercises, practitioners will be invited for guest lectures. Finally, we offer an (optional) excursion to the combined heat and power plant “[Heizkraftwerk Niehl](#)” of the energy supplier RheinEnergie (limited seats will be allocated in the beginning of the course).

Please refer to the second page of this syllabus for a detailed overview of topics and sessions.

Course organization

Class hours & venues:

- Wednesdays, 10:00 – 11:30, 118 Seminarraum 3.03
- Thursdays, 16:00 – 17:30, 118 Seminarraum 3.03

The **excursion** takes place on Friday, 18 Oct 24, 09:30 – 12:30.

Office hours are offered on request.

Course registration generally works via KLIPS, except for IMES students who can register via Monika Räthe (monika.raethe@uni-koeln.de).

The **final exam** will be 90 minutes long. We offer two examination dates during the winter term, which will be published on KLIPS. There is no separate examination date in the summer.

Further information and course material will be distributed via the **ILIAS platform**.

No prior knowledge on energy markets is needed. **If you want more**, you may consider parallel participation in the course “Energy Market Modeling” (course contents and schedules are designed to match well).

For **questions**, please do not hesitate to reach out:

- On content, please contact Maximilian Walde (walde_maximilian@wiso.uni-koeln.de)
- On administration, please contact Monika Rätthe (monika.raethe@uni-koeln.de)

Course schedule

The following schedule is tentative. Potential changes would be communicated via ILIAS.

Date	Type	Topic
09 Oct 24	Lecture 0	Introduction
10 Oct 24	Lecture 1	Energy systems
16 Oct 24	Lecture 2	Power plants
17 Oct 24	Exercise 1	Energy systems & power plants
18 Oct 24	Excursion	Visit of RheinEnergie’s “Heizkraftwerk Niehl”
23 Oct 24	Lecture 3	Short term
24 Oct 24	Exercise 2	Merit order model
30 Oct 24	Lecture 4	Long term
31 Oct 24	Exercise 3	Screening curve model
06 Nov 24	Lecture 5	Capacity mechanisms & renewable support
07 Nov 24	Lecture 6	Storage
13 Nov 24	Exercise 4	Capacity mechanisms, renewables, storage
14 Nov 24	Lecture 7	EU electricity markets
20 Nov 24	Guest lecture (tbd)	Wholesale markets
21 Nov 24	Lecture 8	Consumers
27 Nov 24	Lecture 9	Balancing
28 Nov 24	Exercise 5	Wholesale markets, consumers, balancing
04 Dec 24	Lecture 10	Grids & nodal pricing
05 Dec 24	Lecture 11	Zonal pricing
11 Dec 24	Guest lecture (tbd)	System operation
12 Dec 24	Exercise 6	Locational pricing
18 Dec 24	Buffer	
19 Dec 24	Buffer	
23 Dec 24 – 10 Jan 25	Winter break / Study time	
15 Jan 25	Exam prep 1	Exam info and Q&A on lecture
16 Jan 25	Exam prep 2	Mock exam and Q&A on exercises