



University of Cologne

Microeconomics, Institutions and Markets Area
Chair in Political Economy and Energy Economics

Dr. Eren Çam

Economics of Renewable Energy Integration

Winter Term 2023-24

Introduction

The power sector is a major contributor to greenhouse gas emissions, particularly through the burning of fossil fuels such as coal, natural gas, and oil. Decarbonizing the power sector requires increasing the share of renewable energy sources. According to the International Energy Agency's (IEA) Net Zero Emissions by 2050 Scenario, renewable share of generation needs to increase from almost 29% in 2021 to more than 60% by 2030.

Increasing the use of mature technologies such as solar photovoltaic and wind power is therefore crucial to reduce dependence on fossil fuels and mitigate climate change. However, integrating these variable renewable sources into the existing power system is challenging, as their output is influenced by weather patterns and time of day, which poses complexities in balancing electricity supply and demand.

As renewable energy sources are generally more decentralized and dispersed, they necessitate extensive infrastructure upgrades and interconnections. The integration of renewables therefore requires increasing the system flexibility through the development and deployment of advanced technologies, including energy storage, grid modernization and expansion, and smart digital energy systems. Achieving these will involve overcoming various technical, economic and policy challenges.

In this course, students will be able to:

- Discuss and assess different scenarios of the IEA on renewable energy sources
- Identify the technical, economic and policy challenges of integrating renewables
- Receive insights via guest lectures by experts from the IEA and energy consulting industry
- Compare and evaluate best practices between different regions
- Conduct independent data-based analysis on selected real-world topics and present the results orally and in writing

Schedule

09.10.2023 10:00-11:30 12:00-13:30	Lectures Location: Institute of Energy Economics, Vogelsanger Str. 321a, 50827 Cologne
13.10.2023 23:59	Deadline submission of topic preferences Please submit your seminar topic preferences to ecam2@uni-koeln.de Seminar topics will be then allocated to you by email.
16.10.2023 10:00-11:30 12:00-13:30	Guest lecture from Guidehouse Consulting + skills session Location: Institute of Energy Economics, Vogelsanger Str. 321a, 50827 Cologne
20.10.2023 14:00-15:30	Guest lecture from the International Energy Agency, Renewable Energy Division Location: online, over Zoom
17.12.2023 23:59	Deadline submission of presentation slides Please submit your slides over ILIAS
18.12.2023 09:00-12:00	Seminar presentations Location: Institute of Energy Economics, Vogelsanger Str. 321a, 50827 Cologne
19.12.2023 09:00-12:00	Seminar presentations Location: Institute of Energy Economics, Vogelsanger Str. 321a, 50827 Cologne
28.01.2023 23:59	Deadline submission of final seminar paper Please submit your seminar paper over ILIAS

Application

A maximum number of 20 applicants can be admitted to the course. Please register on KLIPS for the seminar during the first registration period.

After you receive a seat in the seminar, please make sure to register for the examination on KLIPS as well. Only those who have a seat in the seminar can register for the examination! Thus, if you decide not to take the seminar, please make sure to deregister from the course, so your peers are able to enrol for the remaining spots before the exam registration phase ends.

Once you have registered for the examination, the registration is binding, and **students who do not give a presentation or do not hand in a seminar paper in time will receive a failing grade**. Thus, please make sure that you are able to hand in all documents within the deadline and attend the mandatory sessions before registering for the course.

Examination

The final grade consists of an oral and a written examination:

- Examination part A (50%): presentation of overall topic at seminar meeting (15 minutes per student – individual grade)
- Examination part B (50%): individual analysis and seminar paper on a specific research topic (max 5000 words)

Examination part A (November – January):

After the introductory lectures, students will be allocated topics regarding the system integration of renewable energy sources. The aim of the oral part of the examination is to assess and develop the students' research questions and analysis approaches in the allocated topics.

Each presentation should provide a general overview of the topic, analyse the current state of literature (introduce relevant literature and the methodology used in those sources) point out interesting research questions. Special focus should be given to identifying relevant data sources, and discussing their potential in helping address the research questions at hand.

Students need to structure their topic and deliver coherent and consistent presentation slides. Each student is required to present for 15 minutes. Grading will be done based on individual performance.

Examination part B (January – March):

In the written part of the examination, students will pick a research question they were able to identify during the presentation phase, in agreement with their mentor.

Focusing on this research question, the students then need to write a paper, which gives an overview of the literature, pick a methodology, identify relevant data sources, and analyse their research question in depth.

The written paper should be around 5000 words (+-10%). The analysis methods (e.g Excel sheets or any scripts) should also be delivered.

General Requirements

We expect students to have a basic understanding of economic concepts. Having taken other energy economics and/or energy policy courses is a plus but is not mandatory. Basic concepts of energy economics will be introduced in the introductory lectures. So those who do not prior experience will have a chance to catch up with the topic.

While the seminar topics will be distributed by the chair, students are expected to determine the main focus of their presentations and seminar paper themselves. The seminar participants are expected to gain in-depth insights into their topic independently. The emphasis within the own topic as well as the draft structure of the paper shall be discussed with the mentor at an early stage.

Active participation in the seminar discussion is expected. Attendance during all presentation days is therefore required.

We provide a guideline for the preparation of seminar papers. This includes all design requirements.

Further Information

Allocated Modules	Specialisation in Energy Economics – Seminar in Energy, Resource and Environmental Economics Remaining seats can be allocated to students in the IMES program
Credits	6
Language	English
Examiner	Dr. Eren Çam
Cooperation Partners	International Energy Agency, Renewable Energy Division Guidehouse Consulting
Organisation	Cordelia Frings (cordelia.frings@uni-koeln.de) person of contact