



Universität zu Köln

Department of Economics – Chair in Economics, Energy and Sustainability

Prof. Dr. Marc Oliver Bettzüge

Seminar in Energy, Resource and Environmental Economics

Summer Term 2024

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## **Hydrogen and its Derivatives as Key Elements of the Cross-Sector Energy Transition**

Germany has set ambitious climate targets, including climate neutrality by 2045 and a reduction of emissions compared to 1990 by 65% by 2030. To achieve these targets, emissions have to be reduced in all sectors. While decarbonisation is comparably well advanced in the power generation sector by using renewable energy sources (RES), other sectors like transport lack significant decarbonisation achievements. Therefore, enabling the RES gains from electricity generation to be available to other sectors will be a key factor for a successful cross-sectoral energy transition.

Climate-friendly produced hydrogen and its derivatives such as ammonia, sustainable aviation fuels (SAF) and methanol can contribute to making the cross-sectoral energy transition work. Compared to electricity, these commodities are easier to transport and to store, particular in large amounts and over longer time periods. In addition, they can be used in processes where the direct use of renewable electricity is insufficient or not possible. Here, a special focus might be the industrial (chemical/feedstock/high-temperature heat) and the transport sector (aviation, shipping, long-haul road transportation). In this seminar, students will review our current understanding of the German emission reduction challenge and analyse the potential role of hydrogen and its derivatives from an economic perspective.

The seminar is designed to replicate the full cycle of a master's thesis, with slightly reduced scope in line with the confines of a seminar. In particular, students will be asked to work on an individual research project, to present their results to the group, and to critically reflect on the contributions of their peers. Topics for the projects will be assigned and may cover aspects such as, e.g., the economic potential of hydrogen storage in Germany, analysis of the willingness to pay for hydrogen and its derivatives in the industry, effects of current regulatory framework on the market for hydrogen and its derivatives, potential incentives for hydrogen and its derivatives, or efficient auction designs for H<sub>2</sub>-ready power plants. A full list of topics will be presented in the introductory meeting on April 11<sup>th</sup>, 2024.

**PLEASE NOTE:** It is envisaged to combine the students' presentations on May 22<sup>nd</sup>, 23<sup>rd</sup> and 24<sup>th</sup> with field trips to sights of Uniper. Confirmation and details will be given prior to the *Deadline* to **Register for the**

**Examination via KLIPS.** We further need to hand over the names of students taking part in the course and thus joining the field trips to Uniper for security reasons. With your registration to the course you agree to the disclosure of data.

### Schedule

11.04.2024 10:00-13:30	827 Seminarraum	Introductory meeting Organizational Issues & Topic Introduction
<b>14.04.2024 23:59</b>	<i>Klips</i>	<b>Deadline to Register for the Examination via KLIPS</b>
16.04.2024	ILIAS	Topic allocation
17.04.2024 10:00-11:30	827 Seminarraum	Presentation and Writing Skills Seminar
17.04.2024 12:00-13:30	827 Seminarraum	Guest Lecture (EWI)
<b>28.04.2024 23:59</b>	<i>Klips</i>	<b>Deadline to Withdraw from the Examination via KLIPS</b>
<b>20.05.2024 15:00</b>	<i>ILIAS</i>	<b>Deadline Submission of Presentation Slides to ILIAS</b>
22.05.2024	tba	Presentations..... <b>Mandatory</b> Possibly Field Trip
23.05.2024	tba	Presentations..... <b>Mandatory</b> Possibly Field Trip
24.05.2024	tba	Presentations..... <b>Mandatory</b> Possibly Field Trip
<b>19.07.2024 23:59</b>	ILIAS	<b>Deadline Submission of Final Seminar Paper</b>

### 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 (use the Lehrveranstaltungsprüfung “Seminar in Energy, Resources and Environmental Economics”). 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 an written examination part. To pass the examination, students are required to participate in all parts of the examination.

The final grade for this course will be a weighted average of (the quality of):

- A) presentation (40 % - 10 minutes)
- B) seminar paper (60% - 5000 words)

The participation in all examination parts and dates is mandatory in order to successfully complete the course. Fruitful contributions to the sessions can have a positive impact on the final grade.

Examination part A: a presentation:

This is the oral part of the examination. The aim of this part is to provide and receive an overview of different facets of the seminar topic. Students will individually work on a literature review resulting a specific topic definition and a design for a research approach. Review, topics and research approach have to be presented to the other peers and discussed with industry experts. Each student is required to present 10 minutes. A discussion will follow the presentation.

Examination part B: a seminar paper:

The written paper should be 5000 words (+-10%). Students need to narrow down the scope of their paper by choosing a research question, providing an overview of the literature, and critically analysing their research question in depth.

**General Requirements**

The seminar is designed for students to prepare for a Master thesis in Energy Economics. The seminar participants are expected to gain in-depth insights into their topic independently. Thus, **we expect students to already have a solid foundation in Energy Economics** before taking the seminar.

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 emphasis within the own topic as well as the draft structure of the paper, shall be discussed with the mentor at an early stage. Furthermore, students should deal critically with the contributions of other participants. 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. ([https://energie.uni-koeln.de/sites/energie/pdf/Guideline\\_English.pdf](https://energie.uni-koeln.de/sites/energie/pdf/Guideline_English.pdf))

**Further Information**

Allocated Modules	1302MSSMP1 SM Seminar Markets and Economic Policy 1287MESEC1 EM Seminar Economics There are no seats for students in the IMES program
Credits	6
Language	English
Examiner	Prof. Dr. Bettzüge
Cooperation partners	Uniper & EWI
Field Trip	Scheduled scheduled for May 22 <sup>nd</sup> , 23 <sup>rd</sup> and/or 24 <sup>th</sup> , to be confirmed.
Organization	Cordelia Frings ( <a href="mailto:cordelia.frings@uni-koeln.de">cordelia.frings@uni-koeln.de</a> )