APPLIES TO ACADEMIC YEAR 2013/2014

MAN 1676/1677 Energy Economics

Programme

Responsible for the course
Dr. Gintaras Gavenas

Department
Department of Innovation and Economic Organisation

Term
According to study plan

ECTS Credits
30

Language of instruction
English

Introduction
This course provides the requisite knowledge and skills for broad range of management working in energy sector.
The content is organized along value creation chain, with certain emphasis on strategic issues and covers main topics in electricity, gas and district heat industries. This way alignment of the curricula with local set up of energy industry is achieved, enabling students to prepare themselves for hands-on decision making in actual business environment. The energy industry studies are organised going through demand and supply analysis, analysing electricity generation utilities; modern developments in electricity and gas market liberalization and trade are taught in detail and analysing Baltic/Nordic real life cases. Countries energy strategies are analysed in detail from both energy security and technological perspective and detail study of national energy strategy is closing the course.

Faculty comprises both local leading experts and executives being practically involved in key solutions of generation, transmission and distribution of electricity, gas and heat, and international experts practically worked with developing liberalised markets in Europe. Material of the course is kept as close as possible to real market conditions and practical cases from real operation are used. Aim of the course is to link text-book knowledge with hands-on practice form insiders of the industry.

This course is designed for executives and middle management working in energy sector (electricity, gas, district heat) leading both strategic, development and operational units. The course is also valuable for decision makers in supply chain of energy industries.

Learning outcome
Knowledge and understanding :
Participants will acquire scientific knowledge, insights of international context, and local practices related to management and applied economics of integrated energy generation, transmission, distribution and consumption of electricity, gas and heat industries. Students will understand interrelations between various energy sources and interactions at international, regional, national and local levels.

Cognitive skills :
Students will acquire cognitive skills required to manage decision making processes in energy industry and to link energy industry specifics, highly technical in nature and dynamic environment with economic and political processes featured by energy sector.

Transferable skills, competence and attitudes :
Participants of the course will become comfortable to understand and analyze industry challenges and opportunities, to combine technical, economical and managerial insight to solve practical issues and business cases. They will have necessary skills to transfer most important knowledge base and analytic capabilities to their companies in order to lead decision making processes in the area of their responsibility. At the end of the course, students will be able to assess the strategic development of energy industry in general and to evaluate factors playing in their field of action, to involve technical, managerial and economical knowledge in order to capitalize on business opportunities.

Prerequisites
Bachelor degree (or equivalent), motivation evidence to accomplish study requirements, at least upper intermediate level English, 4 years of managerial work experience.

Compulsory reading

Recommended reading

Course outline

Energy economics: fundamentals in energy management. Interrelation between economics, energy and environment. Energy demand and supply elasticity. Energy economics for fossil and non-fossil energy sources. Substitution between energy sources.
Oil economy. The global oil market; understanding oil price developments. Economic theory of exhaustible resources. Political approaches to understand the oil market. The Hubbart curve. Exchange rates and the oil price. Geopolitics of oil and the Middle East; OPEC and the IEA

Markets for natural gas. The noncompetitive nature of natural gas markets. Regulation of natural gas markets. Geopolitics of natural gas and Russia; energy developments in the Arctic. Conventional and unconventional oil and gas; shale gas revolution; liquefied natural gas (LNG). EU vs US natural gas markets. Energy policy. EU energy policy; national energy policies. Public policy and administration in the energy sector. Goals and roles of the state in the energy sector. State-private combinations in the petroleum sector

Energy demand analysis: main components and parameters (electric power; district heating; fuel). Short term/long term demand; Macroeconomic and microeconomic factors of energy demand Relation of consumer behavior and energy demand

Electric power supply: primary sources, fuel markets, supply chain; generation of electricity (fossil, nuclear, renewable); cost and pricing. Generation development (investment, engineering, project management); production (planning, management, optimization). Electricity market: competition, regulation, support mechanisms.

