APPLIES TO ACADEMIC YEAR 2013/2014

GRA 8216 Energy Transition, Efficiency and Sustainability

Programme
Executive Master of Management in Energy (EMME)

Responsible for the course
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Department
Department of Innovation and Economic Organisation

Term
According to study plan

ECTS Credits
6

Language of instruction
English

Introduction
The world economy is fueled by fossil resources. Oil, natural gas and coal account today for more than 80% of the primary energy mix, while global energy demand is increasing to meet social and economic development.

All societies require energy services to meet basic human needs (e.g., lighting, cooking, space comfort, mobility and communication) and to serve productive processes. As the world population is growing and the developing world is catching up with developed countries mode of consumption, the debate has been focusing on whether there will be enough energy resources to fuel the economy.

However, from an environmental perspective, there may be too much fossil fuels remaining underground. Greenhouse gas emissions resulting from the consumption of fossil resources have contributed significantly to the historic increase in atmospheric GHG concentrations. Recent data confirm that consumption of fossil fuels accounts for the 2/3rd of global anthropogenic GHG emissions. Emissions continue to grow and CO_2 concentrations are close to reach 400ppm ; temperatures have grown by +0.8°C since pre-industrial level, while the reasonable limit is assessed at +2°C to prevent *probable* uncontrollable climate change.

An energy transition is hence required in order to decouple human development and welfare from GHG emissions. There are multiple options for lowering emissions from the energy system while still satisfying the global demand for energy services. Some of these possible options, such as energy conservation and efficiency, fossil fuel switching, renewable energies will be assessed during this course.

A comprehensive evaluation of any portfolio of mitigation options would involve an evaluation of their respective mitigation potential as well as all associated risks, costs and their contribution to sustainable development. This course will concentrate on the role that the deployment of energy transition policies can play within such a portfolio of mitigation options. As well as having a large potential to mitigate climate change, transforming the global energy system must provide wider benefit: implemented properly, energy transition must contribute to social and economic development, energy access, a secure energy supply, and reducing negative impacts on the environment.

Under most conditions, energy transition policies will require financial mechanisms and coordinated action plans to stimulate changes in the energy system. Deployment of renewable energies and energy efficiency technologies has increased rapidly in recent years, and their share is projected to increase substantially under most ambitious mitigation scenarios. Additional policies would be required to attract the necessary increases in investment in technologies and infrastructure.

Energy Transition and Sustainability (“ETS”) course will introduce participants to the theory and practice of energy efficiency measures and their socio-economic impacts. Through several lectures and discussions regarding technologies and their implementation in different sectors, the course will provide the participant with a vast and general overview of sustainable energy systems and their impact on the industries, society, environment, markets and our everyday life.

Learning outcome
Each session will be an opportunity to discover, review, analyze and discuss major recent developments in deployment of low-carbon technologies and energy transition policies, to explore key technical, economic, financial, social and political issues relevant to this area, such as techniques related to electricity generating unit management (simulation tool), financing of renewable energy projects, and energy efficiency technologies review.

Prerequisites
Granted admission to the Executive Master of Management in Energy Management programme.

Compulsory reading

Other:
Christian DE PERTHUIS (2013), Energy transition: ambiguity of the notion of variable geometry, EU Energy Policy Blog: http://www.energypolicyblog.com/2013/04/21/energy-transition-ambiguity-of-the-notion-of-variable-geometry/
IEA Key world energy statistics 2013:
http://www.iea.org/publications/freepublications/publication/KeyWorld2013.pdf
SIM-Power (CESIM) simulation tool description
Videos: TEDx Rainier, Amory LOVINS (2012), Reinventing Fire: https://www.youtube.com/watch?v=u-Kq89M0t18

Recommended reading

Articles:
Björn ÁSTMARSSON, Per Anker JENSEN, Esmir MASLESA. 2013. Sustainable renovation of residential buildings and the landlord / tenant dilemma. Energy Policy Journal
Kenneth GILLINGHAM, Richard G. NEWELL and Karen PALMER. 2009. Energy efficiency Economics and Policy
Michael G. POLLITT. 2012. The role of policy in energy transitions: lessons from the energy liberalisation era. Cambridge University Electricity Policy Research Group
Michel CRUCIANI. 2013. Year 2 of Germany's energy transition. French Institute of International Relations (IFRI).

Other:
Christof RÜHL, BP Chief Economist. 2014. Energy consumption growth – one hump or two?. LinkedIn post
Synopia Report. 2014. A new European energy policy? Assessment and proposals

Course outline

Solar Financing: Challenges, technical aspects:
· Project financing challenges for industrial partners (equity & debt investment, risk management, bankability)
· Techno-economic aspects and financial structuring of solar projects (influence of electricity market, PPAs, FITs, merchant plant)
· Contractual and legal aspects of solar project financing (relationship with co-developers, banks, EPCs, local energy authority, landowner…)

Utility (fossil & renewables) Management (market simulation):
· Strategic management of fossil fueled & renewables utilities under competitive market
· Dynamics of power markets – both conventional and renewables – and power production (pricing, marketing, investment & divestment decision-making, capacity utilization and operational improvements)
· Risk management (funding, price risk hedging, policy regulation)

Energy Transition Day - World Energy Council Conference: *Lifestyles and Energy in the City* .
· Individuals mode of consumption and their relationship with consumer goods (purchasing strategy, consumer habits, distribution channel…)
· Balance between the individual and the group, and the choice of "how to live together" (housing, transport, new forms of solidarity, etc.)
· The role of cities and citizens in the energy transition

Energy efficiency
· Assessment of energy efficiency policies and finance mechanisms (national and international action plans, political challenges, financing)
· Energy efficiency in a local context (investment decisions, regulatory framework, project financing)

Computer-based tools
It's Learning and e-mail.

Learning process and workload
1 ECTS credit corresponds to a workload of 26-30 hours.

Attendance to all sessions in the course is compulsory. If you have to miss part(s) of the course you must ask in advance for leave of absence. More than 20% absence in a course will require retaking the entire course. It's the student's own responsibility to obtain any information provided in class that is not included on the course homepage/ It's learning or other course materials

Examination

The course evaluation will be based on:
- 50% Individual Paper
- 50% Case Study Group

This is a course with continuous assessment (several exam elements) and one final exam code. Each exam element will be graded using points on a scale (e.g. 0-100). The elements will be weighted together according to the information in the course description in order to calculate the final letter grade for the course.

Specific information regarding student evaluation beyond the information given in the course description will be provided in class. This information may be relevant for requirements for term papers or other hand-ins, and/or where class participation can be one of several elements of the overall evaluation

Examination code(s)
GRA 82161 - Continuous assessment; accounts for 100 % to pass the program GRA 8216, 6 ECTS credits

The course is a part of the Executive Master of Management in Energy (EMME) and all evaluations must be passed to obtain a certificate for the degree.

Examination support materials

Re-sit examination
Re-takes are only possible at the next time a course will be held. When course evaluation consists of class participation or continuous assessment, the whole course must be re-evaluated when a student wants to retake a exam. Retake examinations entail an extra examination fee.

Additional information