

Energy Economics and Regulation

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DTU

Energy Economics and Regulation

Systems Analysis Division, DTU Management Engineering

Klaus Skytte

Energy Economics and Regulation

December 2017 Tsinghua University

DTU Management Engineering Department of Management Engineering



DTU Management Engineering

Systems Analysis division

- Energy Systems Analysis (ESY)
 - Global and regional energy system optimisation models (all sectors)
 - Integration of intermittent renewables in energy systems
 - GIS prepossessing tools
 - Quantitative scenario analysis
- Energy Economics and Regulation (EER)
 - Analyses of regulatory frameworks and market designs that facilitate the transition towards larger share of renewable energy in the energy system, energy savings, and climate change
 - Policy analysis and economic assessment
 - Economic and social aspects of wind integration, coupling of markets, and flexibility options
 - Demand behaviour based on technical/economic or econometric models
- Climate Change and Sustainable Development
 - Modelling of climate Change mitigation, renewable energy, and smart cities;
 - Decision making tools for climate change impacts and adaptation
- Transport Economics



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Department of Wind Energy

DTU Elektro Institut for Elektroteknologi

Sister departments

DTU Wind Energy

Five research themes

1. **Energy system modelling**: Advanced tools and expertise supporting national and international energy policy making. Open access modelling. E.g. TIMES and Balmorel models.

2. Energy economics, policy analysis and energy demand modelling:

E.g. design of energy markets with high share of variable renewable energy, economics of wind energy, and analysis of economic effects from energy and environmental policies and savings, demand forecast, and analysis of high-frequency individual energy demand data.

3. Climate change impacts, risks and adaptation

4. **Urban systems and green economy**: Research in connections between liveable cities, urban infrastructure, energy, water and local and global ecosystems in order to make cities smarter and more sustainable.

5. **Transport economics**: Assessment of the economic effect of transport policies, Analyses of travel demand and the relationships between the transport sector and the economy in general, especially the housing and labour markets.

The Future Energy System

Goals and RE-thinking of the Energy Policy Co-Operation



Lessons learned from Denmark



DTU

5



Denmark - The Country of Wind and District Heating

Wind 42% share (2015).

Political targets:

- **2020:** 50% of traditional electricity consumption covered by wind power
- **2035:** All electricity and heat based on renewable energy (Obs. the previous governmental position)
- 2050: The total* energy supply based on renewable energy *Total energy system incl. heat, gas, transport, industry, etc.



	District heating			
	share of heat supply	CHP share of DH	CHP share of electricity supply	Power-to-Heat share of DH
Denmark	50%	69%	65%	<1%











 develop a Baltic Grid concept (roadmap for offshore grid development) in a close dialogue with relevant industry and political stakeholders

Resources

- InterReg
- 2016 2019
- DTU Wind k€ 204 DTU Man: 192 k€
- DTU Wind, DTU Man,
 - + Baltic/german/Polish partners
- WP3 Regulation & Policy + feasibility study





Cooperation on RES support auctions

AURES: Auctions for Renewable Energy Support: Effective use and efficient implementation options

3-year H2020 project, 8 partners from 7 EU countries, 1.6mEUR, DTU is coordinator

Cases on future RES support auction implementations

Project example

- 5 cases
- 5-7 meetings per case
- 4 regional workshops
- policy making support right where it happens
- joint analysis on pressing issues
- knowledge generation about processes



Iremb





Innovative re-making of markets and business models in a renewable energy system based on wind power

Content

- Market design that facilitates the uptake of renewable energy sources
- WP on existing and new designs

Resources

- Approx 3 mio DKK
- Three year 2016-2018
- 1 PhD to SYS









Flexibility for Variable Renewable Energy Integration in the Nordic Energy System

Integrating a high share of variable renewable energy through enhanced energy market interaction

Identify and assess regulatory and technical pathways towards coherent Nordic energy systems

in 2050 based on strong interaction between different energy markets that ensure resilience, sustainability and efficiency.



Nordic Energy Research Flagship project September 2015 - March 2019



Flexibility Resources/Market Actors



Electrification/sector coupling - Finding ramping capabilities



Sector coupling Electrification as source of flexibility







Flexible Nordic Energy Systems

www.Flex4RES.org

Funded by:



Nordic Energy Research Nordic Council of Ministers

Thank you for your interest







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