Energy supply (continued). Economics of electricity supply. Case studies: gas fuel cogeneration plant; energy storage/hydro accumulation; wind park; solar photovoltaic park

Electric power transmission: European grids; Synchronous zones (operation, sustainability); Interconnections; Historical development and perspective

Electric power distribution: Layout of electricity networks; management, operation and automation; planning and development of the network; reliability, sustainability, loses, measurement, indicators; future developments, smart grids

Energy markets and trading. Electricity market: market development, liberalization, regulation; trading system, transparency, surveillance; market principles: day-ahead, intra-day trading, market coupling, market splitting. Case: Elspot–Nord Pool spot. Gas market

District heating management and economics: evolution and future trends in Europe and Lithuania; technologies, applications, country models; district heating in Lithuania (regulation, pricing, technical and economical solutions, developments and failures analysis); management of operators, ownership models, economic incentives, fossil and renewable fuel

Gas management and economics. Natural gas industry outline: technology, economy and regulation. Upstream analysis: world's natural gas resources, exploration, and extraction.
Transportation and storage: technologies, LNG chain, transmission and distribution networks, underground gas storage. Market and trading: natural gas price formation mechanisms, fuel to fuel competition, contractual frames and trade platforms. Regulation: regulation principles and tasks, business expectations and market situation

Energy – environment interactions. Environmental economic aspects and internal pollution costs. Economics of climate change. Flexible mechanisms: emission trading schemes, clean development mechanism (CDM), joint implementation (JI).
Economics of renewable energy sources. Renewable energy: technologies, development, future trends; Economics of renewable energy supply; Subsidies, support mechanisms: case and practic

Market regulation: historical approach; independart regulators role; regulation in EU market; regulation in Lithuania.
Ownership and governance practices: private and state ownership in energy; privatization cases: results and ourcomes; governance practice

Energy security: definition of energy security; trends and practices around the world; EU energy policy; transformation of Baltic energy sector; Baltic energy market interconnection plan (BEMIP); Lithuanian energy policy

Public and private interrelation in energy: public and private capital interaction; purpose and methods of state intervention into energy sector; public procurement, supply chain management.
Competition in energy: natural monopolies and competition restrictions in energy sector; competition surveillance

Strategies in energy sector: energy strategies at macro level; factors influencing on country energy strategy; strategic features applied by countries. Case studies: Strategies applied by countries

National energy strategy: purpose, meaning, building blocks and methodology overview of historical energy strategies.
Experience of putting up national energy strategies: SWOT, main drivers, forecast scenarios, global challenges, international commitments. Analysis of future scenarios: estimation methodology, planning tools, statistical analysis, information sources, evaluation of main development paths. Energy strategy implementation plan

Computer-based tools

Learning process and workload
The program is conducted through 16 course modules, a total of 128 lecturing hours. Project tutorials consist of personal tutorials and tutorials given in class. Generally the students may expect consulting, not evaluating tutorials.

Examination
The students are evaluated through a term paper, counting for 10 credit hours and an 4 hours individual written exam, counting for 20 credit hours. Both evaluations must be passed to obtain a certificate for the program. The term paper may be written individually or in groups of maximum three persons.

Examination code(s)
MAN 16761 - Term paper; accounts for 100 % to pass the program MAN 1676, 10 credits.
MAN 16771 - Written exam; accounts for 100 % to pass the program MAN 1677, 20 credits.
Both evaluations must be passed to obtain a certificate for the program.

Examination support materials
Written material such as books, notes, etc. are allowed, including portable PC. Mobile phones, other communication tools or electronic media are not allowed

Re-sit examination
At the next ordinary exam.

Additional information

Reading list:

Compulsory literature (total: 1761 pages)	**Textbook(s):**
	Subhes C. Bhattacharyya, S.C. (2012). *Energy economics* . Springer. 1-645 (645 pages)
	Aswathanarayana, U., Harikrishnan, T., Thyyib Sahini, K.M. (2010). Green energy: technology, Economics and Policy. CRC Press. Selected chapters to complement the main textbook: 5-147, 201-331 . (277 pages)
	Bern, G. (2011). *Investing in Energy* . John Wiley & Sons, Inc. Selected chapters to complement the main textbook: 3-50, 147-198 . (98 pages)
	Boardman, A.E., Greenberg, D.H., Vining, A.R., Weimer, D.L. (2006). *Cost-Benefit Analysis. Concepts and Practice* . Pearson education, Inc. Selected chapters to complement the main textbook: 1-278 . (278 pages)
	Everet, B., Boyle, G., Peake, S. & Ramage, J. (2012). *Energy systems and Sustainability* (2nd ed.). Oxford University Press. Selected chapters to complement the main textbook: 1-139, 315-379, 465-620 . (358 pages)
	Articles (in alphabetic order):
	Guide to Cost-Benefit Analysis of Investment Projects . (2008). European Commission, Directorate General Regional Policy. 13-200 (187 pages)
	Houmoller, A. P. (2012). *The Liberalised Electricity Market.* In: www.houmollerconsulting.dk . (8 pages)
Recommended literature (total: 1121 pages)	**Books**
	Smil, V. (2010) *Energy Myths and Realities* , Washington: The AEI Press, 55-164. (109 pages)
	Simkins, B., Simkins, R. (2013). *Energy Finance: Analysis and Valuation, Risk Management, and the Future of Energy* . John Willey & Sons, Inc. 5-277 (272 pages)
	Articles (in alphabetic order):
	Alhaji, A.F. (2008, issue IV). What is Energy Security ? Energy Politics, 1-21. (21 pages)

