



University of Cologne

Department of Economics – Chair in Economics and Energy Economics
Prof. Dr. Marc Oliver Bettzüge

Seminar in Energy, Resource and Environmental Economics

Winter Term 2017/18

The future of final energy consumption – the role of (natural) gas

Schedule	<ul style="list-style-type: none">▪ Introductory Meeting: October 12th 2017, 15:00 to 16:30 at the Institute of Energy Economics, Vogelsanger Str. 321a, 50827 Cologne<ul style="list-style-type: none">▪ Introduction▪ Organizational Issues▪ Allocation of Seminar Topics▪ Seminar: November 28-30th, 14:00-19:00<ul style="list-style-type: none">▪ Presentation by each seminar participant▪ Accompanying presentations▪ Discussion▪ Submission of final seminar papers until January 6th 2018.▪ Field trip: probably in November or early December
Allocated Modules	<ul style="list-style-type: none">▪ Specialisation in Energy Economics – Seminar in Energy, Resource and Environmental Economics▪ The seminar can also be selected by IMES students▪ A maximum number of applicants of 25 can be admitted, priority will be given to students of the WiSo Faculty
Credits	6
Language	English
Examiner	Prof. Dr. Bettzüge

1. Topic

The German government aims at reducing carbon emissions by around 40 percent until 2030, relative to 2014, and by an even more ambitious rate until the year 2050. So far, most discussions have centred around the structure of electricity generation, with e.g. decisions to implement a Europe-wide cap-and-trade scheme, the EU emissions trading system (EU-ETS) or to increase the capacity for converting so-called renewable energy sources.

The structure of final energy has received considerably less attention. For a fully-fledged energy transformation, final energy represents the crucial challenge. In Germany, currently, final energy is received mainly from mineral oil (37 %, 2015), natural gas (23 %), and electricity (21 %), with the remainder being distributed among various other energy carriers such as heat, coal, and biomass. At the current emission factor of the German electricity mix, electricity is not necessarily cleaner than using natural gas, and gas conversion technologies are well-established and supported by an existing infrastructure. So, in the short term, shifting the final energy mix towards gas would provide relatively large, fast, and inexpensive ways to reduce GHG emissions. E.g., in the heating sector, natural gas is an efficient alternative to fuel oil, particularly when it can be used e.g. in efficient heating systems or even in (micro) CHPs. This applies both to in households as well as to applications in the industry. Similarly, natural gas has also substantial potential in the transport sector as well, e.g. in the automotive sector in which compressed natural gas can reduce carbon and other emissions in comparison to diesel or gasoline, or in heavy transportation where liquefied natural gas (LNG) could quickly speed up the decarbonisation trajectory.

In the longer term, a further roll-out of electricity generation from so-called renewable energy sources (RES), especially Wind and Solar, will necessarily lead to an increased use of synthetic fuels as long-term (seasonal) storage. Hydrogen and synthetic methane are currently seen as two of the most promising of such fuels when produced with electricity generated from RES. Rather than only being used as a back-up fuel for the electricity system, such synthetic gases could also directly enter final energy consumption as secondary energy carriers instead of electricity. And they might also be imported from outside of Germany, relieving the German energy supply from the restrictions posed by her rather limited Wind and Solar potential.

Thus, the existing European gas infrastructure can prove to become an excellent backbone along the German GHG mitigation pathway, flexibly adapting to an increasing share of 'green gas' with more and more stringent restrictions placed on carbon emissions, and with an increasing use of the power-to-gas-technology as the growth in RES-capacities leads to more and more curtailment problems. Thus, from the perspective of an affordable energy system with efficient carbon mitigation, it is expected that the role of gas should gain increasing importance in the energy sector, and especially in additional end energy uses.

So far, however, the political debate is shaped more by the idea of fast electrification of the entire final energy consumption rather than by looking for a gradual trajectory making use of the potential offered by gas-based technologies, and the gas infrastructure.

Given this background, the seminar will explore the potential future of (natural) gas in the German energy system from various perspectives. Key issues studied comprise: gas supply to Germany from a global and European perspective (economics, and security of supply); economic potential of various end-energy technologies in the heat sector and transport sector; the technical, political, and economic perspectives of synthetic fuels; as well as the perspectives for the gas infrastructure (grid and storage).

2. Cooperation Partners

The seminar, and the field trip in particular, will be organized in cooperation with Wingas, Kassel, and further cooperation partners in the final energy sector.

3. Meetings

- Introductory meeting
- 3 day seminar meeting
- Field trip

4. Mode of Examination

- Seminar Paper (max 5000 words)
- Presentation of work progress at seminar meeting (15 minutes)
- Accompanying presentation of a fellow student's topic

5. General Requirements

The seminar participants are expected to gain an in-depth insight into their topic independently. They should determine the main focus of their seminar paper. The emphasis within the own topic as well as the draft structure of the paper shall be discussed with the supervisor at an early stage. Furthermore, students should deal critically with the contributions of other participants. Active participation in the seminar discussion is expected. We provide a guideline for the preparation of seminar papers. This includes all design requirements.

6. Application

The registration for examination should be done using KLIPS. The registration is binding and students who do not hand in a seminar paper or who do not present their paper will receive a failing grade.

7. Organisation

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Please do not hesitate to contact me in case of further questions.