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Lecture: "Advanced Energy Economics" (V2/Ü2, 81.28928)

Description
Expanding demand and limited supplies jeopardizes energy supply security and thus also social and economic development. At the same time, unrestricted energy use, mainly through fossil fuels, is a significant contributor to escalating levels of CO_2 and other pollutants. Research and investment in alternative sources of energy is growing rapidly, as well as the use of the renewable energy technologies. Moreover, policy and regulatory changes affect the transition process of the existing energy system and bring new challenges for the supply side as well as for the demand side of the energy system.

Given these adverse trends, a deep and critical understanding of energy supply and demand/use, and how it impacts our national and global economies, becomes more important with every passing day. This course has been designed to facilitate the development of that understanding. It will contain four basic modules, described below.

1. The first module explores the dominant theoretical and empirical perspectives on energy and its supply and demand. Students will be introduced to discounting, the standard models of renewable and non-renewable resource extraction, and some basis in the econometric analysis of energy systems.
2. The next module focuses on the negative consequences of energy use. Factors affecting energy efficiency and use and modeling issues will be explored. We also look at the problem of pollution and how it can be controlled through economic mechanisms. These mechanisms include energy taxes and tradable carbon permit (or green certificate) markets.
3. The third module focuses on individual sources of energy. We will look at salient aspects of the oil, natural gas, coal, nuclear, biofuel and other alternative energy sectors. There will also be some discussion of energy security, transmission and distribution of electricity and deregulation of the electricity sector.
4. The final module explores risk management in the energy space and familiarizes students with investment under uncertainty (real options modeling), futures markets and derivatives. It concludes with some discussion of energy policies and how they might affect outcomes in the sector.

Organization
Weekly lecture on Tuesday, 16:30 – 18:00 hrs, H07. A two-hour weekly exercise unit will complement the lecture (Wednesday 16:30 – 18:00 hrs, E.ON ERC 00.24. To participate successfully you have to register via CAMPUS and pass the exam (60 minutes) at the end of the course. Course materials will be made available for download on the e-learning platform RWTHmoodle.

Target audience
This course is dedicated to master's students in economics, engineering economics, georesources management, and selected other related fields. In order to find out whether you are allowed to take this course, please get in touch with your study advisor.

Requirements
Basic knowledge in Economics (Micro/Macro) and Energy Economics.

Literature
[1] Anderson S.T., Newell R.G. (2004) Information programs for technology adoption: the case of energy-efficiency audits, *Resource and Energy Economics* 26, 27-50

[2] Bhattacharyya S.C. (2011). *Energy Economics: Concepts, Issues, Markets and Governance*, Springer-Verlag, London/Dordrecht/Heidelberg/New York

[3] Gollier C., Proult D., Thais F., Walgenwitz G. (2005). Choice of nuclear power investments under price uncertainty: Valuing modularity, *Energy Economics* 27: 667-685

[4] Jaffe A.B., Stavins R.N. (1994) The energy paradox and the diffusion of conservation technology, *Resource and Energy Economics* 16, 91-122

[5] Jain S., Roelofs F., Oosterlee C.W. (2013). Valuing modular nuclear power plants in finite time decision horizon, *Energy Economics* 36: 625-636

[6] Mulder P. (2005). *The Economics of Technology Diffusion and Energy Efficiency*, Edward Elgar, Cheltenham/UK and Northampton/Mass

[7] Perman R., Ma Y., McGilray J. and Common M. (2003). *Natural Resource and Environmental Economics*, Pearson Education Limited, Harlow

[8] Thomas B.A., Azevedo I. (2013). Estimating direct and indirect rebound effects for U.S. households with input–output analysis Part 1: Theoretical framework, *Ecological economics*, 86: 199-210

[9] Thomas B.A., Azevedo I. (2013). Estimating direct and indirect rebound effects for U.S. households with input–output analysis Part 2: Simulation, *Ecological economics*, 86: 188-198

[10] Yepez R.A. (2008). A Cost Function for the Natural Gas Transmission Industry, *The Engineering Economist*, 53: 68-83