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Faculty of Business and Economics  
Chair of Business administration, esp. Energy Economics

# **Decision Support in Power Plant Operation and Expansion Planning: Navigating Germany's Energy Future in Times of Growing Uncertainties**

Class Room Session #3 – Studienprojekt / Case Studies in Energy Economics

July 09, 2024

# Overview on semester plan all economics programmes + CMS Energy Track

16. Apr 24	All	Kick-start	
23. Apr 24	Upon OPAL scheduler request	Consultation	P2P #1 Energy track students
30. Apr 24	Upon OPAL scheduler request	Consultation	
07. Mai 24	Energy track students	Classroom discussion	
14. Mai 24	Upon OPAL scheduler request	Consultation	P2P #2 Energy track students
21. Mai 24	Pentecost holidays		
28. Mai 24	Energy track students	Classroom discussion	
04. Jun 24	Upon OPAL scheduler request	Consultation	P2P #3 Energy track students
11. Jun 24	Upon OPAL scheduler request	Consultation	
18. Jun 24	All	Classroom presentation (CMS literature studies)	
25. Jun 24	Upon OPAL scheduler request	Consultation	
02. Jul 24	Upon OPAL scheduler request	Consultation	
09. Jul 24	Energy track students	Classroom discussion	
16. Jul 24	All	Final presentation (EE2/CMS energy track)	

# Task description Economics + CMS

Operations Research Forum (2023) 4:37  
<https://doi.org/10.1007/s43069-023-00203-w>

## TUTORIAL



### Learning by Doing: Insights from Power Market Modelling in Energy Economics Courses

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#### Abstract

Much of energy economics curricula involves the study of techno-economic aspects of energy systems with an increasing focus devoted to fostering an understanding of the interactions between innovative technologies and adaptive markets. As the interplay of these dynamics and their impacts on market equilibria and outcomes is quite complex, optimization models are well-suited to facilitate their study. This paper presents two exemplary model approaches and associated case studies, which can be employed to study market developments driving long-term adaptations in the portfolio of power-generation assets as well as scheduling problems of individual plant owners with a focus on assessing the impact of changing market conditions on the profitability of investments. The combination of these two modelling approaches constitutes an innovative means of facilitating students' understanding of how individual decisions of different market stakeholders lead to welfare-maximizing market equilibria under the assumption of perfect competition. The models are discussed along with the experiences acquired employing them in various forms as project assignments. In summary, the integration of modelling exercises and assignments into the curriculum of energy economics courses has proven to be a practical means of reinforcing and broadening lecture material that is both interesting and rewarding for students.

**Keywords** Energy modelling · Electricity markets · Peak load pricing · Storage optimization · Energy economics

**Mathematics Subject Classification (2010)** 90-01 · 90-04 · 90-10

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1. Based on either ELTRAMOD<sub>stud</sub> \* or STORMOD<sub>stud</sub>\*, prepare a small research paper (10-14 pages) and consider the following aspects when delivering your research:
  - Motivate your research based on a short literature study;
  - Formulate a clear research question incorporating uncertainty;
  - Implement stochastic programming to address the research question;
  - Describe formally the developed and applied model;
  - Describe all parametric inputs;
  - Formulate your investigation approach, e.g. developed scenarios, etc.;
  - Prepare and discuss your results in an appealing way.
2. Prepare a small research talk and share your findings with the classroom students during the final project presentations (16. July, 2024).
3. Submit your paper along with the executable code applied at 15. September, 2024 (agreed within the classroom).

\* <https://doi.org/10.1007/s43069-023-00203-w>

# Some general guidelines for preparing and submitting the paper

- You can use any Latex or Word template of your preference, that meet general scientific standards. Hint: Overleaf provides templates for Springer and Elsevier papers.
- There is one example of a paper from a different course available at OPAL (tud\_ew3\_paper\_anonymized.pdf). May have look how these students prepared their paper.
- Please bind your paper. Ring book binding is fine. Note: I don't accept a loose stack of sheets.
- Also send me a digital copy of your paper (pdf) via email alongside executable code(s). Both should be compiled as one .zip file and labeled with your group members' last names in the file name.

# Some general guidelines for next week's paper presentation

- Please schedule your presentation to a duration of 15 minutes. We will have a 10 minute discussion afterwards.
- You can use your own laptops. The projector requires HDMI connection. Let me know in advance if you need a laptop from the department
- Please send me your presentation until end of day of the day before (Monday 15. July, 2024). It is ok if your final presentation contains slight additions.
- The audience may consist of participants that are not well familiar with your works. Prepare your presentations in an audience-focused way.

# Thank you for your attention

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