Recommended literature (total: 1121 pages)	BP (2012) *BP energy outlook 2030* . BP, London, (88 pages)
	Cameron, P.D. *Competition in Energy Market. Law and Regulation in the European Union* . Oxford University Press, 203-344., 2007. (141 pages)
	Dreyer, I., Erixon, F., & Robin Winkler. (2010, no 1). *Fighting Europe's Dependency on Russian Gas more Effectively* . ECIPE occasional paper. 1-37. (37 pages)
	Energy Information Administration (EIA). (2011) *International Energy Outlook* . Washington. 57-87. (31 pages)
	Energy 2020: A strategy for competitive, sustainable and secure energy. (2010) Communication from the Commission to European Parliament, The Council, The European Economic and Social Committee of the Regions. Brussels. 1-21 (21 pages)
	ENTSO-E Guideline for Cost Benefit Analysis of Grid Development Projects. (2013). European Network of transmission System Operators for Electricity. Brussels. 1-66. (66 pages)
	Greenpeace. (2012). *Energy revolution. Executive summary* . 14-17,19-47 (31 pages)
	Hamidi, N.F. Abdullah, M.P., Hassan, M.Y. & Hussin, F. (2012*). Load shifting and retrofitting strategy for reducing electricity bill* . Res. Dev. Scored Ieee Stud. Conf., 182–187. (6 pages)
	Houmoller, A. P. (2010). *Unbundling of spot exchanges and associated clearing houses* In: www.houmollerconsulting.dk . (18 pages)
	International energy Agency (IEA). (2013) *World Energy Outlook.* Paris (52 pages)
	de Jong, J., Weeda, E. (2007). *Europe, the EU and its 2050 energy storylines.* Clingendael Energy Paper. 1-51. (50 pages)
	Kirschen, D.S (2003, vol 18, no 2). *Demand-side view of electricity markets* . Power Syst. Ieee Trans., 520–527 (8 pages)
	Kowli, A., Negrete-Pincetic,M., & Gross, G. (2010). *A successful implementation with the Smart Grid: Demand response resources* . Power Energy Soc. Gen. Meet. 1–4, 25. (5 pages)
	Lang, K-O. *Energy: pulling the Baltic sea region together or apart* . (2009). Latvian institute of International affairs. 283-200 (16 pages)
	Organization for Economic Cooperation and Developments (OECD), 2012: *Environmental Outlook to 2050: The Consequences of Inaction* . Paris. 71-154 (81 pages)
	Parkinson, S., Dan Wang, & Djilali, N., (2012) *Toward low carbon energy systems: The convergence of wind power, demand response, and the electricity grid* . Innovative Smart Grid Technology. Asia Insight. p. 1–8. (8 pages)
	Powell, W. (2011). *Shale Replaces LNG as Gas Consumers' Savior.* Platts Insight: 2012 Global energy outlook. The McGraw-Hill Companies. 13-17 (4 pages)
	Sounders, P.J., Legvold, R. & Krutykhin, M. *Russian energy policy and strategy.* (2008). Vol 19(2). The National Bureau of Asian Research, 3-33. (30 pages)
	Smith K.C., (2008). *Russian Energy Policy and its Challenge to Western Policy Makers.* Center for Strategic and International Studies. Washington. 1-11. (11 pages)
	Salazar, I.A., Ortega, M.A., Escrivaì, G.E., C. A. Bel C.A. & Mariìn, A.G.

commended literature (total: 1121 pages)	(2009) *Customer participation in short term electricity markets: Application to the Spanish case.* Sustain. Altern. Energy Ieee Pesias Conf., p. 1–6. (6 pages)
	Stasinopoulos, D. (2001): *The United States New Energy Policy: A European Perspective* . Minerals & Energy - Raw Materials Report, 16:4, 31-34 (3 pages)
	Tiptipakorn S. & Wei-jen Lee, W. A. (2007*). Residential Consumer-Centered Load Control Strategy in Real-Time Electricity Pricing Environment* . Power Symposium 2007 Naps 07, 39th North Am., 505–510. (6 pages)