Energy Markets and Regulation

Prof. Dr. Oliver Ruhnau
University of Cologne
oliver.ruhnau@uni-koeln.des

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 of 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) field trip to the combined heat and power plant "Heizkraftwerk Niehl" of the energy supplier RheinEnergie (limited seats will be allocated at 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 **field trip** takes place on Friday, 24 Oct 25, 09:30 – 12:30.

Office hours are offered on request.

Course registration generally works via KLIPS (2nd registration period and allocation of remaining seats), 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 of 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 Räthe (monika.raethe@uni-koeln.de)

Course schedule

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

Date	Type	Topic
15 Oct 25	Lecture 0	Introduction
16 Oct 25	Lecture 1	Energy systems
22 Oct 25	Lecture 2	Power plants
23 Oct 25	Exercise 1	Energy systems & power plants
24 Oct 25	Field trip	Visit of a combined heat and power plant
29 Oct 25	Lecture 3	Short term
30 Oct 25	Exercise 2	Merit order model
05 Nov 25	Lecture 4	Long term
06 Nov 25	Exercise 3	Screening curve model
12 Nov 25	Lecture 5	Storage
13 Nov 25	Exercise 4	Storage
19 Nov 25	Lecture 6	Investment mechanisms
20 Nov 25	Exercise 5	Investment mechanisms
26 Nov 25	Lecture 7	EU electricity markets
27 Nov 25	Lecture 8	Consumers
03 Dec 25	Guest lecture	Wholesale markets (EEX)
04 Dec 25	Exercise 6	Wholesale markets, consumers
10 Dec 25	Lecture 9	Balancing
11 Dec 25	Exercise 7	Balancing
17 Dec 25	Buffer	
18 Dec 25	Buffer	
22 Dec 25 – 02 Jan 26	Winter break / Study time	
07 Jan 26	Lecture 10	Grids & nodal pricing

08 Jan 26	Exercise 8	Grids & nodal pricing
14 Jan 26	Lecture 11	Zonal pricing
15 Jan 26	Exercise 9	Zonal pricing
21 Jan 26	Buffer	
22 Jan 26	Buffer	
28 Jan 26	Guest lecture	System operation (50Hertz)
29 Jan 26	Buffer	
04 Feb 26	Exam prep 1	Exam info and Q&A on the lectures
05 Feb 26	Exam prep 2	Mock exam and Q&A on the exercises